



# Can existing renewables and nuclear help keep prices down next winter?

## The case for a 'pot zero' CfD auction

Discussion Paper

*Rob Gross, UKERC Director*

*Callum MacIver, UKERC, University of Strathclyde*

*Will Blyth, UKERC, Oxford Energy Associates*

April 2022

Reviewed by Keith Bell, University of Strathclyde



# Contents

1.	Summary .....	1
2.	Introduction – why a pot zero CfD? .....	1
3.	Context – gas sets the wholesale price of power and changing the market is difficult .....	3
4.	The potential saving – our approach .....	4
5.	Findings – the size of the prize.....	6
6.	Why would nuclear and renewable energy operators want to take part? .....	7
7.	Conclusion.....	8



# 1. Summary

Wholesale electricity prices are currently dominated by the very high price of gas. The British Energy Strategy proposes a large expansion in wind, solar and nuclear power, all of which can generate electricity more cheaply than gas, at current prices. But this will take many years to come to fruition. Existing nuclear and renewable generation already provide well over half of electricity generated on the GB system. Could we harness their lower costs more quickly, to help consumers through the coming winter? Changing market rules would be controversial and take time, so is it possible to harness existing rules and institutions to do this?

New renewable and nuclear schemes enter auctions for fixed price contracts, called CfDs. This paper presents the possibility of running such an auction for existing wind, solar, biomass and nuclear generators. We call this a 'pot zero' CfD auction and using simple assumptions and analysis of wholesale market price capture for existing generators, provide an indication of how big the financial saving for consumers could be. We assume the scheme is voluntary and present a range of generator participation rates and CfD prices.

Savings start at around £5bn per year or about £70 per household if the CfD price is quite high and around 23% of renewables take part. If most existing renewables and nuclear take part in the scheme then the saving would be around £22bn per year. Household bills could be reduced by over £300 per year. Industrial and commercial electricity users would also benefit from lower prices.

The idea is unorthodox and could be controversial, but unlike any other market reform idea, would not require changes to existing market arrangements or policies. Unlike a windfall tax, 'pot zero' offers eligible generators an upside – secure revenues into the future. Thus, there could be long-term advantages for low-carbon, domestic generation, as well as significant benefits to consumers.

## 2. Introduction – why a pot zero CfD?

The [British Energy Security Strategy](#) launched on the 7<sup>th</sup> April 2022 placed great emphasis on the potential for wind, solar and nuclear power to reduce Britain's reliance on gas imports and help to protect consumers from high prices, as well as reduce CO<sub>2</sub> emissions. However, the strategy focuses mainly on expanding the pipeline of new projects, which will take time to plan and build. With gas prices through the roof, the renewable energy and nuclear power we already have should be cheaper than electricity from gas. Could we do more to harness their lower costs to help consumers through the coming winter?

Some renewable electricity schemes *are* helping keep bills down. Projects developed since 2017 get paid through a scheme called 'Contracts for Difference'

(CfDs).<sup>1</sup> CfDs will also be paid to the new nuclear power station under development at Hinckley Point and forthcoming renewables schemes. Under the CfD arrangements generators get a subsidy if wholesale power prices are low, but pay back to consumers when prices are high.<sup>2</sup> The scheme was devised to reduce risks for investors but also helps stabilise bills, since the CfD pays a fixed strike price to generators that is independent of the prevailing wholesale market price of electricity. For operators with a CfD this largely breaks the link between gas prices and the price they are paid for their electricity.

For now, only a small fraction (about 6 GW or around 15%)<sup>3</sup> of the total fleet of operational renewable energy projects have a CfD, so the saving on consumer prices is quite small. Most existing large scale<sup>4</sup> renewable energy projects are remunerated through a scheme called the Renewables Obligation (RO), that preceded the CfD arrangements.<sup>5</sup> This means they receive the value of their electricity on the wholesale market plus an additional subsidy, called a Renewables Obligation Certificate (ROC) payment. Nuclear generators generally get paid the prevailing market price.

Wholesale power prices are set by the ‘marginal unit’ i.e., the last and most expensive unit of generation required by the system to ensure demand is met<sup>6</sup>. This price clears across the whole market so all generators (unless otherwise contracted) receive this price regardless of running costs. In general prices are lower when it is windy or sunny, or when demand is low. But when gas prices are extremely high any potential for renewable energy or nuclear power to reduce power prices tends to be overwhelmed by the very high price of gas.

This Discussion Paper puts forward a simple idea. What if more of our *existing* renewable or nuclear generation were to get paid via a CfD? CfD auctions are run each year for new renewables schemes. Why not run a CfD auction open to *existing* wind, solar and biomass generators (who then opt out of the Renewables Obligation) and existing nuclear generators? They may then be able to contribute power at much lower cost and in return receive long-term stable revenues. We call this a ‘pot zero’ auction and using simple assumptions, provide an indication of how big the financial saving could be.

---

<sup>1</sup> Contracts for Difference. Allocation Round 4 resource portal. [Access here.](#)

<sup>2</sup> When wholesale ‘reference’ prices are above the CfD strike price generators make payments to the Low Carbon Contract Company, which in turn makes payments to Suppliers. We assume that these pass through to consumers in the form of lower prices.

<sup>3</sup> Low Carbon Contracts Company. Scheme dashboards. [Access here.](#)

<sup>4</sup> By ‘large scale’ we mean generators of more than 5 MW installed capacity. Most small-scale generators, such as rooftop solar, small scale wind schemes, some small hydro schemes, are remunerated through the Micro-Generation Feed in Tariff. This was open to new projects between 2010 and 2019 with a 20-year life. [Access here.](#)

<sup>5</sup> BEIS 2021. The Renewables Obligation for 2022/23. [Access here.](#)

<sup>6</sup> In the GB market generators and suppliers enter into bilateral contracts that may extend several years into the future under a range of terms and conditions, much of them commercially confidential. In the paper we principally refer to wholesale market prices close to real time, as revealed through day ahead prices in exchanges such as N2EX or Balancing Mechanism prices. Energy can be traded and re-traded numerous times before real time, so day ahead markets provide the most accessible data on prevailing electricity prices.

### 3. Context – gas sets the wholesale price of power and changing the market is difficult

The start of April 2022 was windy. During the week beginning on 4<sup>th</sup> April 2022, wind energy consistently provided over 40% of our electricity.<sup>7</sup> Solar, nuclear, hydro, biomass and imports made up much of the rest so at times during that week gas was providing only 15% of our power, but the day-ahead market price was seldom less than £200/MWh.<sup>8</sup> Windy days usually tend to be low price days, but recently the price of gas has been so high that even when the share of gas on the grid is low, the price of gas still dominates power prices. Gas prices eased during mid-April, with corresponding reductions in power prices, some of the time at least. Even so, prices are still much higher than what used to be the norm, and high gas prices next winter will again lead to sky-high power prices, so the problem will return.

Under the old RO scheme, renewable projects get paid the prevailing wholesale electricity market price plus the value of a ROC, which is at least £50/MWh. Some offshore wind schemes get paid the wholesale price plus two ROCs, or around £100/MWh.<sup>5</sup> When the average wholesale power price was typically £50 or £60/MWh this made sense. When the average wholesale price is £200/MWh or more it seems that we are very significantly overpaying a lot of renewable generators. A similar logic applies to existing nuclear, although this does not receive the ROC payment. We assume it was operating profitably when wholesale prices were much lower than current levels, and nuclear operating costs are largely unaffected by gas prices.

Is the high price currently paid to all electricity generators inevitable? Could we change the way that power markets set prices and break – or at least reduce – the link between high gas and the power prices paid to non-gas-fired generators like wind farms and nuclear?

In the scramble to come up with ideas to reduce bills for next year the notion that we can radically reform the power market has been considered and is still up for debate. This question is not just being asked in the UK. Across Europe, countries with a large share of nuclear and renewable plant have argued for changes to EU market rules<sup>9</sup> to allow the lower generation costs of these forms of energy to pass through to consumers. Other European countries are considering measures such as a wholesale market price cap, a single buyer of electricity intervening in the market, or a windfall tax on generator profits.<sup>10</sup>

---

<sup>7</sup> Drax Electric Insights. [Access here.](#)

<sup>8</sup> Nord Pool N2EX Day ahead daily prices. [Access here.](#)

<sup>9</sup> EURACTIV. France leads calls to reform 'absurd' EU energy market. [Access here.](#)

<sup>10</sup> Batlle et al 2022. Power price crisis in the EU 2.0+: Desperate times call for desperate measures. [Access here.](#)

No changes to markets are straightforward. All distort the market in some way and are likely to have unintended consequences.<sup>10</sup> In addition, major changes to power market rules would need primary legislation that could take a long time.

Retrospective changes to the terms and conditions set through government policies are generally regarded as a very bad idea, since retroactive rule changes are likely to discourage future investors, not just in renewable energy but in other sectors too. Perhaps this is why the British government appears to have dismissed the idea of changing the rules of the electricity market in time for next winter. A review was announced as part of the Energy Strategy, but with an eye on the long term rather than current prices.<sup>11</sup>

But what if we could unlock the potential of cheap renewables without changing any of the market rules, using existing support schemes and institutions? BEIS is already geared up to run auctions for CfD contracts for new renewables. For a while the government only ran what were called 'pot 2' auctions, for less mature technologies that include offshore wind. The pots have been reclassified into pots 1, 2 and 3, each with a different price cap.<sup>12</sup> They are now going to run auctions for onshore wind and solar. Why not run a 'pot zero' auction that *existing* projects could bid into? Doing so would not require any new legislation or changes to market rules. If it were voluntary, it would not undermine investor confidence. To explore the merits of this idea UKERC did some calculations to show the size of the prize.

## 4. The potential saving – our approach

The potential cost savings from a pot zero auction depend on the *volume* of generation that might transfer into the auction (how many MWh), and the *price reduction* (£/MWh payment to nuclear or renewables) achieved by the auction. On both volume and price, our analysis is based on some very simple assumptions. We do not attempt to predict what price participants would seek in an auction or determine how many renewable operators will respond to the proposition. We do not have the information needed to do this. For illustrative purposes, we merely make assumptions that seem within the bounds of the possible.

On auction prices we assume that the clearing price of the auction for RO projects is in the range £50/MWh to £100/MWh. The lower bound is based on the 2019 CfD auction round in which offshore wind developers bid below £40/MWh (2012 prices) for projects that will be operational in 2023.<sup>13</sup> The latest auction caps the price paid to offshore wind at £46/MWh and onshore wind at £53/MWh.<sup>14</sup> New renewable energy schemes tend to be cheaper than old ones, as innovation has lowered costs, but existing plant that have partly paid off their capital costs might choose to come in

---

<sup>11</sup> HM Government 2022. British Energy Security Strategy. [Access here.](#)

<sup>12</sup> BEIS 2021. Contracts for Difference (CfD) Allocation Round 4: Administrative strike prices methodology. [Access here.](#)

<sup>13</sup> Simon Evans 2019. Analysis: Record-low price for UK offshore wind cheaper than existing gas plants by 2023. [Access here.](#)

<sup>14</sup> BEIS 2021. Contracts for Difference Scheme for renewable electricity generation. [Access here.](#)

cheaper on the back of a new secure longer-term contract. This could extend the economic life of current generators and/or provide a basis for repowering (replacing old turbines with new). Since existing nuclear does not receive ROC payments, we assume that a CfD price of £50/MWh might also be attractive to existing nuclear generators. We use a CfD strike price of £50/MWh as our lower bound case.

As an upper bound, under the terms of the RO and assuming 'normal' wholesale prices of around £50/MWh it may be inferred that most existing schemes were commissioned and financed on the expectation that they would be paid around £100/MWh for their output. Contract duration extensions at a fixed price around this level might seem attractive even to relatively recent RO projects. It would also be possible to cap the auction price to ensure only schemes that will reduce costs enter the new arrangements.

On volumes, we start from an assumption that 50% of wind and solar generators currently in receipt of RO support would take part in the pot zero auctions. This would amount to 30 TWh of generation per year<sup>15</sup> (representing around 23% of all renewables, or 10% of total generation). We then progressively expand the volume of generation taking part, to cases where 100% of RO wind and solar plant bid into the auction (61 TWh total generation), then include large biomass plants (71 TWh total generation), include Sizewell B nuclear (80 TWh total), and finally extend to all nuclear (121 TWh total generation).

Combining these price and volume assumptions, our analysis uses the following outcome scenarios:

1. 50% of existing RO wind and solar schemes bid in and the CfD clearing price is £100/MWh
2. 100% of existing RO wind and solar schemes bid in and the CfD clearing price is £50/MWh
3. As outcome 2 with the addition of the two large biomass units currently supported by the RO
4. As outcome 3 with the addition of the Sizewell B nuclear power station
5. As outcome 4 with the addition of all operating nuclear power stations

These cases represent a large simplification of what might be conceived in practice. It is possible to sub-divide the 'pot' such that we get a mix of schemes at different out-turn prices. We assume that wind, solar and hydro schemes supported by the micro-generation feed in tariff do not participate. For simplicity we also exclude biomass CHP, hydro and landfill gas generators. We distinguish between the Sizewell B reactor and older nuclear power stations (Advanced Gas Cooled Reactors) because the latter are coming close to the end of the operating lives and the incentive to participate in a CfD auction may be limited.

The final step on price assumptions is to determine the current price received by the plant that might opt into the pot zero auctions. Wholesale price assumptions are

---

<sup>15</sup> Ofgem. Public reports and data: RO. [Access here](#).



based on daily day ahead market price data from the Nordpool N2EX<sup>8</sup> trading platform from October 2021 to March 2022, a 6-month period characterised by consistently high market prices that averaged £201.4/MWh. Since price still tends to be slightly lower on windy and sunny days we calculate an average 'capture price'<sup>16</sup> for wind and solar of £190/MWh over this 6-month period. Adding in the RO Certificate (ROC) price of £52.9/ROC gives an average price received of £243/MWh for RO wind and solar. For biomass we calculate a capture price of £206/MWh, and assume they also receive the full value of the ROC. For nuclear, we calculate a capture price of £202/MWh, with no additional income from ROCs.

Total GB savings are calculated by multiplying the assumed volume of generation bid into the auction by the price reduction achieved in the auction. Domestic (household) consumption represents 38.5% of total electricity consumption.<sup>17</sup> We divide this share of the national cost saving by the number of households in Great Britain (27.3 million<sup>18</sup>). This gives an average annual saving per household. The remainder would accrue to commercial and most industrial electricity users (energy intensive users are already partially exempt from RO costs so save slightly less). Some of the savings to commercial users may pass through to consumers in the form of slightly lower prices for consumer goods.

Different household types use different amounts of power so our average saving would not divide equally among households. For example, small flats tend to use less power than large houses and electrically heated homes use more electricity than those with gas heating. Income, demographics and family size also affect electricity use. We have not attempted to decompose bill savings at this level of detail. Doing so would be a valuable addition.

## 5. Findings – the size of the prize

Based on these assumptions our findings are as follows:

If 50% of eligible wind and solar power were to take part and the CfD price were to clear at £100/MWh the savings would be £4.9bn per year, a reduction in wholesale costs of 7.2%. This would reduce household bills by an average of £69 per year.

If 100% of the eligible wind and solar power were to take part and the CfD price were to clear at £50/MWh the savings would be £12.8bn per year, a reduction in wholesale costs of 19%. This would reduce household bills by an average of £180 per year.

If the scheme was extended to the large power station burning biomass and currently receiving RO payments (units 2 and 3 of Drax) and the price was £50/MWh

---

<sup>16</sup> Capture price is the weighted average spot price taking account of the volume of wind or solar generated in each time interval. For this illustration, we used daily prices and volumes.

<sup>17</sup> BEIS. Energy Trends: UK Electricity. [Access here](#).

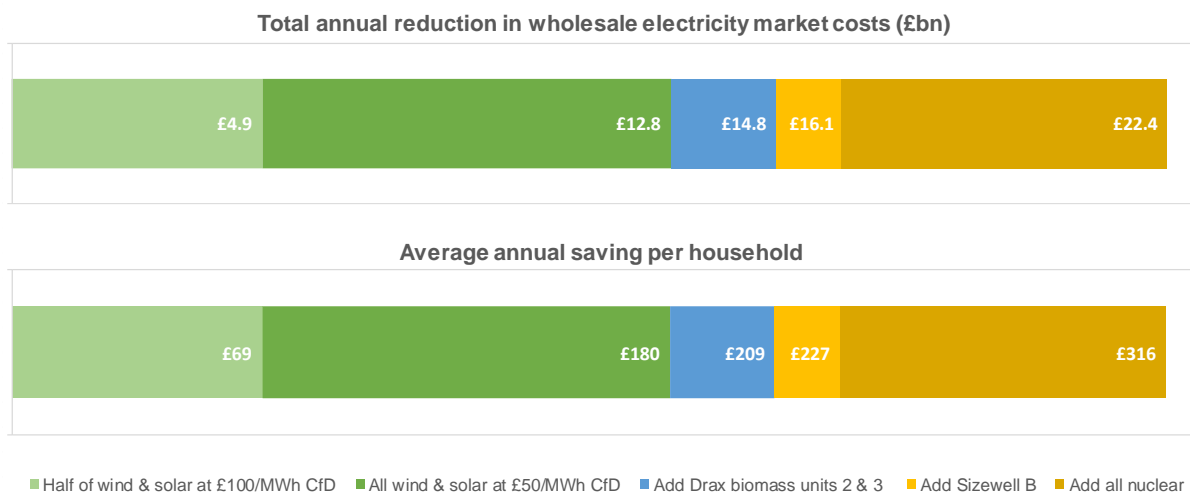
<sup>18</sup> ONS. Households by household size, regions of England and GB constituent countries. [Access here](#).



then savings would be £14.8bn per year, a reduction in wholesale costs of 22%. This would reduce household bills by an average of £209 per year.

If Britain's most recently constructed nuclear power station was to participate too, overall savings would be £16.1bn per year, a reduction in wholesale costs of 23.8%. This would reduce household bills by an average of £227 per year.

Finally, if all of Britain's operating nuclear power stations were to participate, overall savings would be £22.4bn per year, a reduction in wholesale costs of 33.2%. This would reduce household bills by an average of £316 per year.



**Figure 1. Potential savings: reduction in wholesale electricity costs and average savings per household**

## 6. Why would nuclear and renewable energy operators want to take part?

Our analysis assumes that participation is voluntary. It is therefore reasonable to ask why existing generators with support under the RO and/or the ability to profit from high power prices would want to join in. Some might because the RO contracts that they are currently under will begin to expire soon. The scheme started in 2002 and offered support for 20 years. The new CfD would offer a longer-term fixed price (CfDs for new renewable schemes offer 15-year contracts), perhaps linked to a requirement for older projects to repower or refurbish.

A bit like a fixed price mortgage in reverse, the idea would be to heavily discount the current very high prices in return for a long period of secure revenue. The stable revenues offered by the CfD could provide the basis for refinancing existing projects, and analysis of CfD auctions to date suggests they substantially reduce the cost of

capital.<sup>19</sup> This is because although power prices are at a record high now, only two years ago they were at record lows. Indeed prior to the current crisis a significant concern was the potential for ‘price cannibalisation’ to drive prices extremely low – perhaps even negative – on windy and sunny days.

The RO provides 20-year contracts and only closed to new entrants in 2017 so it may be that owners of newer RO projects prefer to continue to make hay while the sun shines (and wind blows) up until 2037. It is also less obvious why existing nuclear (particularly older plants close to the end of operating lives) would enter the auction, though future low power prices are a risk to nuclear as well. One alternative is to make the scheme mandatory, though this falls foul of the usual rules of good governance. Other authors have noted that desperate times call for drastic measures and that is why far-reaching market reforms are under discussion overseas.<sup>10</sup> Policymakers could use similar analysis to benchmark a prospective windfall tax that could be used to recompense consumers.

This analysis seeks to explore the size of the prize if generators were to participate in a pot zero CfD, rather than to determine that they would, or if they should. We look forward to discussing the idea with industry stakeholders, policymakers and others. The principal point is that current wholesale market arrangements do not serve consumers well, at least in the short term. Whilst the problem is caused by the gas price rather than power market design per se, current wholesale market conditions appear to be over-remunerating some generators whilst consumers face record bills, so the search for solutions is legitimate and important. We have also seen that intervening only in the retail market (through the price cap) cannot solve the problem. A scheme that allows generators to trade some short-term profits for longer term price stability could be part of the solution. This is exactly what a pot-zero CfD auction could provide, without the need for any new legislation.

## 7. Conclusion

Our analysis illustrates the potential wholesale market cost savings that could be achieved if existing nuclear and renewable generators move onto a CfD. Doing so has the potential to materially reduce household and industrial electricity bills if gas prices stay high. We assume that the scheme is voluntary and do not know how many generators would participate in our hypothetical scheme, or what CfD auction prices would result. However, the analysis demonstrates that if bid prices are as low as £50/MWh and generators currently in the RO and all nuclear stations take part, we would reduce bills by as much as £316. More conservative assumptions of 50% participation of RO wind and solar generation only and a £100/MWh CfD price reduce the saving to around £70 per household.

---

<sup>19</sup> Grubb and Newberry. 2018. UK Electricity Market Reform and the Energy Transition: Emerging Lessons. [Access here](#).

Unlike a windfall tax, 'pot zero' CfDs offer renewable generators the upside of secure revenues in the future, perhaps allowing existing projects to be refinanced and help ensure older renewable projects continue to generate clean power into the future. Thus, the scheme could deliver long-term advantages for existing low-carbon, domestic generation that we will continue to need, as well as significantly benefitting consumers. And unlike any other form of market reform idea, the scheme would not require changes to existing market arrangements or policies. The idea is unorthodox and could be controversial, but if we are serious about action now to reduce bills for next winter it makes sense to consider whether renewable and nuclear schemes that already exist can play their part.