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Analysis of the e-POWER January 2022 auction

February 2022

Tim Dixon, Lucy Dolton & Luke Ansell

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1 e-POWER Auction Analysis

1.1 Headlines

- The January 2022 e-POWER auction ran for three days from 26 January and sold Power Purchase Agreements (PPAs) for 40 renewables projects totalling 161.85MW, with the majority selling power from April 2022 for six or 12 months
- The auction saw the highest ever £/MWh values achieved by renewable assets selling their power in any e-POWER auction as analysed by Cornwall Insight, which dates back to 2013. This can be attributed to all-time high wholesale power prices experienced during the current "energy crisis"
    - The average PPA price achieved by all sites in the auction was £173.50/MWh, while the price achieved for sites where ROCs are not included was £131.31/MWh
- However, against the assessed theoretical maximum value that sites could have been achieved, % value retention levels declined compared to levels observed before the current energy crisis
    - This can be attributed to the extreme levels of volatility along the curve in the wholesale market, which has created a challenging environment for offtake parties and has impacted on PPA pricing levels. Nonetheless, the underlying rise in wholesale prices has far outweighed the impact of reduced value retention
- Underlying certificate values, including those from the Renewables Obligation (ROCs) and Renewable Energy Guarantees of Origin (REGOs) schemes, are also trading at elevated levels, further supporting £/MWh values achieved in the auction
    - REGO values have been trading at their highest ever levels; prices as high as £6.20 were observed in the latest e-REGO auction held in December 2021. Meanwhile, a high RO target for 2022-23 and recent trends of low wind output in 2021 has led to high ROC recycle value forecasts
- Despite challenging market conditions for energy suppliers, competition between offtake parties and overall bidding levels remained healthy, although was down on previous auctions. An average of 11 bids per site was observed, with one site seeing 21 bids

1.2 Cornwall Insight view

The current energy crisis is having wide reaching impacts across the market, with PPAs being no exception. Renewable generators will be welcoming higher £/MWh values in their contracts, particularly after a period of depressed wholesale prices experienced during the peak of the COVID-19 pandemic. Green generators are continuing to benefit from a strengthening appetite from energy suppliers wishing to secure renewable electricity via PPAs, whilst sourcing REGOs for an ever-increasing number of customers on green tariffs and ROCs to meet steep RO targets.

The impact of the energy crisis on offtake parties has been more acute. Electricity suppliers active in the PPA market have had to grapple with extreme levels of volatility in the wholesale market and in imbalance prices, whilst continuing to face the uncertainty of output levels and price cannibalisation on intermittent asset types. Combined, this has made the job of pricing PPAs more difficult, which has been exemplified in this auction by lower % value retention and bidding levels compared to previous auctions.

Nonetheless, few active established PPA providers in the market have exited, although generators are perhaps more cautious of who they contract with. Furthermore, competition in the PPA market remains strong with approximately 40 providers across energy supplier and trader parties. With decarbonisation high on the agenda for many suppliers and end consumers, the PPA market is set to remain competitive, but the immediate challenges brought by the energy crisis may persist for some time to come.

2 Methodology

This report analyses the results for contracts awarded in the January 2022 e-POWER auction between 26 and 28 January 2022. It analyses the actual values achieved by generators and compares them against a maximum market benchmark value generators can potentially achieve if the full value of all revenue streams are realised. Achieved project and maximum benchmark values are presented as a £/MWh figure based on the sum of various revenues streams. These are assessed post-auction, where sources of value include:

- **Wholesale power price**
  - A variety of wholesale power price assumptions were used in this assessment for maximum benchmark values, based on PPA length and start dates. This auction saw five different PPA lengths and start dates, the majority of which were for 12 months starting 1 April 2022 (58% of all PPAs) or for six months starting April 2022 (33% of all PPAs)
  - For the purposes of the benchmark prices, the summer 2022 baseload power price has been taken for six-month contracts from April 2022 at £189.39/MWh. 12-month contracts from April 2022 are assumed at £193.89/MWh. Other contracts saw start dates of March 2022, June 2022 or April 2023, with the respective seasonal, annual or average monthly forward prices used for benchmark prices
- **Green certificates**
  - Regarding Renewables Obligation Certificates (Rocs), the buy-out price is used by e-POWER for maximum benchmark values; however, Ofgem has not yet confirmed the buy-out price for 2022-23 so a value of £51.00/Roc has been used in this assessment
  - Values for REGOs are not included in the maximum benchmark value assessment. However, it should be noted that suppliers may price in value for REGOs as part of their bids
- **Generation Distribution Use of System charges (GDUoS)**
  - These are paid by distribution network operators for localised generation and vary depending on the time of day. GDUoS is the most variable of the potential benefits, as it differs by region and connection voltage. GDUoS is always built into the contract price, whether it is a cost or a benefit
- **Transmission and distribution losses**
  - As embedded generators can help avoid the amount of thermal losses in the networks, distribution connected generators can avoid these extra costs and offer them as a benefit to suppliers
- Triad benefits are not included in this analysis as they are paid separately in the e-POWER contract

Typical maximum benchmark values used for this analysis are summarised in Figure 1. As previously mentioned, other wholesale power price assumptions are used where contracts dates differ from the front-season and front-annual prices.

Figure 1: Benchmark values (£/MWh) of e-POWER auction elements, showing select historic auctions

Auction date	Front Season Wholesale Baseload Power	Annual Wholesale Baseload Power	Rocs	Embedded Benefits
Jan-22	£189.39	£193.89	£51.00	-£1.63 to + £14.38
Jul-20	£47.79	£45.34	£50.05	£0.00 to £15.00
Jan-20	£36.63	£40.89	£50.00	£1.00 to £14.00
Jul-19	£56.39	£52.79	£48.78	£2.00 to £14.11
Jan-19	£55.83	£59.31	£48.50	£0.90 to 14.30
Jan-18	£43.63	£46.85	£47.22	£0.40 to £13.90
Jan-17	£46.10	£47.67	£45.00	-£0.60 to +£7.40
Jan-16	£31.60	£33.90	£45.00	£0.00 to £10.60
Jan-15	£41.60	N/A	£44.00	-£1.40 to +£7.30

Source: e-POWER

3 January 2022 analysis

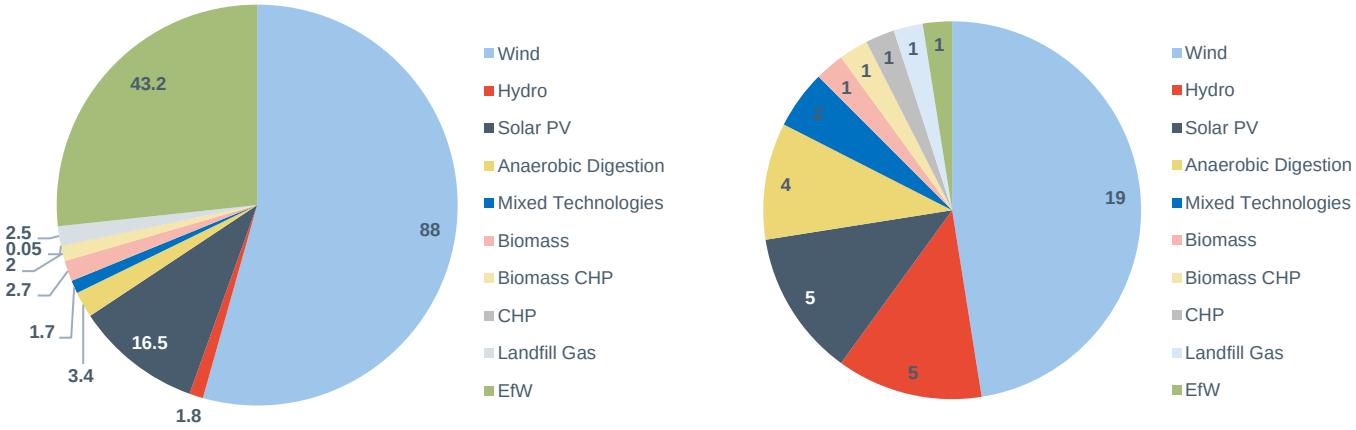
3.1 Auction summary and participation

The January 2022 e-POWER auction sold PPAs for 40 projects totalling 161.85MW of generation. In terms of capacity, it was the largest e-POWER auction since January 2020, while by number it was the largest since July 2020. Overall e-POWER now has over 150 generators through the auction and a capacity close to 600 MW.

A wide range of assets participated in the auction, with 10 different technology types across assets that are under both the RO and Feed-in Tariff (FiT) schemes, as well as assets that were selling power only (either subsidised or unsubsidised). Project sizes ranged from 0.05MW up to 43.2MW.

This auction saw five different PPA lengths and start dates, the majority of which were for 12 months starting 1 April 2022 (58% of all PPAs) or for six months starting April 2022 (33% of all PPAs).

Figure 2: Capacity (MW) participating in the January 2022 auction (left) and by number (right), broken down by technology



3.2 Values achieved & impact of the "energy crisis"

The auction was the first of e-POWER's larger six-monthly auctions that has taken place during the current energy crisis, with the overall result being record high absolute values (£/MWh) being achieved by generators. The average PPA price achieved by all sites in the auction was £173.50/MWh, while the price achieved for sites where ROCs are not included was £131.31/MWh. This compares to £90.63/MWh and £54.18/MWh respectively in the July 2020 auction – the last auction for which a full analysis was published and during the first wave of the COVID-19 pandemic.

The increase is due to a large underlying rise in wholesale power prices; however, the extreme levels of volatility in the market has also shaped PPAs. As offtake parties have had to grapple with challenging and fast-changing market conditions, % value retention levels have declined on previous auctions. Average % value retention across all sites in the auction was 76%, compared to 101% in the July 2020 auction.

Record high values achieved but lower % value retention levels can be attributed to the following market trends:

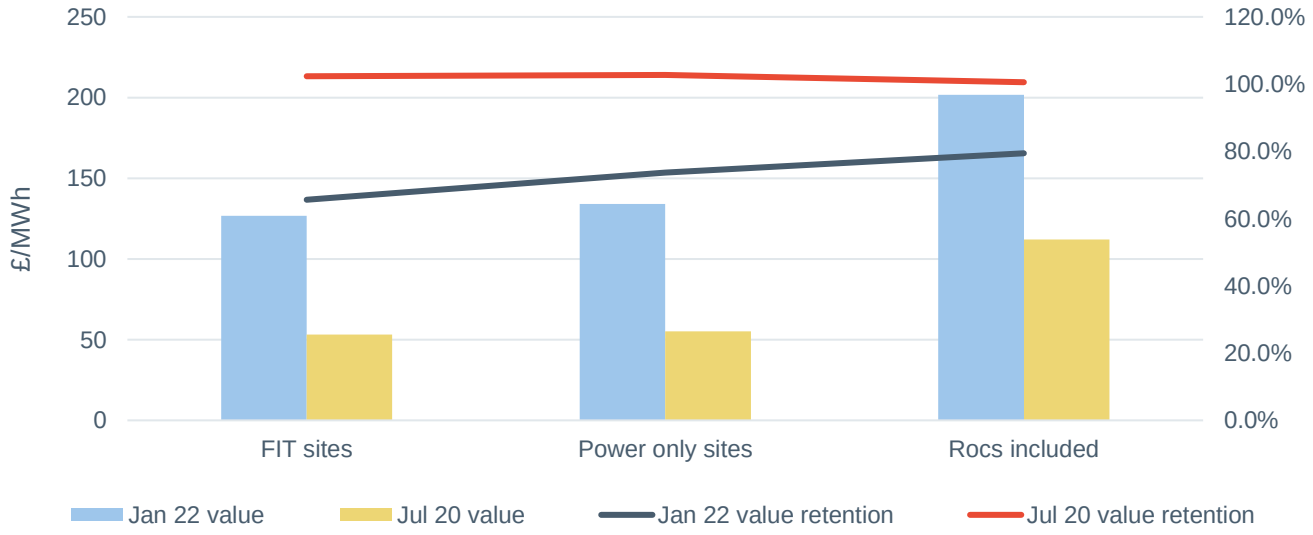
- Record high forwards wholesale power contracts. Power prices (spot and future) during the current winter period have traded at unprecedented levels, as a tight global gas market and rising commodity

prices have fed into the power market. Furthermore, power supply margins in GB have tightened compared to previous winters, exacerbating the upwards price movements of late

  - The majority of assessed forward baseload wholesale prices for the contract durations sought in the auction were around the £190/MWh mark. This is ~185% above the level that the same contracts would have traded six months previously
  - In the week leading up to the auction, wholesale power prices for summer 22 and winter 22 rose by upwards of £35/MWh, as escalating tensions between Ukraine and Russia created uncertainty in the global gas market. Assets in the auction likely caught some of the upside of these events

- Underlying certificate values, including ROCs and REGOs, are also trading at elevated levels, further supporting £/MWh values achieved in the auction. Further details are provided in Sections 3.4 and 3.5
- Ongoing experiences of extreme wholesale market volatility has meant % value retention levels against prevailing full market prices has lowered. This had led to offtakers needing to price in heightened imbalance risk and shaping costs, as well as factoring in the risk of large within-day variations in wholesale prices at the time of the auction
  - During the three days over which the auction took place the annual April 22 power contract varied by more than £10/MWh as tensions between Ukraine and Russia caused gas and power prices to shift considerably
- Impacts of price cannibalisation continue to be factored into bids. Price cannibalisation is the depressive influence that high levels of correlated intermittent generators have on wholesale prices, which lowers the captured price of such technologies. This phenomenon was exacerbated amid low electricity demand caused by COVID-19, but has also been observed during the current energy crisis, as intermittent technologies often fail to realise the full baseload price of power

Figure 3: Average £/MWh values achieved and value retention levels, January 2022 auction versus July 2020 auction



Source: e-POWER

Despite challenging market conditions for energy suppliers, competition between offtake parties bidding on assets remained healthy. The auction delivered an average of 11 bids per site, with one site receiving 21 bids. However, the average number of bids was down on auction levels prior to the current energy crisis, exemplifying the challenging market conditions for offtakers. The wider PPA market has also experienced a widening spread between bids from individual offtakers in tenders, as parties find it more difficult to value fixed price PPAs. A combination of recent offtaker exists from the market and the challenging pricing environment may have contributed to a slight reduction in overall bidding levels.

3.3 Broken down by technology

Ten different technology types participated in the auction across 40 projects including onshore wind, hydro, biomass, anaerobic digestion (AD), energy from waste (EfW), solar PV, landfill gas, combined heat and power (CHP), biomass CHP and mixed technologies.

Wind had the greatest number of contracts in the auction with 19 of the 40 sites, representing 54% of overall capacity. This is up from 14 sites in the January 2020 auction and is up by a single project compared to the July 2020 auction. Solar PV and hydro had five projects apiece, and a respective capacity share of 10% and 1%. Other technologies individually had four or fewer assets. While only one 43MW EfW plant entered the auction, the technology had the second highest capacity share of 26.7%.

Average value retention was higher for fuelled technologies, with EfW (100%), landfill gas (99%) and AD (89%) achieving greater retention than intermittent renewables. This trend has been observed in previous auctions, as offtakers typically place a premium on baseload generation. Intermittent generation comes with greater imbalance risk, shaping costs, and the associated impacts from price cannibalisation. Furthermore, these impacts on intermittent assets have been exacerbated by the current energy crisis.

As highlighted earlier, recent exceptionally high and volatile wholesale market conditions have weighed on value retention in this auction with value retention below 100% in all but one of the auction contracts. In the July 2020 auction, we saw value retention above 100% for all contracts amid comparatively low wholesale market volatility.

Highlights for each technology are below, and comparisons with the previous auction made where possible[1].

- **Onshore wind** had the largest presence in this auction with 19 of 40 sites, auctioning 88MW of capacity. Wind PPA value averaged £178.78/MWh, the fourth highest of any technology, and ranged between £122.00/MWh and £222.40/MWh. Value retention averaged 76%, the median value across all technology types. 15 of the sites were sold with Rocs, which will increase overall £/MWh values achieved and value retention levels with the revenue stream broadly unimpacted by the energy crisis
    - Onshore wind assets continue to suffer from price cannibalisation with this impact factored into bids. Analysis by Cornwall Insight shows that wind sites have had captured prices ~8.4% below baseload prices in the period October – December, whilst in summer 21 the technology captured wholesale prices 6.5% below baseload levels
    - Competition for onshore wind sites was just below the auction average of 11 bids per site, with an average of 10 bids per wind site
- **Solar PV** had the joint-second highest presence in the auction by number, with 16.5MW of capacity over 5 sites. Solar PPA value averaged £165.90/MWh, the median value, and ranged between £100.00/MWh and £218.50/MWh. Appetite for solar contracts was strong, with an average of 13 bids per site (noting one site received just one bid). One site included the sale of ROCs, one was FiT accredited, while the remaining three sold power only with the subsidy scheme undisclosed
    - Value retention averaged 79%, the fourth highest by technology type and slightly higher than the auction average of 76%. However, one very small site (0.1MW) with a retention rate of 49% weighed on the technology's average and, in its absence, would have been 87%
    - Value retention levels for solar were higher than for wind. Looking at FiT sites or assets selling power only, value retention for solar PV was 77% but was 66% for wind. This highlights the greater impact of volatile energy market conditions on wind compared to solar
- **Hydro** also had five sites present in the auction, with a combined capacity of 1.8MW. Three sites included the sale of ROCs, one included FiT revenue and one chose to sell only power (undisclosed

[1] Direct £/MWh comparisons between contracts sold in this auction and contracts sold in previous auctions can be difficult, particularly for RO generators receiving different Roc awards. Therefore, we make comparisons wherever it is possible to do so.

subsidy scheme). Average PPA value was £140.72/MWh, ranging between £113.00/MWh and £171.10/MWh. Competition for hydro sites averaged 10 bids per site, slightly under the auction average. Value retention averaged 66%, lower than the auction average of 76%, similar to the July 2020 auctions where hydro achieved the lowest value retention of all technologies

- **AD** had the fourth highest presence in the auction by number, with four sites totalling 3.4MW. Three sites included the sale of ROCs while one site was FiT accredited. AD sites had an average PPA value of £244.78/MWh, the highest of any technology ranging between £133.00/MWh and £295.40/MWh. Average AD value retention was 89%, above the auction average
    - High absolute values and high value retention reflects the baseload nature of AD generation, but also the fact that 75% of the sites included ROC awards that were 1.8 or 2 per MWh. Competition for AD PPAs was above average, with an average of 14 bids per AD site in this auction
- **EfW** saw just one site participate, at 43.2MW, the largest in the auction. The site achieved a PPA value of £100.10/MWh, the lowest of any technology because the forward curve drops by the contract start date of April 2023. Despite this, the site achieved the highest value retention in the auction of 100.1%, while competition for the site was below the auction average, with five bids
- **Landfill gas** also saw one site participate with a capacity of 2.5MW. This site saw the most competition of any asset, attracting 21 bids. This competition is reflected in a high PPA value of £242.40/MWh and high value retention of 99%, with a baseload premium enjoyed by this technology type
- **Biomass** (without CHP) had one 2.7MW site auctioned, as well as a 2.0MW biomass CHP site. The former, which included ROCs, attracted 10 bids with a PPA value of £203.20/MWh. The latter, which was without ROCs, attracted a single bid with a PPA value of £120.20. Value retention was greater for the biomass site with ROCs, at 74%, compared to 58% for the biomass CHP site without ROCs
- **Mixed technologies** saw two sites auctioned for power only with a combined capacity of 1.7MW. Average number of bids per site was 9, with this asset class achieving a £/MWh price and value retention at the lower end of the auction range, at £126.00/MWh and 64% respectively

It is important to note that while many technologies saw lower average value retention levels compared to auctions prior to the energy crisis, absolute £/MWh values achieved by all technologies were significantly higher in this auction owing to elevated wholesale power prices.

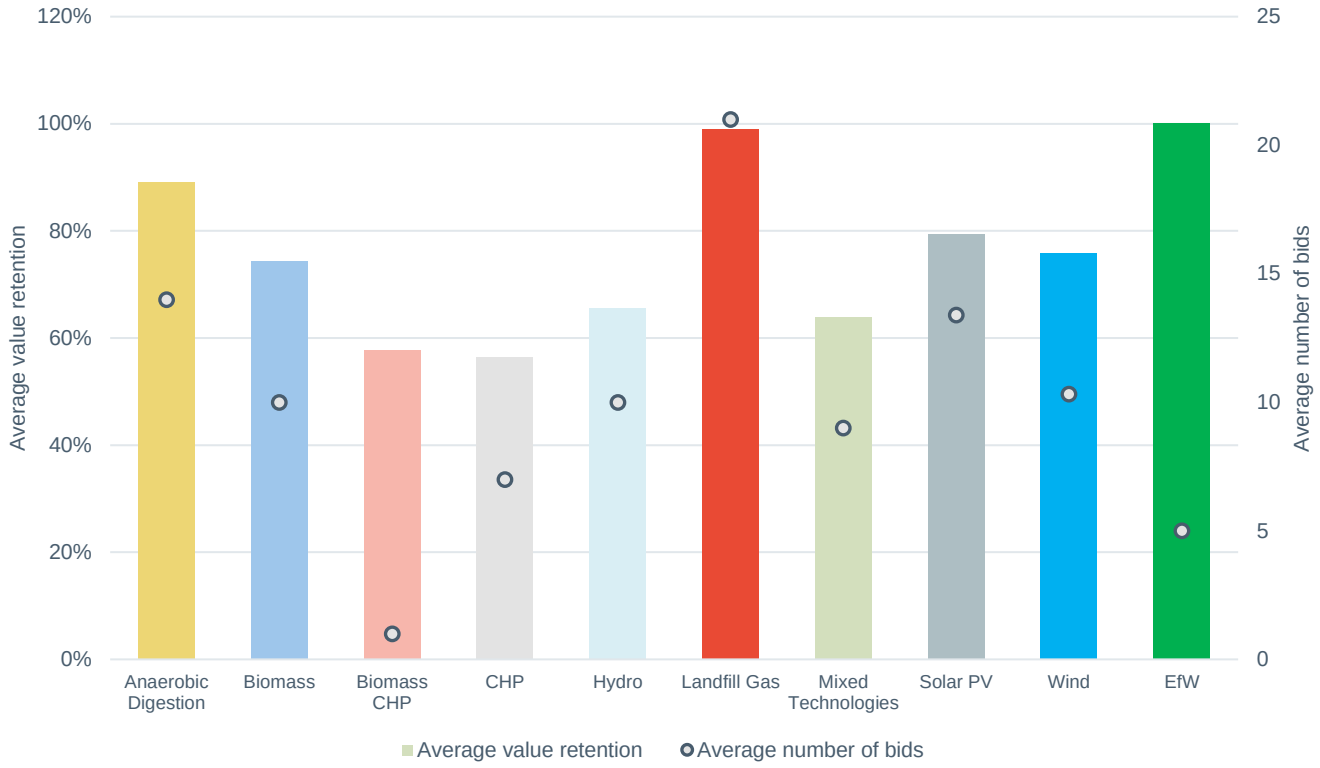
Figure 4 shows the range of values achieved by different technologies, while Figure 5 shows the average value retention as well as the average number of bids accrued per generator.

Figure 4: Average, minimum and maximum PPA value by technology (£/MWh)

Value	Anaerobic Digestion	Biomass	Biomass CHP	CHP	Hydro	Landfill Gas	Mixed Technologies	PV	Wind	EfW
Average	£244.8	£203.2	£120.2	£113.0	£140.7	£242.4	£126.0	£165.9	£178.8	£100.1
Maximum	£295.4	£203.2	£120.2	£113.0	£171.1	£242.4	£126.0	£218.5	£222.4	£100.1
Minimum	£133.0	£203.2	£120.2	£113.0	£113.0	£242.4	£126.0	£100.0	£122.0	£100.1
Number of contracts	4	1	1	1	5	1	2	5	19	1

Source: e-POWER

Figure 5: Average value retention and average number of bids by technology



Source: e-POWER

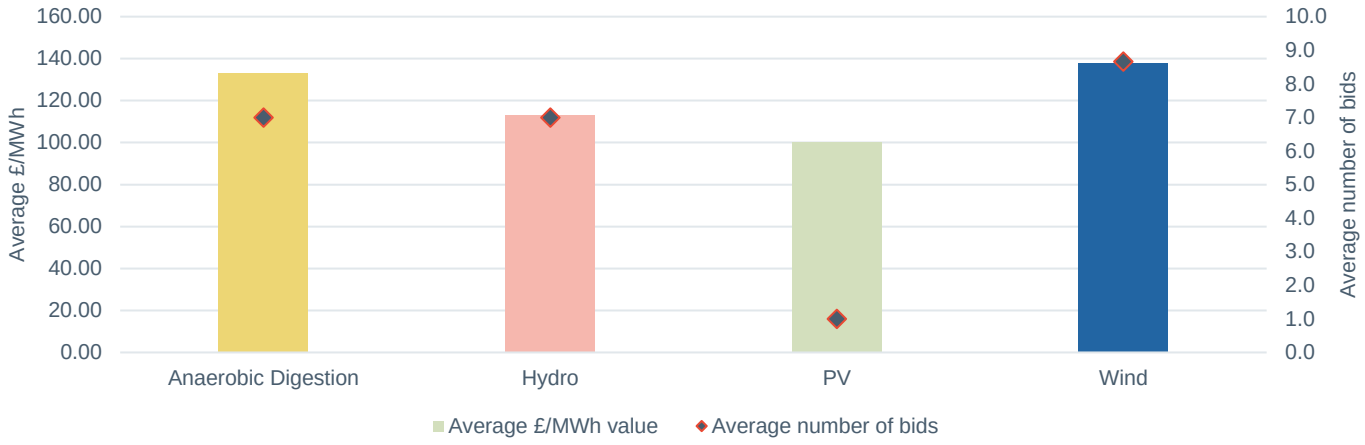
3.4 Summary by support scheme

3.4.1 FiT Generators

Six FiT sites were included in the January 2022 e-POWER auction. Amid the ongoing highs in wholesale prices, all FiT projects in this auction achieved prices notably in excess of the 2021-22 higher export rate (£55.70/MWh), ranging between 194% and 262% higher. FiT sites saw a high average price achieved of £126.73/MWh, while overall value retention levels averaged 65.6%, down slightly on their ROC project counterparts. On an average value retention basis, this is down 43.2pp from the July 2020 auction, as the energy crisis continues to impact offtaker offerings. However, and noting the recent surge in wholesale prices, on an absolute £/MWh basis this is up £74.61/MWh, a percentage increase of 143.2% since the July 2020 auction.

Of the FiT-accredited technologies included in this auction, wind sites saw both the highest absolute £/MWh and value retention levels. Three FiT wind sites participated in the auction, with value retention ranging between 62 and 82%, and absolute values between £122.00 and £162.40/MWh. Wind FiT sites also saw the highest bidding levels of all FiT-accredited sites, followed by anaerobic digestion, hydro, and solar PV. Figure 6 provides a technology breakdown of average values achieved by FiT projects.

Figure 6: Average £/MWh values, and average number of bids achieved by FiT sites, by technology



Source: e-POWER

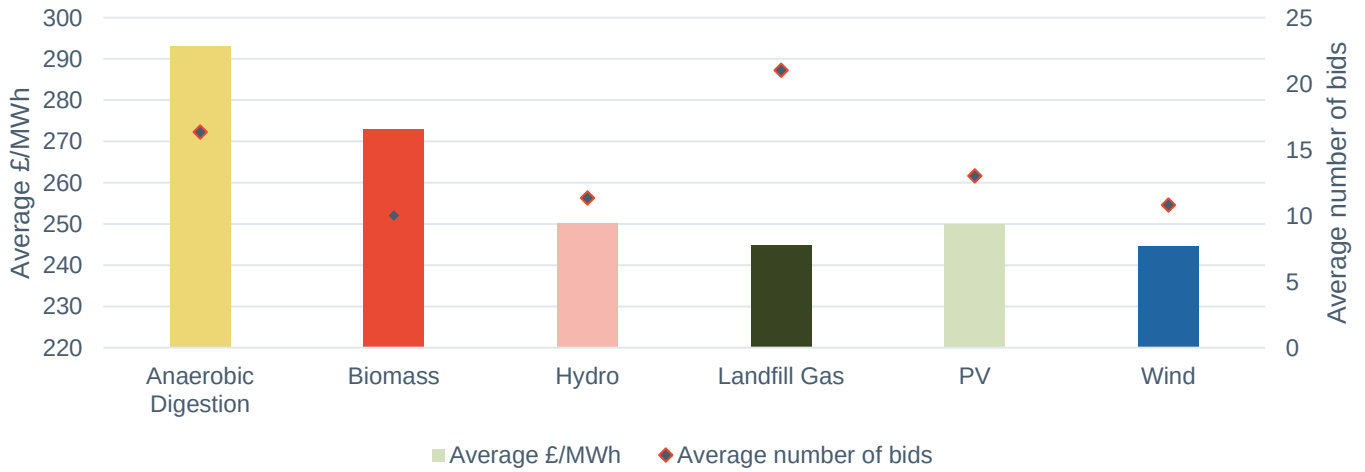
3.4.2 Roc Generators

Amid wholesale price volatility, the relative stability of ROC revenue, in addition to ROCs trading at elevated levels in light of low wind output across the current compliance period, it has meant that Roc projects in the January 2022 auction saw the highest absolute £/MWh values compared to both FiT and power-only sites.

In the January 2022 auction, 24 RO-accredited sites participated, making up just over half of all sites by count, and 61% of all contracted capacity, at 99MW. All RO sites in this auction sold both power and Rocs, with 15 wind sites, 3 hydro, 1 landfill gas, 3 anaerobic digestion, and 1 solar PV site taking part in the auction. Across all RO sites, value retention levels in the January 2022 auction ranged between 60% and 99%, with values on a £/MWh basis ranging between £145.40/MWh and £295.40/MWh. By technology, anaerobic digestion sites achieved the highest values, averaging £282.03/MWh (96% value retention). Roc buy-out values in this auction were set at £51.00/Roc, with the CP21 (2022-23) Roc buy-out price yet to be confirmed by Ofgem (as of 11 February).

Roc values in the current compliance period, CP20, have risen in light of low wind output persisting across most of the CP. This was exemplified in the latest e-ROC auction held in January 2022 which saw record high average ROC values being achieved, exceeding £58/Roc. For CP21, the RO target being set at the second highest level has also benefitted RO-accredited generators seeking to sell their output via PPAs, in an otherwise volatile pricing environment.

Figure 7: Average £/MWh values, and average number of bids achieved by RO sites, by technology



Source: e-POWER

3.4.3 REGOs

Since the July 2020 e-POWER auction analysis, REGO prices have maintained a strong upwards trajectory, repeatedly breaking record highs across both fuelled and unfuelled technology classifications. While values for REGOs are not included in the maximum benchmark value assessment in e-POWER auctions, suppliers may price in value for REGOs as part of their bids.

The increased demand for REGOs, particularly for the current fuel mix disclosure (FMD) year following low wind output across most of 2021-22, has supported prices. The latest e-REGO auction was held over 3 days from 9 December. 'Deep green' REGOs saw prices average £6.20/REGO, while fuelled REGOs averaged £4.25/REGO, double the value seen in the previous e-REGO auction held in October 2021. While gains have been most pronounced in nearer-term FMD year REGOs, prices for later-dated REGOs have also risen. Low wind output and increased demand from corporates using REGOs as part of their ESG reporting has buoyed prices further along the curve.

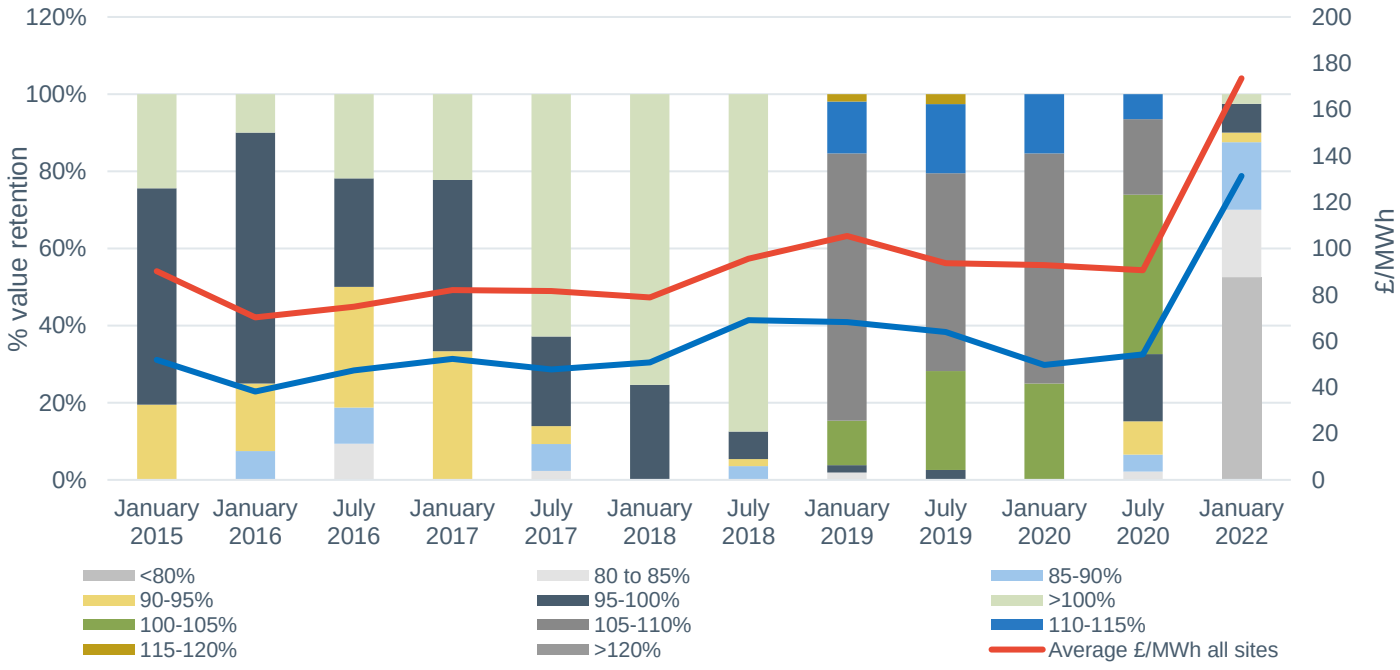
Trends from Cornwall Insight's January 2022 Green Certificates Survey show that average reported REGO prices for FMD2021-22 were in excess of £4/REGO, up nearly 50% from the previous quarter. Reported prices for future compliance years were also high but easing slightly for FMD2022-23, and further still for FMD2024-25.

3.5 Comparison with previous auctions

The January 2022 auction saw the highest ever £/MWh values achieved by renewable assets of any e-POWER auction as analysed by Cornwall Insight, which dates back to 2013. This can be attributed to all-time high wholesale power prices experienced during the current energy crisis, furthered by heightened certificate values (ROCs and REGOs), but offset by lower % value retention levels as offtake parties undergo challenging market conditions.

The average PPA price achieved by all sites in the auction was £173.50/MWh, while the price achieved for sites where ROCs are not included was £131.31/MWh. This compares to £90.63/MWh and £54.18/MWh in the July 2020 auction, respectively, the last auction for which a full analysis was published and during the COVID-19 pandemic.

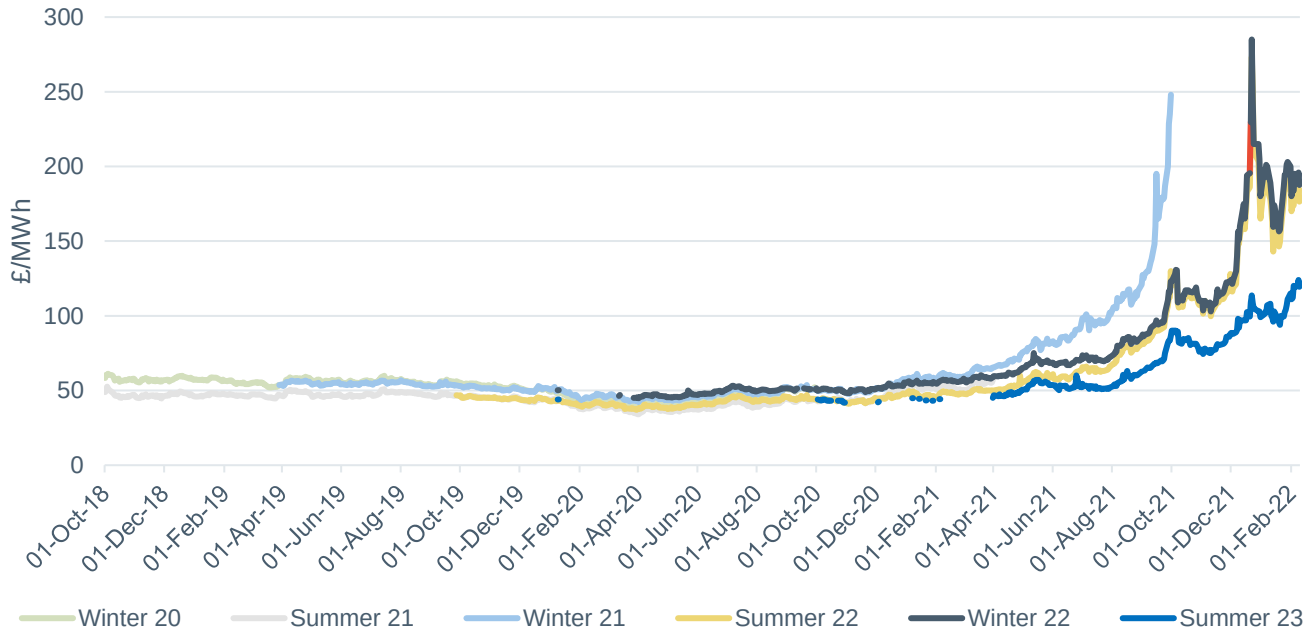
Figure 8: Values achieved, distribution of values achieved compared to maximum benchmark values (i.e. value retention), and changes over time



Source: e-POWER

The majority of assessed forward baseload wholesale prices for the contract durations sought in the auction were around the £190/MWh mark. This is ~185% above the level that the same contracts would have traded at six months before, and ~290% - 340% above the average assessed wholesale power contract prices assessed at the time of the July 2020 e-POWER auction which occurred as power prices were resurging from the initial COVID-19 lockdown restrictions. Figure 9 shows wholesale power prices dating back to October 2018, highlighting how high prices have become during the energy crisis.

Figure 9: Seasonal baseload wholesale power price movements



Source: Cornwall Insight

Underlying certificate values, including ROCs and REGOs, are also trading at elevated levels compared to historic auctions. REGOs for the 2021-22 Fuel Mix Disclosure (FMD) period have reportedly traded in excess of £6 - £7/REGO in recent months. While it is generally expected that REGO prices for future FMD years will subside from the current highs, values of broadly between £1.50 and up to £5 have frequently been reported. This is starkly contrasted to traded REGO values prior to 2021-22, where values were rarely reported above £1/REGO, particularly during the COVID-19 pandemic when at times they traded below £0.2/REGO. Meanwhile, ROCs have undergone a similar trend, where traded prices fell notably during the peak of the COVID-19 pandemic with expectation of reduced recycle value, but have risen more recently amid a shorter market.

Assessed embedded benefit values were comparable to previous auctions. These are highly site specific and so depend on the individual assets competing in each auction. Nonetheless, higher transmission and distribution loss benefits, which are correlated to wholesale price movements, have supported embedded benefit levels more generally of late. However, the BSUoS benefit was removed from April 2021, with its value having been ~£4.80/MWh the previous year.

Overall bidding levels in the auction were down on previous auctions but remained healthy. An average of 11 bids per site was observed, compared to 25 in the July 2020 auction and 19 in the January 2020 auction. As previously mentioned, challenging market conditions for energy suppliers have resulted in offtake parties finding it more difficult to value fixed price PPAs, meaning individual offtakers may have differing views on the prevailing value of an asset and leading to a reduction in overall bid numbers. Interest from energy suppliers in securing green power via PPAs has remained high nonetheless, as consumers ranging from the domestic to the I&C level, continue to seek greener energy deals, illustrated by the sharp rise in REGO prices in the last year.