Committee on Climate Change

Independent advice to government on building a low-carbon economy and preparing for climate change

Question and answer form – Drax Group Response

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 answers to 400 words per question and provide supporting evidence (e.g. academic literature, market assessments, policy reports, etc.) along with your responses.

A. Climate science and international circumstances

Question 1: The climate science considered in the CCC's 2019 Net Zero report, based on the IPCC Special Report on Global Warming of 1.5°C, will form the basis of this advice. What additional evidence on climate science, aside from the most recent IPCC Special Reports on Land and the Oceans and Cryosphere, should the CCC consider in setting the level of the sixth carbon budget?

Not Answered

Question 2: How relevant are estimates of the remaining global cumulative CO_2 budgets (consistent with the Paris Agreement long-term temperature goal) for constraining UK cumulative emissions on the pathway to reaching net-zero GHGs by 2050?

ANSWER:

Estimates of the remaining global cumulative CO2 budgets are certainly important for the UK in setting a pathway to reaching net-zero GHGs. These budgets will have a direct correlation to a UK target and, if it believed that these global CO2 budgets will be exceeded, could mean that developed countries with a strong focus on sustainability and decarbonisation like the UK could begin to set one or more of the following:

- More stringent targets with earlier dates for net-zero;
- Sharper emissions reduction trajectories as we approach a net-zero target;
- Targets which are net negative by 2050.

Question 3: How should emerging updated international commitments to reduce emissions by 2030 impact on the level of the sixth carbon budget for the UK? Are there other actions the UK should be taking alongside setting the sixth carbon budget, and taking the actions necessary to meet it, to support the global effort to implement the Paris Agreement?

ANSWER:

Question 3: How should emerging updated international commitments to reduce emissions by 2030 impact on the level of the sixth carbon budget for the UK? Are there other actions the UK should be taking alongside setting the sixth carbon budget, and taking the actions necessary to meet it, to support the global effort to implement the Paris Agreement?

There are a number of actions which can be taken alongside the setting of the sixth carbon budget to support the global effort to implement the Paris Agreement. The most important of these is the implementation of Article 6 of the Paris Agreement and the development of an international emissions trading scheme. Such a scheme should ensure that there is a global marketplace for negative emissions which would be an enabling action for long term climate ambitions.

In addition, to providing climate leadership to the rest of the world, the UK has the opportunity to become a world leader in exporting technologies required to meet a net-zero target such as CCUS, BECCS, and hydrogen. These technologies are expected to play a key role in emissions reductions not just in the UK, but globally according to IPCC reports.

Finally, the UK has an opportunity to become a CCUS CO2 storage hub due to the ample amount of CO2 storage based in UK waters. A report from the Energy Technologies Institute highlighted that UK stores could store in excess of 78,000 MtCO which provides the UK with the opportunity to store the CO2 produced by European countries for a number of decades[1].

Question 4: What is the international signalling value of a revised and strengthened UK NDC (for the period around 2030) as part of a package of action which includes setting the level of the sixth carbon budget?

ANSWER:

More aggressive carbon reduction strategies set by the UK can provide a signal for other countries to follow the same course of action. Since being the first major economy to set a net-zero target into law the UK has provided a model for other countries to follow or to try and beat. For example, France has recently set a similar net-zero target by 2050 into law, and Finland is expected to set a target of net-zero by 2035 in the coming months[2].

Revising and strengthening the UK NDC for the period around 2030 would provide a similar signal to countries around the world, and provides a target for these countries to hit and exceed.

B. The path to the 2050 target

Question 5: How big a role can consumer, individual or household behaviour play in delivering emissions reductions? How can this be credibly assessed and incentivised?

Not Answered

[1] https://www.eti.co.uk/insights/taking-stock-of-uk-co2-storage

[2] https://www.climatechangenews.com/2019/06/14/countries-net-zero-climate-goal/

Question 6: What are the most important uncertainties that policy needs to take into account in thinking about achieving Net Zero? How can government develop a strategy that helps to retain robustness to those uncertainties, for example low-regrets options and approaches that maintain optionality?

ANSWER:

One of the biggest uncertainties that policy will need to consider regarding a net-zero target is the role of behavioural change in driving decarbonisation. Whilst it is clear that behaviour change will be required in order to hit this target, some behaviour change is likely to prove easier to influence than others. For example, the switch to EV's could be a fairly simple transition but eating less meat or flying less could prove to be difficult and unpopular to implement.

To counter this risk, we believe that optionality in hitting a net-zero target will be necessary. One of the primary methods of providing optionality is through Greenhouse Gas Removal (GGR) technologies. Whilst these technologies shouldn't be seen as a way of avoiding cheaper or easier decarbonisation measures the do provide a certain amount of flexibility in hitting a net-zero target through their ability to provide negative emissions.

Question 7: The fourth and fifth carbon budgets (covering the periods of 2023-27 and 2028-32 respectively) have been set on the basis of the previous long-term target (at least 80% reduction in GHGs by 2050, relative to 1990 levels). Should the CCC revisit the level of these budgets in light of the net-zero target?

ANSWER:

Drax supports the revisiting of the level of fourth and fifth carbon budgets in light of the net-zero target. Whilst the fourth budget may be only able to accommodate minimal reductions in the level of the budget due to the short timescales in which the budget will commence, the fifth carbon budget is less time constrained and could be significantly revised following the setting of a net-zero target.

When revising the level of the fourth and fifth carbon budgets the CCC should take into account several factors including:

- A trajectory which is consistent with meeting a net-zero target by 2050.
- The significant cost reductions we have seen in a number of decarbonisation technologies such as offshore wind and electric vehicles which could mean that these technologies are deployed quicker, or at greater scale, than anticipated.
- The deployment of Greenhouse Gas Removal technologies in the 2020s to enable learning by doing, innovation and cost reduction ahead of a scale-up in the 2030s.
- The increased reliance of the national electricity transmission system on biomass and gas to provide system stability services such as inertia, frequency response and voltage control.

The setting of net-zero GHG emissions target by 2050 has created a situation where all emitters in the economy will now have to assess mechanisms to enable them to decarbonise. Such an approach has meant that emitters now have "nowhere to hide" under a net-zero target. By revising the fourth and fifth carbon budgets the CCC could raise the urgency in these sectors to decarbonise.

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Question 8: What evidence do you have of the co-benefits of acting on climate change compatible with achieving Net Zero by 2050? What do these co-benefits mean for which emissions abatement should be prioritised and why?

ANSWER:

As part of our work on the Zero Carbon Humber project in conjunction with Equinor and National Grid Ventures we have commissioned analysis by Element Energy that considers the co-benefits of decarbonising the Humber region through the deployment of CCUS and hydrogen infrastructure[3]. Some of the key findings were as follows:

- Protect up to 55,000 jobs in manufacturing and engineering sectors in the region.
- Avoid £2.9 billion per year in carbon taxes by 2040 for emitters in the region.
- Save £148 million in avoided public health costs between 2040 and 2050 as a result of higher air quality.
- Boost the economy of a region which has struggled as a result of deindustrialisation.
- Provide a number of additional jobs during the construction and operational phases.

The Humber is just one of several proposed CCUS industrial clusters and many of the findings of our report can also be applied to these regions, albeit at a smaller scale.

Other co-benefits of decarbonisation are particularly well highlighted through sector deals struck between industry and the government. Two major sector deals relating to decarbonisation can be found in the Nuclear and Offshore Wind sector deals with key commitments including at least 60% of the offshore wind supply chain provided by UK content and at least 40% female participation in the nuclear sector[4].
We would encourage the CCC to assess the value added by these sector deals and recommend a number of additional sector deals in areas such as CCUS, and hydrogen.

There strong evidence to show that demand for forest products leads to greater productivity of forests, which translates to greater forest growth, inventory (carbon stored) and forest acres. This is because markets for forest products incentivise landowners to invest in maintaining forests as forests and implementing good forest management practices. For example, in the US South, increased demand for forest products driven by the construction industry has led to a 57% increase in harvesting rates since 1953; however, over that same period, the amount of inventory in those same forests has grown

[3] https://www.zerocarbonhumber.co.uk/wp-content/uploads/2019/11/Capture-for-Growth-Zero-Carbon-Humber-V4.9-Digital.pdf

[4] https://www.gov.uk/government/publications/industrial-strategy-sector-deals/introduction-to-sector-deals

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by 108% and the acreage has grown by 3%[5]. These co-benefits also apply to the biomass and bioenergy sectors in the UK which provide a revenue stream for the lower value wood products which were previously used in the paper and pulp sectors.

C. Delivering carbon budgets

Question 9: Carbon targets are only credible if they are accompanied by policy action. We set out a range of delivery challenges/priorities for the 2050 net-zero target in our Net Zero advice. What else is important for the period out to 2030/2035?

ANSWER:

We welcomed the work undertaken by the CCC in developing the 2050 net-zero target in the advice published last year and share the CCC's view that carbon targets are only credible if they are accompanied by sufficient policy action. The range of delivery challenges/priorities identified in the advice are sensible however we would like to highlight the following areas which we believe that are important for the period out to 2030/2035:

- As explained in our answers to other questions in this call for evidence we believe that the rollout of Greenhouse Gas Removal technologies such as BECCS will need to commence at scale by, or just before, 2030. In the absence of a significant policy intervention by government to create an investment framework for negative emissions, it is unlikely that these technologies will attract the necessary investment to support First of a Kind projects. Therefore, we believe the CCC should recommend the development of a negative emissions policy as one of the priorities for government in the near term.
- We also believe that carbon pricing will have a vital role to play in driving decarbonisation across the economy. To support this, there is merit in the CCC investigating the role of an economy wide carbon price, as touched upon in the Future of Carbon Pricing letter sent by the CCC to the minister last year. Such a carbon price will need to have a clear trajectory which is consistent with meeting a net-zero target but will need to be mindful of detrimental effects such as the effect on fuel poverty or the competitiveness of UK industry.
  We welcome the UK government's stated preference to link a UK-ETS to the EU-ETS following the transition period of the UK's withdrawal from the EU. In the absence of a linkage to the EU-ETS, a UK-ETS will need to ensure sufficient liquidity to remain viable as a scheme but could also present an opportunity to support GGR technologies through the inclusion of negative emissions in the scheme.
- To alleviate the risk of carbon leakage of UK industry we believe that there is also merit in the CCC investigating the role of a carbon border adjustment mechanism to maintain the competitiveness of UK industry.
- Finally, it is well understood that the UK power system will require significant levels of storage and flexibility in order to support increased levels of intermittent power generation on the system. As highlighted in a recent report, GB lags behind other

5 https://www.forest2market.com/hubfs/2016_Website/Documents/20170726_Forest2Market_Historical_Perspective_US_South.pdf

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countries in readiness to support flexible technologies[6]. Whilst the UK scores well for its strong commitment to decarbonisation, slow market and regulatory changes required to support flexible technologies means that this transition is being hindered.
This problem is particularly detrimental to projects which have large CAPEX development costs such as pumped storage hydro. Policy changes are likely to be required to support these technologies in deployment for example by providing specific revenue stabilisation mechanisms such as a cap-and-floor, or changes to the capacity market to facilitate.

Question 10: How should the Committee take into account targets/ambitions of UK local areas, cities, etc. in its advice on the sixth carbon budget?

ANSWER:

A number of local authorities have recently set climate emergencies in response to increased public pressure to do so. Separately a number of local authorities and local enterprise partnerships have produced industrial and energy strategies which highlight key objectives and milestones for these regions to decarbonise. It would be prudent for the CCC to assess these strategies for metrics such as expected decarbonised heat deployment between electrification and hydrogen, CCUS deployment, and anticipated EV rollout. The CCC should be mindful to ensure that these strategies are consistent with a net-zero target by 2050 or earlier.

The Humber region for example has produced a clean growth white paper as a precursor to their industrial and energy strategies. Within the paper they highlight the importance of utilising CCUS and hydrogen to decarbonise local industry to maintain jobs, the potential of offshore wind in the region, and the significant biomass logistics network in place in the region to support Drax. The report focuses on the significant economic opportunities for the region in decarbonising, but also highlights that a failure to act could result in significant economic decline and the loss of thousands of well-paying highly skilled jobs[7].

Question 11: Can impacts on competitiveness, the fiscal balance, fuel poverty and security of supply be managed regardless of the level of a budget, depending on how policy is designed and funded? What are the critical elements of policy design (including funding and delivery) which can help to manage these impacts?

ANSWER:

In our work on developing a policy mechanism which ascribes the correct value to negative emissions to support the rollout of BECCS and other GGR technologies we have remained

[6] https://www.r-e-a.net/wp-content/uploads/2019/11/Energy-Transition-Readiness-Index-2019.pdf

[7] https://www.humberlep.org/wp-content/uploads/2019/11/Humber-Clean-Growth-White-Paper.pdf

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mindful of the need to ensure that ensure that impacts on fiscal balance and fuel poverty are mitigated as much as possible.

Since BECCS provides two products useful for meeting the UK's decarbonisation goals it makes sense to treat these differently. The first product, renewable electricity, will probably best be supported through existing mechanisms to support low-carbon electricity deployment in the UK, for example through a CfD on power prices which is funded by power consumers.
The second product, negative emissions, could be supported through an alternative market-based mechanism, for example through a CfD on carbon pricing rewarding negative emissions, or an obligation on fossil fuel suppliers. In the longer term, it would be prudent to ensure that power consumers are not funding the costs of these negative emissions given that the value of negative emissions will be in decarbonising difficult-to-abate sectors of the economy such as aviation and agriculture.

As with our earlier answer impacts on competitiveness could be alleviated through mechanisms such as a carbon border adjustment and we would encourage the CCC to investigate the merits and shortfalls of such a scheme.

Question 12: How can a just transition to Net Zero be delivered that fairly shares the costs and benefits between different income groups, industries and parts of the UK, and protects vulnerable workers and consumers?

ANSWER:

As with our earlier answer, the costs and benefits for technologies such as BECCS which have cross-sector decarbonisation potential should be carefully managed over the long-term to ensure that costs are not levied on one group of consumers e.g. electricity consumers.

At Drax we believe we provide a good case study of how to protect competitiveness and jobs when faced with the threat of closure. In repurposing an existing asset by converting Drax power station to operate from coal to biomass we have protected the jobs of skilled workers and the 4,000 jobs indirectly supported in the north alongside the direct employees of almost 1,000 people[8].

As we increasingly move towards a net-zero target, the role of BECCS will become more important to remove residual emissions from the economy. Drax's current extensive biomass logistics and supply chains are well placed to support the development of BECCS technologies. Drax also has the opportunity to deliver BECCS at a lower cost than a purpose built BECCS facility given our intention to reuse and repurpose infrastructure already in place on site.

[8] https://www.draximpact.co.uk/

Question 12: How can a just transition to Net Zero be delivered that fairly shares the costs and benefits between different income groups, industries and parts of the UK, and protects vulnerable workers and consumers?

We would also reiterate the CCC's point in the net-zero report around the need to ensure that UK emissions are reduced and dealt with in the UK, rather than simply offshoring these emissions. This point is particularly relevant to energy intensive industries with large skilled workforces and we believe the best mechanism to decarbonise these industries is though the use of CCUS.

D. Scotland, Wales and Northern Ireland

Question 13: What specific circumstances need to be considered when recommending an emissions pathway or emissions reduction targets for Scotland, Wales and/or Northern Ireland, and how could these be reflected in our advice on the UK-wide sixth carbon budget?

Not Answered

Question 14: The Environment (Wales) Act 2016 includes a requirement that its targets and carbon budgets are set with regard to:

- The most recent report under section 8 on the State of Natural Resources in relation to Wales;
- The most recent Future Trends report under section 11 of the Well-Being of Future Generations (Wales) Act 2015;
- The most recent report (if any) under section 23 of that Act (Future Generations report).

a) What evidence should the Committee draw on in assessing impacts on sustainable management of natural resources, as assessed in the state of natural resources report?

b) What evidence do you have of the impact of acting on climate change on well-being? What are the opportunities to improve people's well-being, or potential risks, associated with activities to reduce emissions in Wales?

c) What evidence regarding future trends as identified and analysed in the future trends report should the Committee draw on in assessing the impacts of the targets?

d) Question 12 asks how a just transition to Net Zero can be achieved across the UK. Do you have any evidence on how delivery mechanisms to help meet the UK and Welsh targets may affect workers and consumers in Wales, and how to ensure the costs and benefits of this transition are fairly distributed?

Not Answered

Question 15: Do you have any further evidence on the appropriate level of Wales' third carbon budget (2026-30) and interim targets for 2030 and 2040, on the path to a reduction of at least 95% by 2050?

Not Answered

Question 16: Do you have any evidence on the appropriate level of Scotland's interim emissions reduction targets in 2030 and 2040?

Not Answered

Question 17: In what particular respects do devolved and UK decision making need to be coordinated? How can devolved and UK decision making be coordinated effectively to achieve the best outcomes for the UK as a whole?

Not Answered

E. Sector-specific questions

Question 18 (Surface transport): As laid out in Chapter 5 of the Net Zero Technical Report (see page 149), the CCC's Further Ambition scenario for transport assumed 10% of car miles could be shifted to walking, cycling and public transport by 2050 (corresponding to over 30% of trips in total):

a) What percentage of trips nationwide could be avoided (e.g. through car sharing, working from home etc.) or shifted to walking, cycling (including e-bikes) and public transport by 2030/35 and by 2050? What proportion of total UK car mileage does this correspond to?

b) What policies, measures or investment could incentivise this transition?

Not Answered

Question 19 (Surface transport): What could the potential impact of autonomous vehicles be on transport demand?

Not Answered

Question 20 (Surface transport): The CCC recommended in our Net Zero advice that the phase out of conventional car sales should occur by 2035 at the latest. What are the barriers to phasing out sales of conventional vehicles by 2030? How could these be addressed? Are the supply chains well placed to scale up? What might be the adverse consequences of a phase-out of conventional vehicles by 2030 and how could these be mitigated?

ANSWER:

Question 20 (Surface transport): The CCC recommended in our Net Zero advice that the phase out of conventional car sales should occur by 2035 at the latest. What are the barriers to phasing out sales of conventional vehicles by 2030? How could these be addressed? Are the supply chains well placed to scale up? What might be the adverse consequences of a phase-out of conventional vehicles by 2030 and how could these be mitigated?

At present one of the primary barriers to the adoption of EVs is the deployment of charging networks.

Charging networks will need to be sufficiently widespread before the majority of car owners will have the confidence to switch from conventional vehicles to electric vehicles. We believe that workplace charging is a key area to address alongside home charging. Since the majority of workers who drive to their place of work will leave their cars for periods of 8 hours or more, this presents an excellent opportunity to provide both smart charging and vehicle-to-grid services, both of which are likely to play a role in supporting the transition to a net-zero target.

Whilst we welcomed the government recent consultation on a requirement to provide chargepoints in residential and non-residential buildings[9], we believe that the governments ambition in this area could be stronger, and there is merit in the CCC investigating the effect of workplace smart and V2G charging.

Question 21 (Surface transport): In our Net Zero advice, the CCC identified three potential options to switch to zero emission HGVs – hydrogen, electrification with very fast chargers and electrification with overhead wires on motorways. What evidence and steps would be required to enable an operator to switch their fleets to one of these options? How could this transition be facilitated?

ANSWER:

Whilst we are unable to provide an answer specific to operators of HGV fleets, from an energy system perspective two questions are key for decisions to be made:

1. What volume of hydrogen can be securely met at an affordable cost?

   This question ties into decisions around hydrogen for other uses such as heating, in industry, and in power generation. Understanding use of hydrogen for heat is particularly important. In a scenario where a full conversion to hydrogen occurs in the heat network, alongside utilisation of hydrogen in HGVs and in industry, analysis for Drax has predicted that either 819GW of solar or 231GW of offshore wind would be required to produce the volumes of hydrogen required through electrolysis.
   Even under a scenario where hybrid heat pumps become prevalent approximately 403GW of solar or 114GW of offshore wind would be required to produce hydrogen through electrolysis. This would imply that in order to see the volumes of hydrogen required, methane reformation technologies will need to be deployed at scale in the near term.

[9] https://www.gov.uk/government/consultations/electric-vehicle-chargepoints-in-residential-and-non-residential-buildings

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2. What investment would be required in the power system to facilitate the electrification of HGV's?

   The solution to decarbonising cars and vans is often considered to be a switch from traditional internal combustion engines to electric vehicles the majority of which will, over time, transition to charging smartly and possibly utilising vehicle-to-grid services. National grid in their FES scenarios estimate that over 75% of EVs could utilise smart charging by 2050[10]. When considering the merits of switching HGVs, the level of utilisation of services such as smart charging and V2G services will need to be considered alongside other factors such electricity consumption and additional network capacity required to support this transition.

Question 22 (Industry): What policy mechanisms should be implemented to support decarbonisation of the sectors below? Please provide evidence to support this over alternative mechanisms.

a) Manufacturing sectors at risk of carbon leakage
b) Manufacturing sectors not at risk of carbon leakage
c) Fossil fuel production sectors
d) Off-road mobile machinery

ANSWER:

Whilst a carbon price alone is unlikely to be sufficient to drive decarbonisation of these sectors, it will play a key role in driving decision making when considering to costs of adopting decarbonisation technologies. We believe that a strong carbon price with a level of certainty and stability is one of the most vital components to hitting a net-zero target in the UK.

The lead option for decarbonising industry will be the development of policy mechanisms to support the rollout of CCUS across the UK. Such mechanisms are likely to include a regulated asset base for the deployment of CO2 transport and storage networks, and a raft of policy mechanisms designed to support the capture projects of a diverse array of industrial emitters. These policy mechanisms will likely vary based on metrics such as risk of carbon leakage and international competitiveness, therefore we do not believe that a "one-size-fits-all" approach to deploying CCUS in industry is likely to be effective.

As mentioned in an earlier question we believe there is merit in the CCC investigating the role of a carbon border adjustment mechanism to maintain the competitiveness of UK industry. In addition, the CCC could also consider the role of local and national government

[10] http://fes.nationalgrid.com/media/1409/fes-2019.pdf

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a) Manufacturing sectors at risk of carbon leakage

b) Manufacturing sectors not at risk of carbon leakage

c) Fossil fuel production sectors

d) Off-road mobile machinery

procurement policies to favour low-carbon products, the role of low-carbon product standards, and possible operational expenditure support in the nearer term.

When considering mechanisms to help support the transition to decarbonised industry, the government should remain mindful to avoid distortive or regressive measures to fund the transition, for example by placing the costs of decarbonising industry onto power consumers.

Question 23 (Industry): What would you highlight as international examples of good policy/practice on decarbonisation of manufacturing and fossil fuel supply emissions? Is there evidence to suggest that these policies or practices created economic opportunities (e.g. increased market shares, job creation) for the manufacturing and fossil fuel supply sectors?

ANSWER:

One of the best examples of good policy/practice for decarbonising manufacturing emissions can be found with the Northern Lights project in Norway. The Norwegian government has provided significant policy and financial support for the project for example through funding FEED studies[11]. Such an approach could be replicated in the UK to achieve large scale Transport and Storage networks in several clusters around the UK.

Another good example can be found with the Puro scheme. This scheme has developed the world's first marketplace for GGR technologies with the aim of linking residual positive emitters to negative emitters[12]. Whilst a voluntary approach may be effective for decarbonising some sectors and companies, it is unlikely to drive a transition to a net-zero economy wide target unless made mandatory. Nonetheless the mechanism is worth further investigation by the CCC.

Question 24 (Industry): How can the UK achieve a just transition in the fossil fuel supply sectors?

As per our answer in other questions, the most effective mechanism for ensuring a just transition in industry and fossil fuel supply sectors is likely to be through the deployment of CCUS.

[11] https://northernlightsccs.com/en/about

[12] https://puro.earth/about-us/

Question 25 (Industry): In our Net Zero advice, the CCC identified a range of resource efficiency measures that can reduce emissions (see Chapter 4 of the Net Zero Technical Report, page 115), but found little evidence relating to the costs/savings of these measures. What evidence is there on the costs/savings of these and other resource efficiency measures (ideally on a £/tCO2e basis)?

Not Answered

Question 26 (Buildings): For the majority of the housing stock in the CCC's Net Zero Further Ambition scenario, 2050 is assumed to be a realistic timeframe for full roll-out of energy efficiency and low-carbon heating.

a) What evidence can you point to about the potential for decarbonising heat in buildings more quickly?

b) What evidence do you have about the role behaviour change could play in driving forward more extensive decarbonisation of the building stock more quickly? What are the costs/levels of abatement that might be associated with a behaviour-led transition?

Not Answered

Question 27 (Buildings): Do we currently have the right skills in place to enable widespread retrofit and build of low-carbon buildings? If not, where are skills lacking and what are the gaps in the current training framework? To what extent are existing skill sets readily transferable to low-carbon skills requirements?

Not Answered

Question 28 (Buildings): How can local/regional and national decision making be coordinated effectively to achieve the best outcomes for the UK as a whole? Can you point to any case studies which illustrate successful local or regional governance models for decision making in heat decarbonisation?

Not Answered

Question 29 (Power): Think of a possible future power system without Government backed Contracts-for-Difference. What business models and/or policy instruments could be used to continue to decarbonise UK power emissions to close to zero by 2050, whilst minimising costs?

ANSWER:

Drax believes that a CfD will continue to play a role in supporting the deployment of decarbonisation technologies for the foreseeable future. We do, however, believe that eligible technologies for a CfD will need to be extended to encompass a wider range of technologies such as BECCS.

Question 29 (Power): Think of a possible future power system without Government backed Contracts-for-Difference. What business models and/or policy instruments could be used to continue to decarbonise UK power emissions to close to zero by 2050, whilst minimising costs?

Alongside a CfD there will need to be an evolution in the role of a capacity market. The capacity market could incorporate elements such as the role of system stability or ancillary services to ensure that system security can be met at least cost. Ancillary or flexibility contracts at present are currently too short term, and are not able to be signed in advance, meaning that it is difficult to build an investment case for flexible technologies based on revenues from the flexibility market. We believe that longer term ancillary service contracts will be necessary in the future to enable the investment required.

Currently there is no mechanism to reward the production of negative emissions in the UK. At Drax we are investigating possible policy mechanisms which could be introduced to develop a market to support negative emissions technologies such as BECCS and DACCS. A number of options remain possible including a CfD on power or carbon prices, the introduction of negative emissions into the EU-ETS or UK-ETS, or an obligation on residual emitters or fossil fuel suppliers to source negative emissions certificates. We believe the government should look to consult on a policy to support the deployment of negative emissions technologies as soon as possible.

Question 30 (Power): In Chapter 2 of the Net Zero Technical Report we presented an illustrative power scenario for 2050 (see pages 40-41 in particular):

a) Which low-carbon technologies could play a greater/lesser role in the 2050 generation mix? What about in a generation mix in 2030/35?

b) Power from weather-dependent renewables is highly variable on both daily and seasonal scales. Modelling by Imperial College which informed the illustrative 2050 scenario suggested an important role for interconnection, battery storage and flexible demand in a future low-carbon power system:

   i. What other technologies could play a role here?

   ii. What evidence do you have for how much demand side flexibility might be realised?

ANSWER:

The exact technology mix for the power sector in 2030/35 and out to 2050 is difficult to predict as deployment of specific technologies is often reliant on supportive government policy, rather than through market-based mechanisms alone. That said, through our internal modelling work on a net-zero target we have identified a number of key points which we believe should inform the CCC's thinking in this area:

- The level of BECCS implied in the CCC's net zero report to provide negative emissions indicates a minimum capacity of 5GW in the power sector by 2050. For a generation mix in 2035 we assume that three Drax biomass units have been converted to BECCS providing 1.9GW of capacity and negative emissions. We also assume that the role of BECCS in providing low-carbon power is secondary to the role of BECCS in providing negative emissions. In the event of a favourable policy environment for BECCS we could convert all four Drax biomass units to BECCS by 2035.

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a) Which low-carbon technologies could play a greater/lesser role in the 2050 generation mix? What about in a generation mix in 2030/35?

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i. What other technologies could play a role here?

ii. What evidence do you have for how much demand side flexibility might be realised?

- We assume that hydrogen CCGTs are able to play the role of back-up generation and flexibility services more effectively that post-combustion gas CCGTs. This is due to the increased ramp up times of post combustion CCGTs and the low CO2 capture rates during these ramp-up periods. If the role of gas is operating at low load factors (our analysis predicts load factors of below 20% by the 2040's) then hydrogen CCGTs or OCGTs may be a better option.
- Beyond the development of Hinkley Point C and Sizewell C we have assumed that the majority of additional nuclear deployment occurs in the 2040's but capacity is similar to today's levels. The power sector is still able to reach net-negative emissions without nuclear deployment due to BECCS, and in the absence of BECCS is able to reach emissions of around 8MtCO2 per year by 2050 (primarily from some outstanding unabated CCGTs providing back-up power).
- In more ambitious decarbonisation scenarios, the increased amount of offshore wind on the system results in older and less efficient CCGTs leaving the system earlier. Due to this decrease in older CCGT plant, there is an increase in the number of new build CCGTs in the mid-2020's which operate at higher efficiency levels. We estimate that new CCGTs are built up until 2030, after which all new build CCGTs are either post-combustion CCUS, or hydrogen.
- Given the level of uncertainty around the deployment of CO2 transportation and storage networks in the UK, we have assumed that not all CCGTs will be able to decarbonise in the 2040s, particularly those which are located away from the industrial clusters identified in the government's CCUS Action Plan[13]. The CCC should recommend to government that they develop a clearer picture of how CO2 transport and storage networks will extend to regions outside the identified industrial clusters.

In terms of other technologies playing a role in meeting the variability of intermittent renewables we believe that Pumped Storage Hydro will play a significant role in managing this variability both in terms of the large volume of storage capacity available, and its role in providing ancillary and flexibility services to the grid. A report from DNVGL highlighted the benefits of deployment of additional pumped storage hydro in the UK, but it also highlighted the barriers to deployment of this technology given its long development phase and long project payback period[14]. We would encourage the CCC to investigate the role of additional pumped storage hydro in meeting a net-zero target.

[13] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/759637/beis-ccus-action-plan.pdf

[14] https://www.scottishrenewables.com/publications/benefits-pumped-storage-hydro-uk/

Question 30 (Power): In Chapter 2 of the Net Zero Technical Report we presented an illustrative power scenario for 2050 (see pages 40-41 in particular):

a) Which low-carbon technologies could play a greater/lesser role in the 2050 generation mix? What about in a generation mix in 2030/35?

b) Power from weather-dependent renewables is highly variable on both daily and seasonal scales. Modelling by Imperial College which informed the illustrative 2050 scenario suggested an important role for interconnection, battery storage and flexible demand in a future low-carbon power system:

   i. What other technologies could play a role here?

   ii. What evidence do you have for how much demand side flexibility might be realised?

Question 31 (Hydrogen): The Committee has recommended the Government support the delivery of at least one large-scale low-carbon hydrogen production facility in the 2020s. Beyond this initial facility, what mechanisms can be used to efficiently incentivise the production and use of low-carbon hydrogen? What are the most likely early applications for hydrogen?

ANSWER:

We believe that hydrogen has clear role in industrial decarbonisation, heavy duty transportation, and likely has a key role to play in heat and power generation by providing low carbon back up power to the grid.

Given the significant role that hydrogen will play in a decarbonised economy we believe that multiple low-carbon hydrogen production facilities will be required in the 2020's to begin the rollout of low-carbon technologies which operate using hydrogen. One of the most promising early uses of hydrogen is in power. Newer CCGT turbines could operate with a blend of up to 30% hydrogen, however as of yet manufacturers have struggled to receive hydrogen at volume to test potential options.

We believe that policy mechanisms should focus on the production side to seek cost parity with alternatives and carbon price. However, there will also be a need to include an obligation/incentive to deploy on the user side. The phase out of alternative technologies could be a key driver to this.

We believe that two possible approaches to hydrogen business models should be considered.

1. The first would be an obligation type approach like the Renewable Transport Fuels Obligation (RTFO) or Renewables Obligation. Such an approach would obligate some users of high-carbon alternatives to source a certain level of low-carbon hydrogen certificates each year. If the buy-out price of such an obligation was set high enough this would provide a sufficient revenue stream to help the production of low-carbon hydrogen. This approach has been successful in driving the deployment of renewables in the power sector, and lessons can be taken from the operation of the RTFO with lower carbon intensity hydrogen provided with additional certificates for example.

Question 31 (Hydrogen): The Committee has recommended the Government support the delivery of at least one large-scale low-carbon hydrogen production facility in the 2020s. Beyond this initial facility, what mechanisms can be used to efficiently incentivise the production and use of low-carbon hydrogen? What are the most likely early applications for hydrogen?

2. A hydrogen production CfD could cover the operational cost differential of hydrogen production compared with high-carbon alternatives. Such an approach could be tied to the natural gas wholesale price and provide an additional level of revenue to hydrogen producers.

Two important challenges also need to be considered when designing a business model to support hydrogen production:

- Hydrogen currently has little demand in the economy.
  - We believe that this is one of the fundamental challenges of hydrogen deployment in the UK. A business model will need to take into account this current lack of demand perhaps through an obligation on the end users of hydrogen to increase the uptake.

- Hydrogen is difficult to transport at present.
  - Hydrogen is currently unable to be transported through the gas network due to a number of regulations which mean that hydrogen must be transported via alternative (often expensive) means. Once the safety case of transporting hydrogen has been proved we would recommend that these prohibitive regulations are relaxed to allow for the transport of blended hydrogen in the gas network.

Question 32 (Aviation and Shipping): In September 2019 the Committee published advice to Government on international aviation and shipping and Net Zero. The Committee recognises that the primary policy approach for reducing emissions in these sectors should be set at the international level (e.g. through the International Civil Aviation Organisation and International Maritime Organisation). However, there is still a role for supplementary domestic policies to complement the international approach, provided these do not lead to concerns about competitiveness or carbon leakage. What are the domestic measures the UK could take to reduce aviation and shipping emissions over the period to 2030/35 and longer-term to 2050, which would not create significant competitiveness or carbon leakage risks? How much could these reduce emissions?

ANSWER:

We believe that aviation and shipping emissions should be reduced in the most cost-effective way to the economy. The two primary mechanisms to decrease emissions in these sectors are either through decarbonised process such as electrification of planes, or use of low-carbon fuels, or through offsetting with negative emissions technologies such as BECCS.

Sustainable Aviation in their report into a net-zero aviation sector in the UK, identified a clear role for negative emissions technologies such as BECCS. They highlight that 25.8 MtCO2 savings per year will be derived from market-based measures, alongside savings

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made via sustainable aviation fuels and through the deployment of newer and more efficient aircraft[15].

By developing a marketplace for negative emissions as described earlier which links up negative emissions providers with residual emitters such as aviation, the market should enable decarbonisation to net-zero at the least cost.

Question 33 (Agriculture and Land use): In Chapter 7 of the Net Zero Technical Report we presented our Further Ambition scenario for agriculture and land use (see page 199). The scenario requires measures to release land currently used for food production for other uses, whilst maintaining current per-capita food production. This is achieved through:

- A 20% reduction in consumption of red meat and dairy
- A 20% reduction in food waste by 2025
- Moving 10% of horticulture indoors
- An increase in agriculture productivity:
  - Crop yields rising from the current average of 8 tonnes/hectare for wheat (and equivalent rates for other crops) to 10 tonnes/hectare
  - Livestock stocking density increasing from just over 1 livestock unit (LU)/hectare to 1.5 LU/hectare

Can this increase in productivity be delivered in a sustainable manner?

Do you agree that these are the right measures and with the broad level of ambition indicated? Are there additional measures you would suggest?

Not Answered

[15] https://www.sustainableaviation.co.uk/

Question 34 (Agriculture and Land use): Land spared through the measures set out in question 33 is used in our Further Ambition scenario for: afforestation (30,000 hectares/year), bioenergy crops (23,000 hectares/year), agro-forestry and hedgerows (~10% of agricultural land) and peatland restoration (50% of upland peat, 25% lowland peat). We also assume the take-up of low-carbon farming practices for soils and livestock. Do you agree that these are the key measures and with the broad level of ambition of each? Are there additional measures you would suggest?

ANSWER:

We are at present developing a piece of work with Mckinsey which we believe will shed some light on this question. We will share this bilaterally with the CCC in due course.

Question 35 (Greenhouse gas removals): What relevant evidence exists regarding constraints on the rate at which the deployment of engineered GHG removals in the UK (such as bioenergy with carbon capture and storage or direct air capture) could scale-up by 2035?

ANSWER:

The primary constraint on the deployment of engineered GHG removals in the UK such as BECCS is the lack of a market or revenue stream which properly ascribes value to negative emissions. We believe that it is vital that the government sets out its ambition and policy in this area as soon as possible to enable investment decisions to be made.

At Drax we can scale up BECCS on a unit by unit basis from 2027 onwards subject to an investable revenue stream being developed. Each unit could capture up to 4 MtCO2 of negative emissions per year and could be fully deployed by 2033 capturing up to 16 MtCO2 per year[16].

Our work with Mckinsey will be able to provide additional insights into the constraints of BECCS deployment both in the UK and globally and we will share this with the CCC in due course.

Question 36 (Greenhouse gas removals): Is there evidence regarding near-term expected learning curves for the cost of engineered GHG removal through technologies such as bioenergy with carbon capture and storage or direct air capture of CO_2?

ANSWER:

At Drax we have a stated ambition to reduce our fuel costs from £75/MWh to £50/MWh by 2027. This reduction in fuel costs would have a direct impact on the cost of deploying BECCS at Drax[17].

[16] https://www.drax.com/energy-policy/capture-for-growth-zero-carbon-humber-report/

[17] https://www.drax.com/about-us/our-projects/

Question 36 (Greenhouse gas removals): Is there evidence regarding near-term expected learning curves for the cost of engineered GHG removal through technologies such as bioenergy with carbon capture and storage or direct air capture of CO_2?

In addition, given we are aiming to deploy BECCS in a modular fashion on a unit by unit basis, we would expect cost reductions as a result of learning curves achieved during deployment.

We are furthering our knowledge regarding expected costs of BECCS at Drax and hope to be able to share this with the CCC in due course.

Question 37 (Infrastructure): What will be the key factors that will determine whether decarbonisation of heat in a particular area will require investment in the electricity distribution network, the gas distribution network or a heat network?

Not Answered

Question 38 (Infrastructure): What scale of carbon capture and storage development is needed and what does that mean for development of CO_2 transport and storage infrastructure over the period to 2030?

ANSWER:

In our work in developing a plan to enable a Zero Carbon Humber, we have assessed the level of CCS infrastructure which could be required to enable a net-zero carbon industrial cluster. In the analysis we highlighted that the Humber region could capture 44MtCO2 per year by 2040 with 13MtCO2 of emissions from industry, 16MtCO2 from BECCS, and 15MtCO2 per year from hydrogen production. Working backwards our assumptions for CO2 capture in the region are 33MtCO2 in 2035, 16MtCO2 in 2030, and 5.75MtCO2 in 2027[18].

The development of a CO2 transport and storage network in the Humber region will take a number of years to complete given the need to conduct FEED studies, to obtain land access rights, and the need to receive development approval. Therefore, it is critical that the government moves quickly to implement a policy to support the deployment of these networks in the UK. The costs of conducting FEED studies are significant financial commitments. In order to allow these FEEDs to be conducted on multiple transport and storage networks the government should look to support these studies, either financially or through clear policy commitments.

Finally, we would just like to highlight that a transport and storage network will be used to support the decarbonisation of multiple sectors of the economy including industry, power and through hydrogen production. In the spirit of a just transition, and to avoid any adverse effects on fuel poverty, we believe that the costs of operating a transport and storage network should be shared fairly amongst all users of the network and should not be placed entirely on energy consumer bills.

[18] https://www.zerocarbonhumber.co.uk/wp-content/uploads/2019/11/Capture-for-Growth-Zero-Carbon-Humber-V4.9-Digital.pdf