Committee on Climate Change

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

The Sixth Carbon Budget and Welsh emissions targets – Call for Evidence

Background to the UK's sixth carbon budget

The UK Government and Parliament have adopted the Committee on Climate Change's (CCC) recommendation to target net-zero emissions of greenhouse gases (GHGs) in the UK by 2050 (i.e. at least a 100% reduction in emissions from 1990).

The Climate Change Act (2008, 'the Act') requires the Committee to provide advice to the Government about the appropriate level for each carbon budget (sequential five-year caps on GHGs) on the path to the long-term target. To date, in line with advice from the Committee, five carbon budgets have been legislated covering the period out to 2032.

The Committee must provide advice on the level of the sixth carbon budget (covering the period from 2033-37) before the end of 2020. The Committee intends to publish its advice early, in September 2020. This advice will set the path to net-zero GHG emissions for the UK, as the first time a carbon budget is set in law following that commitment.

Both the 2050 target and the carbon budgets guide the setting of policies to cut emissions across the economy (for example, as set out most recently in the 2017 Clean Growth Strategy).

The Act also specifies other factors the Committee must consider in our advice on carbon budgets – the advice should be based on the path to the UK's long-term target objective, consistent with international commitments and take into account considerations such as social circumstances (including fuel poverty), competitiveness, energy security and the Government's fiscal position.

The CCC will advise based on these considerations and a thorough assessment of the relevant evidence. This Call for Evidence will contribute to that advice.

Background to the Welsh third carbon budget and interim targets

Under the Environment (Wales) Act 2016, there is a duty on Welsh Ministers to set a maximum total amount for net Welsh greenhouse gas emissions (Welsh carbon budgets). The first budgetary period is 2016-20, and the remaining budgetary periods are each succeeding period of five years, ending with 2046-50.

The Committee is due to provide advice to the Welsh Government on the level of the third Welsh carbon budget (covering 2026-30) in 2020, and to provide updated advice on the levels of the second carbon budget (2021-25) and the interim targets for 2030 and 2040. Section D of this Call for Evidence (covering questions on Scotland, Wales and Northern Ireland) includes a set of questions to inform the Committee's advice to the Welsh Government.

Question and answer 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 answers to <u>400 words</u> 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?
ANSWER: n/a

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: n/a

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: n/a

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: n/a

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?
ANSWER: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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?

ANSWER: n/a

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?

ANSWER: n/a

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?

ANSWER: n/a

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

ANSWER: n/a

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?

ANSWER: n/a

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?

ANSWER: n/a

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

ANSWER: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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

ANSWER: n/a

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)?

ANSWER: n/a

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?

ANSWER: n/a

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?

ANSWER: n/a

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?

ANSWER: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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?

ANSWER:

Whilst I do not believe that the CCC's targeted increases in crop yield or stocking rate will prove to be sustainable, it is their strategy for reducing extensively grazed livestock on marginal areas whilst encouraging greater intensification on the more fertile land that concerns me most. This is because cattle and sheep that are managed agro-ecologically, (i.e. stocked at densities that are consistent with the inherent carrying capacity of the land being grazed) provide the essential foundation for achieving a net-zero agriculture that does not compromise efforts to conserve wildlife, protect air and water supplies and ensure safe, affordable and secure supplies of food. This, however, is

not true for livestock fed large amounts of grain such as the majority of pig and poultry enterprises and some of the more intensive dairy and beef operations. The use of human-edible crops as feed for livestock represents a huge inefficiency in terms of land use, energy and nutrients even though it is often presented in a more positive light regarding its C-footprint, as here in this consultation brief. Prioritizing cuts in all the various meat sectors, red or white that compete directly with humans for their feed should be at the forefront of any food strategy aiming for true sustainability, combining climate regulation with nature conservation and environmental protection.

I would urge the CCC to recognize the crucial contribution that grazing animals can make towards delivering a full range of ecosystem services and societal benefits whilst mitigating the impacts of climate-change, as described in the recent FFCC report:

https://www.thersa.org/globalassets/reports/rsa-ffcc-our-future-in-the-land.pdf

Concerns over these issues led me to begin considering our livestock's environmental performance. Having studied EBLEX's Beef and Sheep Production Roadmap (http://beefandlamb.ahdb.org.uk/wp-content/uploads/2013/06/Change-in-the-Air.pdf) I was surprised at their advice to re-seed grassland with the latest high-sugar grasses, which ignored the fact that the necessary cultivations would inevitably release carbon stored in the soil, something that would obviously increase overall GHG emissions. I therefore decided to find out more about the calculations underpinning this advice and commissioned the original consultants that had undertaken the assessments that formed the basis of the Roadmap to use the same tool to assess the C-footprint for our beef suckler herd:

https://1drv.ms/b/s!AvgB2WnLQvCFgz7LnvGdKWOlYKMt?e=5BLA2R

Our emissions, at 20.6 kg CO2eq were almost twice as high as the Roadmap's average for upland suckler herds, suggesting that our system, because of its extensive nature, was having an especially damaging climate impact. Most of this was due to the higher-than-average emissions of enteric methane, which comprised 67% of the total, reflecting the longer time it takes to finish cattle on unimproved, semi-natural upland pastures. Conversely just 7% of the total emissions came from the lower-than-average use of external inputs requiring use of fossil-fuels, a relative proportion that reflects the low-input nature of the enterprise.

Methane's 25-30x higher warming potential than CO2, is the main reason why extensively grazed livestock attract such strong criticism from climate scientists and environmental campaigners. However, a recent reassessment of methane's actual warming potential by researchers at Oxford Martin School calls into question the rationale underpinning arguments for increased intensification. This revised CO2 * metric, takes account of methane's short atmospheric residency time, as explained in this paper:
https://www.oxfordmartin.ox.ac.uk/downloads/academic/201908_ClimatePollutants.pdf

This concludes that systems where livestock numbers are not increasing over time do not contribute to any significant additional warming because the methane they are emitting at any point is only replacing what has been broken down from past emissions, as part of a continuing through-put of the gas that produces no net increase in concentration. According to this interpretation, a low-input, pasture-based system like ours, stocked at levels attuned to the land's own carrying capacity would not be contributing

significantly to climate warming, despite its animals producing higher life-time emissions of methane.

This interpretation seems at odds with the CCC's current preference for intensification, weakening, as it does, the importance of methane's role in determining overall emissions. The advised 25% increase in stocking density would obviously incur a significant increase in methane-driven warming wherever this kind of intensification was being adopted, whereas maintaining existing stocking levels implies little or none. Furthermore, intensification is accompanied by higher emissions of CO2 and N2O from the additional fertilizer and other external inputs needed to drive the increases in production. And whilst it is possible to off-set this additional warming by sequestering or saving more carbon elsewhere, the ecological damage that accompanies intensification cannot be so conveniently redeemed. Ultimately it will undermine the productive potential of the land that is being subjected to such abuse, causing the intensive effort to be moved to a new piece of land that will in turn succumb to the same degradation and loss. Continuing down this path seems sure to bring UK farming closer to total collapse as the most productive land continues to be degraded by progressive loss of biodiversity and destruction of ecosystems.

The current uncertainties surrounding the calculation of methane's contribution to climate change are compounded by known inaccuracies and omissions in identifying and quantifying its sources. The conventional metrics are based on laboratory based studies that take no account of variations known to occur on-farm. Differences in individual genotype and breed, variations in diet, soil, vegetation type, and husbandry system have all been found to affect the rate at which animals emit this gas. These questions can best be answered by field-based measurement of the quantities of methane actually being produced, an area of study that is developing rapidly, as this paper demonstrates:

https://www.sciencedirect.com/science/article/pii/S0048969719345917

I understand from the paper's lead author, David Lowry, that he appreciates the need for taking field measurements of the methane output from livestock. He has expressed interest in obtaining such data from our cattle in the hope of better informing strategies for mitigating GHGs from grazing livestock.

It seems that cattle are far from being the only biogenic source of methane; various studies have already shown significant emissions from pigs, horses and trees, though none of these sources have yet been targeted as significant causes for concern. It is unclear why ruminants have been so exclusively singled out for blame, especially as, when being managed extensively on unimproved permanent pasture, their contribution to global warming is likely to be minimal. Emissions from grazed agro-forestry or sylvo-pastoral systems have even been shown to be negative, with uptake of CO2 by the whole system far outweighing the direct emissions from the animals, even when these are conventionally calculated. I further refer to this in my response to Q 34

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:

In broad terms I think these overall targets for land use in 2050 represent a movement in the right direction, although how far they can be delivered by policy incentives and regulatory controls is a matter for debate. Without some form of direct planning control, decisions about how any specific piece of land is used remain largely with private landowners and farmers.

Of the proposals listed I whole-heartedly approve of the peatland restoration element, but think the target for lowland could be more ambitious, bearing in mind that much of the fens in the east of England have lost nearly all of their soil and will be unable to continue producing food indefinitely under the current cropping methods.

I am wary of energy crops because they compete directly with much more socially important uses such as food production, nature conservation and timber supplies. Biomass needs to be kept out of the atmosphere for as long as possible if we are to meet the net-zero target so burning biomass for energy should only ever be a low priority. The exception here could be some form of pyrolysis producing a char-type residue that can be used as a soil conditioner. Genuine renewables such as solar or wind power are more efficient and can be used to create non-carbon fuels.

Of all the other proposed land use systems, agro-forestry should be the priority target because it brings together all the main objectives for truly sustainable land-use under a single concept. In that sense I feel that the target of just 10% of farmland, 2% of the total area by 2050 is rather timid and could be increased to 50% of the total UK land area, taking in elements of what is currently ear-marked as woodland, grassland, rough grazing and arable. The density of trees in these different types of land use will vary according to the needs and wishes of individual occupiers but every holding should be integrating trees and shrubs within their productive remit.

In my response to Q 33 I made clear my objections to how the proposed reductions to meat production are being targeted and why it is especially unwise to discourage extensively managed pasture-fed livestock. Here too there is lots of scope for useful integration between different forms of land use, starting with restoring grazing livestock to arable cropping, where modern farming methods have led to loss of mixed farming practices, centred on traditional grass-based rotations. This has led to soil loss and the increased use of fertilizers and pesticides, with associated loss of wildlife and increasing problems with herbicide resistance amongst certain weed species.

There is much more scope, too, for including trees on marginal land in the uplands where landscapes are often kept artificially open by excessive grazing from deer or sheep. Historically these places have had much higher numbers of cattle, a domesticated species that has evolved from wild ancestors roaming the wood-pasture mosaic that is now known to have covered much of Britain's pre-agricultural landscape.

Cattle provide a more robust partner enterprise for trees than other livestock species, capable of effective browsing but not so severely that regeneration is completely prevented. The reliability of the combination probably reflects their true evolutionary origins.

The main argument against promoting this option more strongly would be that the GHG emissions from the livestock might negate much of the C-sequestration by the trees. However my own investigations demonstrate that this need not be the case. Concerns about discrepancies in some interpretations of livestock's emissions led me to undertake assessments of my own system's C-footprint, as described in my response to Q33. At the same time I did three further assessments using tools that were freely available on the internet at that time, none of which used the PAS 2050 methodology but instead included sequestration of carbon by trees and even by soil. These results completely contradicted the conclusions from the ECO2 study, described previously, all of them indicating that the net emissions were actually negative, so that every kilogram of beef produced was associated with a net uptake of CO2 e, exceeding direct emissions by several times.

I subsequently responded to a consultation undertaken by the All Party Parliamentary Sheep and Beef Group in 2013, presenting results from these studies that I hoped might make them aware of the issues surrounding the use of PAS 2050 in devising the livestock sector's climate strategy. The APPG's report, which can be viewed here, went on to raise several concerns prompted by these results:

http://beefandlamb.ahdb.org.uk/wp/wp-content/uploads/2013/05/Beef-and-Lamb-APPG-The-carbon-footprint-of-the-beef-cattle-and-sheep-sector.pdf

The report emphasises the need for properly agreed and standardized methodologies for including C- sequestration within an industry-approved form of C-footprint assessment. Unfortunately the progress anticipated for this in their report has not yet been made, and methods for estimating sequestration are still a matter of debate, preventing its inclusion in any formalised way into an industry-led strategy. It seems paradoxical that uncertainty over accounting methods prevents C-sequestration being formally included on one side of the emissions equation whilst similar controversy over metrics have not prevented methane's inclusion on the other side.

Some inconsistency is evident in the results from the three different tools, no two of which are in complete agreement. However, the estimates of sequestration are sufficiently commensurate with each other to confirm that the combination of trees and livestock affords an effective land use for mitigating climate change. Hopefully this will be sufficient justification for the Committee on Climate Change to increase their ambition for inclusion of livestock-based agro-forestry in their 6th UK Carbon Budget when it is published later this year, perhaps even referring to wood pasture or sylvo-pastoralism as particularly relevant examples of its application.

And there is still a serious danger that extensive forms of red meat production will continue to be targeted as climate change culprits when in many cases, especially in the uplands, these production systems will actually be ahead of the game in terms of moving towards Net Zero. results showed very clearly how, when the assessment only included direct emissions, our beef could be judged to have performed poorly, registering almost twice as much CO2 equivalent as the average value cited in

The reason for this was obviously due to the fact that, because we only have low grade land, the cattle take more time to finish, during which they are assumed to emit larger amounts of methane. The assessment showed that these enteric emissions accounted for two thirds of the system's total greenhouse gases, based on currently accepted emissions standards. These however, as far as I can tell, have yet to be fully tested across a range of alternative systems involving different breeds of cattle grazing vegetation other than ryegrass swards. This is something that I feel is in urgent need of investigation so I have requested help from researchers at Royal Holloway, University of London who have equipment for measuring point source emissions of methane in the field which they think could help answer this fundamental question.

I understand why enteric methane causes concern amongst many climatologists and environmental scientists generally but I am anxious that this is directed at those sources that are truly responsible for the problem and not just the most convenient scapegoats. although, following a recent reappraisal of the true warming potential of methane, this conclusion is open to challenge, a point I will return to later.

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: n/a

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: n/a

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?

ANSWER: n/a

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: n/a