The Fifth Carbon Budget - Call for Evidence

www.theccc.org.uk/call-for-evidence

Question and Response form

When responding please provide answers that are as specific and evidence-based as possible, providing data and references to the extent possible. Please limit your response to a maximum of 400 words per question.

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Questions for consideration:

A. Climate Science and International Circumstances

Climate science and international circumstances are important criteria in setting carbon budgets.

- The science indicates the impacts associated with different levels of climate change and the limit on emissions globally if these risks are to be contained.
- International circumstances inform the prospects of future action to reduce emissions globally, potential requirements of the UK to contribute to those actions, and prospects for low-carbon technology development and carbon pricing.
- The EU places obligations on Member States to reduce emissions to contribute to reductions in the bloc as a whole. These imply a minimum level of effort for the UK's carbon budgets.

The Committee intends to draw primarily on the work of the IPCC, as published in the Fifth Assessment Report, in assessing the implications of climate science for the budget advice

The Committee's advice is based on a climate objective to limit central estimates of temperature rise to as close to 2°C as possible, with a very low chance of exceeding 4°C by 2100 (henceforth referred to as "the climate objective"). This is broadly similar to the UNFCCC climate objective, and that of the EU.

In order to achieve this objective, global emissions would have to peak around 2020, before decreasing to roughly half of recent levels by 2050 and falling further thereafter.

The UNFCCC is working toward a global deal consistent with such reductions. Individual parties are submitting pledges for effort beyond 2020, with the details of the agreement to be discussed in Paris late in 2015.

The EU has agreed a package that requires a reduction in emissions of at least 40% on 1990 levels by 2030, on the way to an 80-95% reduction by 2050. The UK Government supported this package, while arguing for an increase to 50% in the context of a global deal.

The US and China have jointly made pledges for the period beyond 2020. The US has pledged a reduction of 26-28% by 2025 versus 2005, requiring a doubling of the rate of carbon reduction compared to 2005-2020 and on a trajectory to economy-wide cuts of the order of 80% by 2050. China has pledged to peak CO_2 emissions around 2030, and to make best efforts to do so earlier.

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Question 1 ***The IPCC's Fifth Assessment Report will form the basis of the Committee's assessment of climate risks and global emissions pathways consistent with climate objectives. What further evidence should the Committee consider in this area?***

ANSWER: n/a

Question 2 ***To what extent are the UN talks in Paris likely to have implications for the Committee's advice beyond the pledges and positions announced in advance of the talks?***

ANSWER:

n/a

Question 3 ***Based on the available evidence, does the EU 2030 package reflect the best path to its stated 2050 ambition? How might this package change, specifically its targeted emissions reduction, either before the end of Paris or after Paris?***

ANSWER:

The analysis performed by the European Commission ahead of publishing its proposals for the 2030 package indicated that stronger reductions of carbon emission reductions and increases in renewable energy than those finally put forward were on the most optimal path to the stated 2050 ambition[1].

It is clear that the members of the Barroso Commission made a political judgement that lower ambition for 2030 was the only means to secure agreement from the European Council, and given that the package was ultimately agreed by the Council without significant change it appears that judgement was correct. It remains

[1] The analysis in the 2030 package Impact Analysis (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014SC0015&from=EN) shows the clear economic benefits of moving ahead of the GHG40/EE/Renewables27 final proposal.

the case, however, that the evidence supports the proposition that greater ambition for 2030 will ensure we are on the right path for 2050. It is possible, therefore, that in the context of a robust global deal in Paris that these targets will be revisited, though this would require some member states to move from entrenched positions.

Even with a strengthening of the 2030 ambition, however, there will still need to be significant structural reform of the EU Emission Trading System, beyond the increase in the linear reduction factor which a higher objective would imply. While the recent agreement on introducing the Market Stability Reserve in 2019 is very welcome, it is insufficient to fully deal with the problem of surplus allowances in the system. Even with the reform package agreed between the Council and Parliament, the price of EUAs is likely to average only €18-20/tCO2 over the period 2015-25, which is insufficient to incentivise coal-to-gas switching, let alone investment in new low-carbon generating capacity.

Question 4 ***How does the UK's legislated 2050 target affect its ability to support international efforts to reduce emissions, including its position in negotiations? Does the level of UK carbon budgets have any additional impact (over-and-above the 2050 target) for the UK in international discussions?***

ANSWER:

The unilateral commitment to decarbonisation made under the Climate Change Act gives the UK considerable moral authority in the international negotiations. The evidence-based system of budgets shows that the UK is 'walking the talk', and therefore showing the leadership that those with historical responsibility for climate change need to show to countries that are still industrialising to persuade them from high-carbon development paths.

This leadership also means that the UK can and should be an early adopter of key low-carbon technologies that are appropriate to our resource base, such as offshore wind and the marine renewable technologies of wave and tidal energy. Being an early adopter helps force these technologies down the cost curve, opening them up for countries that don't wish to be first movers. This is not a totally altruistic path, since having leadership positions in low-carbon technologies of the future will have significant economic benefits, but being able to offer cost-effective solutions will certainly help in persuading developing countries to take on emission commitments of their own as part of a global deal. It is the case that having European countries make significant investments in renewable technologies has enabled emerging countries like China to contemplate emission pledges as they can see economically viable pathways which would not have existed without the European leadership. The UK should augment this beneficial dynamic.

B. The cost-effective path to the 2050 target

The carbon budgets need to set a path that is achievable from today without being over-optimistic about what is achievable in later periods to prepare for the 2050 target.

The Committee has previously set out scenarios for 2030 that balance effort before 2030 with potential opportunities from 2030 to 2050. The scenarios aim to include ways of reducing emissions that are likely to be relatively low cost and actions that will develop options that may need to be deployed at scale by 2050.

These scenarios, reviewed in detail in the Committee's report *The Fourth Carbon Budget Review – the cost-effective path to the 2050 target*, include substantial investment in low-carbon power generation, roll-out of low-carbon heat (heat pumps and district heating), development of the markets for ultra-low emissions vehicles and a combination of energy efficiency measures and fuel switching in industrial sectors.

The scenarios also reflect detailed assessments of what is practically deliverable, and the Committee monitors progress towards them as part of its statutory duties. The *2014 Progress Report to Parliament* indicated that current policy would not be enough to meet the fourth carbon budget, but that the 'policy gap' could be closed at affordable cost.

The set of policy options required to close the gap include:

- Strengthening the EU Emissions Trading System.
- Setting a clear objective for Electricity Market Reform (EMR) beyond 2020.
- Focusing on low-cost residential energy efficiency.
- Simplifying policies targeting commercial energy efficiency.
- Tackling financial and non-financial barriers to low-carbon heat.
- Pushing for strong EU targets for new vehicle efficiency in 2030.

The Government has subsequently published various documents, including its formal response, as required under the Climate Change Act, and the National Infrastructure Plan. The Plan includes investments of around £100 billion in low-carbon power generation in the 2020s, in line with the scenarios from the EMR Delivery Plan that reach 100 gCO_2/kWh by 2030. It also has significant investments in offshore oil and gas and in the road network. This includes £15 billion of new spending on roads and around £50 billion on offshore oil and gas.

Question 5 ***In the area(s) of your expertise, what are the opportunities and challenges in reducing emissions to 2032, and at what cost? What may be required by 2032 to prepare for the 2050 target, recognising that this may require that emissions in some areas are reduced close to zero?***

ANSWER:

Previous CCC analysis has pointed to power sector decarbonisation as a key part of the lowest-cost pathway to our 2050 objectives. The recent evidence on the cost of renewable generating technologies shows that we are making even better progress than previously thought. In particular, the outcome of the first CfD allocation round for established technologies highlights the opportunity to minimise the cost of decarbonisation through low-cost renewables. Even the higher cost technologies in the less-established pot are showing good progress towards full competitiveness in the 2020s.

In appendix A we have collated an LCOE analysis for generation technologies which points towards a paradigm shift brought on by a transition to competitive allocation of long term contract for difference process. It would therefore seem sensible that there is a strong focus on the full decarbonisation of the power sector by 2032.

Through our regular engagement with CCC staff on the progress of the technologies we represent, the Committee will know that there is considerable unused potential in wind power both on and offshore. There is also further potential from wave and tidal, though at less certain cost. It is certainly feasible that 50% of our power needs could come from these technologies alone by 2030, at very reasonable cost, and as a result securing industrial leadership in technologies which by that time would be being taken up in many countries around the world. Other renewables could also add to the portfolio.

In this context it is puzzling to say the least that our newly-elected Government is intent on limiting the cheapest renewable power technology, onshore wind, when it is on the path to being the cheapest new power source available in the UK, bar none. Removing this technology from the options available would necessarily mean a higher-cost path to decarbonisation and we would expect the Committee on Climate Change to comment on the additional costs involved. We are happy to engage further on the current and future costs of this technology following the publication of our Onshore Wind Cost Reduction Task Force's report on the matter in April this year (see answer to Question 13 for a link to this work).

The key challenges of a path to 50% wind, wave and tidal in our mix would revolve around managing large volumes of variable renewable energy generation. Having a diverse mix of renewables would help in offsetting the variability, but clearly the tools of demand response, storage and interconnection will have to be deployed at scale, alongside flexible generation such as gas turbines. There are challenges

around the non-generation balancing options, some of which are technological – there need to be more scalable, cost-effective storage options brought forward, for instance. However, many of the challenges are concerned with regulation and the market, and these are quite likely to be time-limiting steps in deploying DSR and storage at scale. The current Government must prioritise clearing regulatory obstacles and making the playing field truly level for these technologies in order to expose where there are opportunities to extract sufficient value to justify investment in this capacity. This will increase the efficiency of the power sector overall and reduce costs to the consumer, making such action truly no-regrets. We would point the CCC towards to work being done in Work Stream 6 of Ofgem's Smart Grid Forum for a full exposition of the regulatory action that can be taken to promote these technologies.

The other main challenges out to 2032 will be on the demand side. If the heat and transport sectors are to be substantially electrified, then this will lead to vastly increased peak power demand, even with major efforts to reduce heat demand through insulation and other building retrofits. The CCC in its advice to Government should also consider alternatives to electrification, for example through promotion of heat networks to allow non-electricity, low-carbon forms of heating to be deployed. Electrification of heating would also further strengthen the need for concerted action on DSR and storage to offset the large peak demand problem that would result.

We also believe that there are a number of dynamics in the power market that the Committee should be aware of that are created by the policy tools chosen by Government to manage the low-carbon transition. We believe the tools, the Contract for Difference and the Capacity Market, are the appropriate and cost-effective ones for the job, but unless there is wider understanding of their impact then there may be adverse reactions to what should be their expected outcomes. In particular, we can expect an increase to some extent in the retail price of electricity, though not the wholesale price, and there may be a political reaction to this.

One such dynamic concerns the Capacity Market: a recent analysis from the London Business School (see link in our answer to Question 13) highlights that the Capacity Market is delaying an increase in wholesale prices of around £15/MWh due to delay in the build out of new generation capacity – it is also the case that the CM will transfer the cost of that new capacity from the wholesale price to the CM levy. There is also evidence from other markets of capacity prices rising as the life of older plants can no longer be extended, such as New England in the US, where capacity market prices are now rising to the levels that are needed to attract investment in new capacity, effectively resulting in price spikes. As existing capacity in the UK comes to the end of its life the same dynamic is likely to apply, and we should be careful not to succumb to an illusion that CM prices will remain low when we should actually expect significant increases in the medium term. While some new capacity came forward in the first CM auction at a price of £19.40/kW, this is likely to be the exception rather than the rule.

There is also a political risk from channelling support through the CfD and CM. This

stems from the fact that the wholesale price is currently not sufficient to ensure investment in new generation capacity of any kind, and the effect of both the CfD and CM will be to make it even less likely in the future that the wholesale price alone can support such investment. Both the CfD supporting plant with low marginal operational costs and the CM transferring the recovery of the capital element of their investment from the energy to the capacity market lead to depressed wholesale prices. Thus there will be an increasing disconnect between the amount of top-up paid through the CfD and the effective 'subsidy' involved. The proper comparison should be between the various low-carbon options and the cost of the cheapest *new* capacity, not the cost of *existing* generation. Without this change in mindset, there could be a perception that 'subsidy' in the form of CfD top-up is going up when actually subsidy in the form of additional payment over the counterfactual alternative is going down. What we think this points to is a full review from first principles of how the Levy Control Framework is constructed and how costs are allocated, so that an integrated view is presented of the total system in making the transition to a low carbon generation system.

Finally, we see a key challenge in providing appropriate grid capacity, at both the Transmission and Distribution levels, in a timely manner. Grid extension and upgrading is a controversial and time-consuming business, and much of our renewable generation potential is being held up by an inability to connect and consequently transport the resulting power to customers. Deploying renewables in a timely and cost-effective manner requires that there is more anticipatory investment in grid capacity, with Ofgem having a greater tolerance of the risk of stranded investment. This requires a culture change that can only be directed by Government. It also needs Ofgem to align its processes with Government objectives: the RIIO-ED1 process has resulted in DNO business plans that include far too little investment in capacity to accept distributed generation, with, for instance, the capacity of solar forecast in the plans for 2023 having already been achieved in 2015, even before the eight-year regulatory period started. There will have to be a willingness to allow further investment in the network within the settlement periods to allow more connections.

Question 6 ***What, if any, is the role of consumer, individual or household behaviour in delivering emissions reductions between now and 2032? And, separately, after 2032?***

ANSWER:

Consumers are unlikely to want to engage heavily with their energy usage, and will generally will not do so unless the cost rises to politically difficult levels. This points to the need for efficiency and behaviour changes to be automated as far as possible. Consequently, there will need to be high investment in the smart

infrastructure that allows such automation. Smart meter roll-out is essential, though we are concerned that this programme does not plan to facilitate automated appliance DSR. This is an essential service to maximise consumer benefits as well as system benefits.

Question 7 ***Is there evidence to suggest that actions to further reduce emissions after 2032 are likely to be more or less challenging to achieve than actions in the period up to 2032?***

ANSWER:

CO_2 reduction efforts will be more critical as time passes and if we maintain an ambition to decarbonise the global economy it is likely that delays to decarbonisation now will require inordinate amounts of investment post 2032.

One of our key areas of concern today is to avoid lock-in. Subsidies and revenue dependence on fossil fuel extraction, infrastructure and generation facilities today could result in a choice between stranding assets and failing to decarbonise. Government should be very careful not to pursue policy that results in overdependence on fossil fuel extraction or use through investments that have lives beyond 2032.

Question 8 ***Are there alternatives for closing the 'policy gap' to the fourth carbon budget that could be more effective? What evidence supports that?***

ANSWER:

With further refinement of the EMR framework we do not believe there is a *policy* gap to close in the power sector (i.e. the tools are available), but the power industry generally needs clear signalling of Government *intent* for the 2020s and beyond, including available budget, in order to organise the billions of pounds of finance and plan the system transformation required. We welcome that there will be stability in the policy framework of the CfD and Capacity Market, and the overarching Carbon Budget regime. The industry needs the 5th Carbon Budget to be set in a timely manner, with a consequent setting of an appropriate Levy Control Framework to at least 2025. There will need to be some development of the CfD regime, however, with priorities including clarity on an 'enduring regime' that has a clear path for

technologies to move from market entry to full maturity.

Similarly, for the heat sector, the 'policy' mechanism exists in the form of the Renewable Heat Incentive, however investors need confidence that the RHI budget to fund new applications will extend beyond 2016. The growth trend in the renewable heat sector is well below what is required to meet the expectation that it will meet 12% of our demand in 2020 if the European renewable target is to be met. Further clarification of intent through budgetary action is therefore required.

One key action that Government can and should take soon is to narrow the set of 'acceptable outcomes' for 2030. The last word on this from DECC, the 2030 scenarios in the EMR Delivery Plan, have huge variations in the delivery of key technologies: for offshore wind, these extended from no deployment in the 2020s to 30GW over that decade. Some of the scenarios are also highly implausible. No investor can move forward with this range of uncertainty in Government action. Government has given itself large powers to direct the market on the route to decarbonisation: future statements of intent for 2030 must give clearer signals to the market on how those powers will be used.

Question 9 ***Are the investments envisaged in the National Infrastructure Plan consistent with meeting legislated carbon budgets and following the cost-effective path to the 2050 target? Would they have wider implications for global emissions and the UK's position in international climate negotiations?***

ANSWER:

It is clearly a positive for the technologies that RenewableUK and Scottish Renewables represent that projects of those types are in the NIP. Similarly, having significant network infrastructure projects included in the Plan is helpful, though as noted in our answer to Question 5, much more anticipatory investment is required. If the NIP were to result in the UK taking a leading position in offshore wind and marine renewables, then this action would have considerable impact on the cost of these technologies and therefore on their global deployment and consequent emission reductions. Such leadership would strengthen the UK's position in global negotiations, as it would be showing that it is willing to invest in the development of key technologies which everyone can benefit from.

We would flag concerns, however, that everything in the power sector in the NIP is considered a priority. If everything has the same status, then none of it is actually being effectively prioritised through the NIP, and industry actors will look at Government actions to discern what is actually being given priority treatment. For example, using the powers in the Energy Act 2013 to negotiate an early contract for

Hinkley Point C nearly ten years in advance of commissioning, or running the FID-ER programme to the major benefit of the offshore wind sector are the kind of actions that indicate priority treatment, which leads to the perception that only single large projects or sectors actually receive attention from a Government with limited resources of time and staff. To be clear, these actions are justified, and the FID-ER programme in particular has been key to ensuring momentum in the offshore wind sector. However, since much of the activity that will be needed to reduce emissions will be thousands of distributed and small-scale actions, collectively on a scale that matches the contribution of more centralised options, how these National Infrastructure priorities are formulated and delivered needs to be reconsidered to ensure that the perception does not endure that these are lower priorities.

C. Budgets and action

The UK's statutory 2050 target requires actions across the economy to reduce emissions. Many of these actions will be driven by (UK and devolved) Government policy and implemented by businesses and consumers. There will be an important role for Local Authorities in successful delivery.

Although the carbon budgets do not require specific actions, they provide an important indication of the overall direction that policy will take in future. Once set, carbon budgets can only be changed if there has been a significant change in the relevant circumstances set out in the Climate Change Act.

Feedback from businesses as part of the Committee's 2013 Call for Evidence for the review of the fourth carbon budget was that stability is an important and valuable characteristic of carbon budgets.

Question 10 ***As a business, as a Local Authority, or as a consumer, how do carbon budgets affect your planning and decision-making?***

ANSWER:

n/a

Question 11 ***What challenges and opportunities do carbon budgets bring, including in relation to your ability to compete internationally? What evidence***

do you have for this from your experience of carbon budgets to date?
ANSWER: n/a

Question 12 ***What would you consider to be important characteristics of an effective carbon budget? What is the evidence for their importance?***
ANSWER: As noted in our answer to Question 8, an effective carbon budget will result in much stronger signalling to the market as to the future course being followed. Such signalling is vital to give investors the confidence to bring projects and industrial capacity forward, and to reduce the cost of capital in the sector. The key Government tool following on from the setting of the 5th Carbon Budget will be the future trajectory of the Levy Control Framework, which should be set as early as possible.

D. Other issues

The Climate Change Act requires that in designing the fifth carbon budget we consider impacts on competitiveness, fiscal circumstances, fuel poverty and security of energy supply, as well as differences in circumstances between UK nations. High-level conclusions on these from our advice on the fourth carbon budget were:

- **Competitiveness** risks for energy-intensive industries over the period to 2020 can be addressed under policies already announced by the Government. Incremental impacts of the fourth carbon budget are limited and manageable.
- **Fiscal impacts**. The order of magnitude of any fiscal impacts through the 2020s is likely to be small, and with adjusted VED banding and full auctioning of EU ETS allowances could be neutral or broadly positive.
- **Fuel poverty**. Energy policies are likely to have broadly neutral impacts on fuel poverty to 2020, with the impact of increases in electricity prices due to investment in low-carbon generation being offset by energy efficiency

improvement delivered under the Energy Company Obligation. Incremental impacts through the 2020s are likely to be limited and manageable through a combination of further energy efficiency improvement, and possible income transfers or social tariffs.

- **Security of supply** risks due to increasing levels of intermittent power generation through the 2020s can be managed through a range of flexibility options including demand-side response, increased interconnection and flexible generation. Decarbonisation of the economy will reduce the reliance on fossil fuels through the 2020s and thus help mitigate any geopolitical risks of fuel supply interruption and price volatility.

- **Devolved administrations**. Significant abatement opportunities exist at the national level across all of the key options (i.e. renewable electricity, energy efficiency, low-carbon heat, more carbon-efficient vehicles, agriculture and land use).

Question 13 ***What evidence should the Committee draw on in assessing the (incremental) impacts of the fifth carbon budget on competitiveness, the fiscal balance, fuel poverty and security of supply?***

ANSWER:

The economics of climate change policy in the UK, Cambridge Econometrics, 2014

Subsidies and costs of EU energy, Ecofys, 2014

Planetary Economics: Energy, Climate Change and the Three Domains of Sustainable Development, Michael Grubb, 2014

The progressive inefficiency of replacing renewable obligation certificates with contracts-for-differences in the UK electricity market, Derek Bunn & Tim Yusupov, 2015

The Impact of Wind Energy on UK Energy Dependence and Resilience, Cambridge Econometrics, 2015

Onshore Wind: Direct and Wider Economic Benefits, RenewableUK, 2015

Onshore Wind Cost Reduction Taskforce Report, RenewableUK, 2015

Offshore Wind Programme Board Annual Report 2014

UK offshore wind in the 2020s: Creating the conditions for cost effective decarbonisation, Green Alliance, 2015

State of the renewable industry: Investment in renewable electricity, heat and transport, Price Waterhouse Coopers, 2015

Question 14 ***What new evidence exists on differences in circumstances between England, Wales, Scotland and Northern Ireland that should be reflected in the Committee's advice on the fifth carbon budget?***

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ANSWER:

Question 15 ***Is there anything else not covered in your answers to previous questions that you would like to add?***

ANSWER:

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Appendix A

This appendix is a Levelised Cost of Energy (LCOE) comparison of new build electricity generation technology. We also note key CfD strike price data and some Social Cost of Energy (SCOE) data from analysis undertaken by Siemens.

It spans over 3 time periods:

1. 'Current'
2. 2020 forecast
3. 2020 to 2030 period

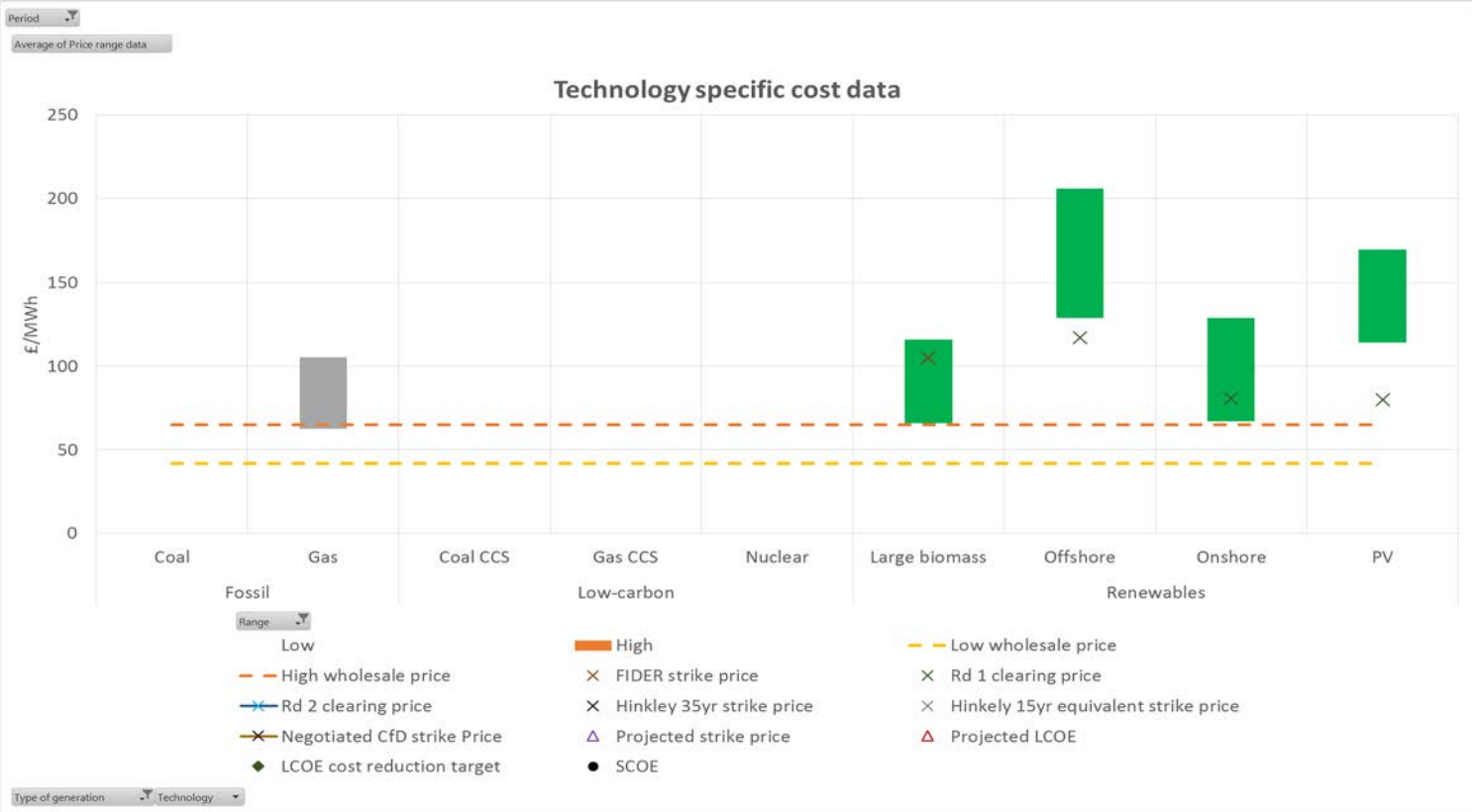
It contains 3 types of data

1. DECC wholesale price projections[2] – high and low
2. DECC[3] and CCC[4] 2013 generation cost data projections – high and low
3. Data points that represent known data or technology specific projections that have been made

For the generation cost projections it is important to note that the high values represent the highest value within these data sources (DECC and CCC 2013) used for a technology within the period referenced whilst the 'low value' represents the lowest value. The High and low should therefore be viewed as the maximum and minimum LCOE values for each technology within the period referenced.

[2] Updated energy and emissions projections: 2014, Annex M: Growth assumptions and prices, DECC, 2014 - https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2014
[3] DECC Electricity Generation Costs, DECC, 2013 - https://www.gov.uk/government/publications/electricity-generation-costs-december-2013
[4] Next steps on Electricity Market Reform, CCC, 2013 - http://www.theccc.org.uk/publication/next-steps-on-electricity-market-reform-23-may-2013/

Current



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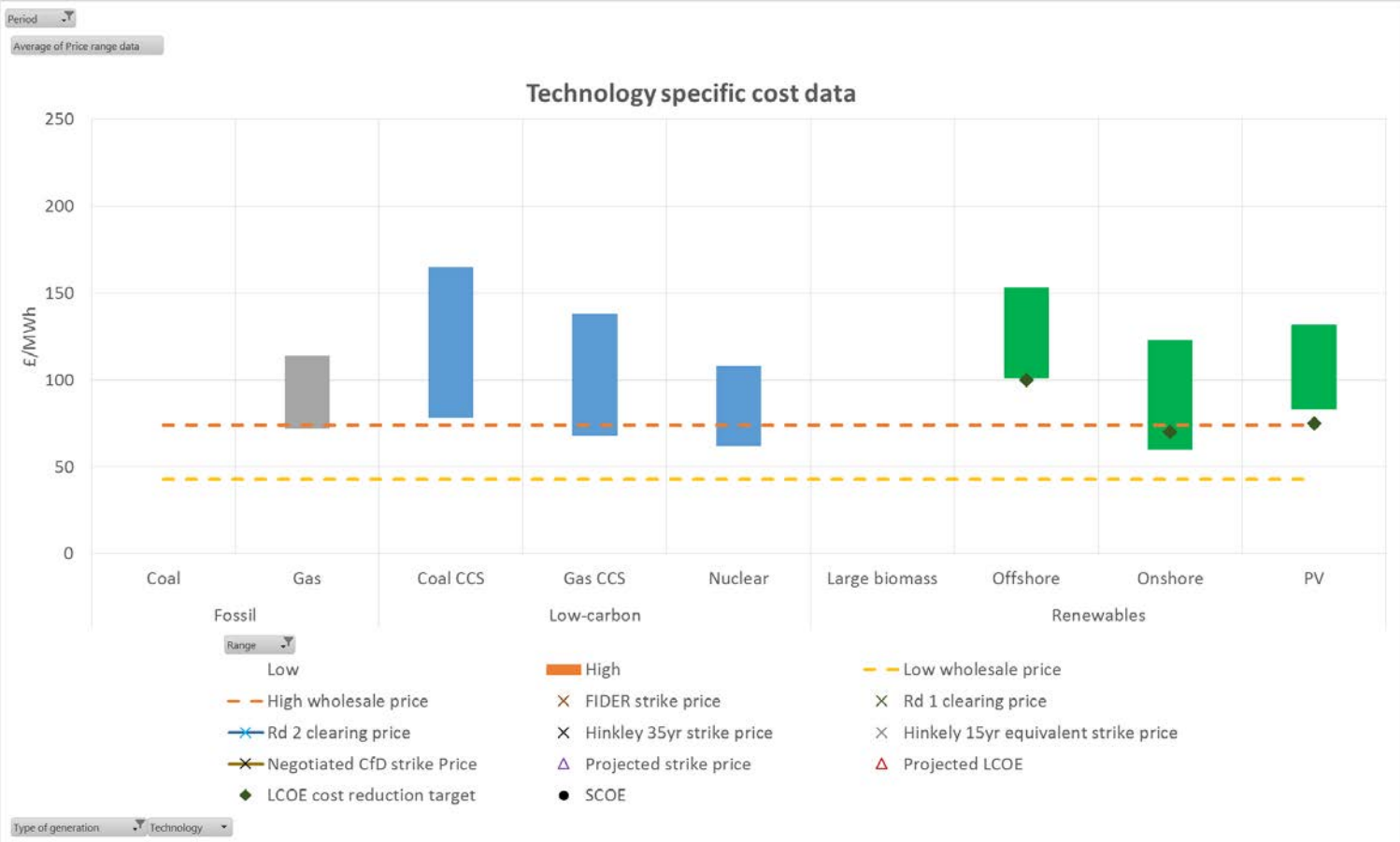
2020 Horizon



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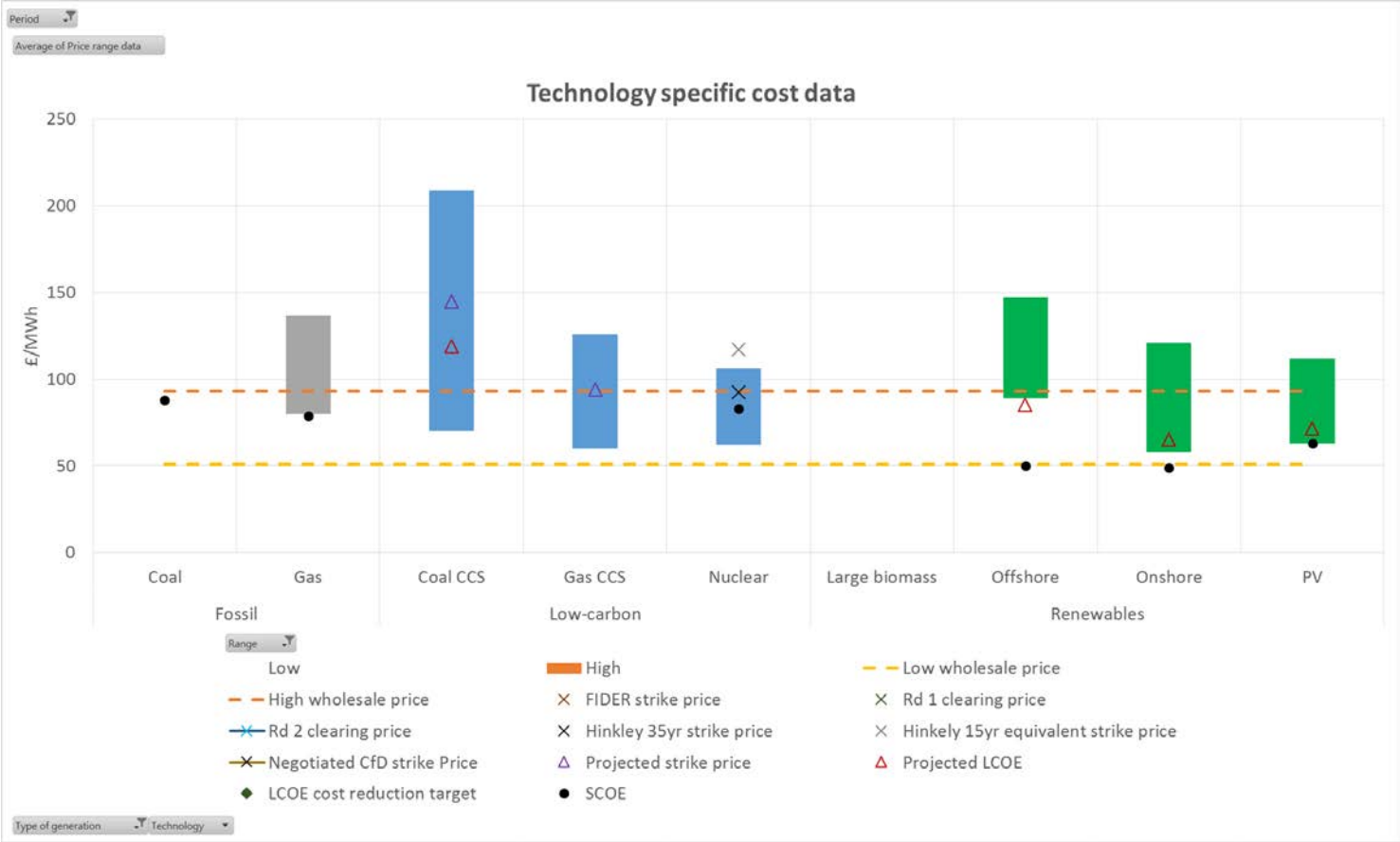
2020 to 2030 projections



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