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.

Part 1: Climate Science

Question 1 (Climate Science): The IPCC's Fifth Assessment Report and the Special Report on 1.5°C will form an important part 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: We have no comment to make on this question.

Question 2 (CO_2 and GHGs): Carbon dioxide and other greenhouse gas gases have different effects and lifetimes in the atmosphere, which may become more important as emissions approach net-zero. In setting a net-zero target, how should the different gases be treated?

ANSWER:
It is important to tackle all sources of greenhouse gases that contribute to global warming. EDF Energy considers that a net-zero target should cover all greenhouse gases, not just carbon dioxide.

As emissions of carbon dioxide reduce, remaining emissions of other greenhouse gases, with a higher global warming potential, will become more significant. Early action on these gases will help to minimise the overall cost of reaching a net-zero target.

For the energy sector, a key emission source is (and will continue to be) the fugitive emissions of methane, from the extraction of natural gas (including fracking) and the transportation of natural gas. This category of emissions has received relatively little attention to date, but there is evidence that it could be larger than previous assessments have indicated (for example, see https://pubs.acs.org/doi/10.1021/acs.est.8b03535).

We recommend an early review of the fugitive emissions of methane from production and supply for the UK.

Part 2: International Action

Question 3 (Effort share): What evidence should be considered in assessing the UK's appropriate contribution to global temperature goals? Within this, how should this contribution reflect the UK's broader carbon footprint (i.e. 'consumption' emissions accounting, including emissions embodied in imports to the UK) alongside 'territorial' emissions arising in the UK?

ANSWER:
In the electricity sector, it is particularly important that that we account for carbon emissions associated with the import of electricity through interconnectors. The carbon content associated with imports is particularly critical for the electricity sector because:-

- Electricity has exceptionally low transport costs (compared with steel, cement and similar sectors).
- The carbon cost is an exceptionally high proportion of total costs for electricity.
- The hour by hour variation in carbon content of total electricity generation is significant, which means that optimisation of the carbon content of the full range of generation sources is exceptionally important to cost-effective abatement

The carbon intensity of imported electricity will depend on a number of factors, including the landing location of the interconnection in mainland Europe. In addition, as the share of renewables grows, there is likely to be increasing correlation between UK and European generation mixes, due to the correlation of patterns of wind and sunlight in neighbouring countries.

Any analysis which excludes emissions associated with interconnectors could reach highly misleading conclusions. For example it could mistakenly suggest that the UK can achieve a very high level of decarbonisation in electricity sector simply by importing more, when in reality the UK could simply be exporting carbon emissions from electricity production.

Another risk is that excluding interconnector emissions could make certain technology or electricity mix choices appear significantly more attractive than a more comprehensive analysis would show, through a high reliance on imports which are erroneously assumed to be zero carbon. This point is especially important given that the UK's interconnection with the European continent is set to substantially increase over the coming decade.

We recognise that the CCC, in its own analyses, has acknowledged the relevance of this question. A number of options exist for accounting for carbon emissions from electricity imports. A simple option is to apply the annual average carbon intensity of the generation mix from the exporting country to the volume of power imported into the UK from that country.

More sophisticated and robust analyses would look at the time of imports and the electricity mix applying at that time – such data is available from sources such as electricity map (www.electricitymap.org) and could well further demonstrate that at times of high imports into the UK, the carbon intensity of imported power is often materially higher than the annual average of the source country.

We therefore encourage CCC to adopt a robust methodology for accounting for the carbon emissions associated with electricity imports and to recommend that this or similar approaches are adopted for all relevant analyses conducted by other energy sector stakeholders.

More generally, it is important for the UK to consider the risk of "outsourcing" of its emissions by shifting production outside the UK. If we consider the internationally agreed

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Greenhouse Gas Emissions Protocol, a proportion of China's scope 1 and 2 emissions are also our scope 3 emissions (to give just one example).

There are a number of ways in which an international perspective can help to find opportunities to reduce total global emissions. For example, data centres are intrinsically global and are best located in areas with a low carbon intensity electricity supply.

Question 4 (International collaboration): Beyond setting and meeting its own targets, how can the UK best support efforts to cut emissions elsewhere in the world through international collaboration (e.g. emissions trading schemes and other initiatives with partner countries, technology transfer, capacity building, climate finance)? What efforts are effective currently?

ANSWER:
International R&D projects are key enablers to leverage worldwide expertise and funding to promote and demonstrate new low carbon technologies and business models. Such innovations can help the UK deliver a net zero target over the long term.

As example of international collaboration, the EDF Research & Development division is structured around an international network of centres (France, UK, Germany, Italy, Singapore, China and US) that are key to the transfer of ideas and innovation through various collaborative projects. For instance, the EDF Energy R&D UK Centre is participating together with the EDF R&D German centre (EIFER) in different international projects, such as Sim4Block, a H2020 project involving 8 European countries to investigate the feasibility and the value of various Demand side response technologies and business models.

As part of this network, the EDF Energy R&D UK Centre is developing a concept of low carbon and affordable micro grid to address the issue of access to energy in remote areas, while supporting the transition from fossil fuel to renewable energy. A demonstrator project entitled MASERA (Microgrid for affordable and sustainable electricity in remote areas) has been built in Singapore with input from various specialisms within the EDF Group, including distribution network operations.

A key principle for international collaboration on emission reductions is that of a "Just Transition". As an example of the actions that can be taken in support of this, under the sponsorship of the International Labour Organisation, the EDF Group has concluded a worldwide Responsible Employer agreement with 13 trade union federations. The signatories support measures in favour of an energy mix compatible with the objectives of reducing carbon dioxide emissions.

Carbon Capture, Utilisation and Storage (CCUS) is a good example of a technology area in which international collaboration is likely to be far more effective than a series of independent, national initiatives (such as the abandoned UK competition for a pilot CCS scheme). This is because it presents not one but several major technical challenges, each of which requires a solution and integration into an overall process. We strongly recommend that international collaboration for CCUS is pursued by the UK.

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It is important that the UK works to ensure that international standards for biomass are developed to effectively reduce the lifecycle emissions of the fuel. These standards must take Land use, land-use change, and forestry (LULUCF) into account when assessing the emissions factors of biofuels, and should also require impacts on biodiversity, water quality and access to environmental justice to be respected in line with international agreements such as CITES, the ESPOO, and Aarhus conventions.

Question 5 (Carbon credits): Is an effective global market in carbon credits likely to develop that can support action in developing countries? Subject to these developments, should credit purchase be required/expected/allowed in the UK's long-term targets?

ANSWER:
To date, the global experience in the use of carbon credits has been very mixed, with a number of stakeholders questioning their effectiveness in reducing carbon emissions.

Carbon credits can only be a transitional measure as, ultimately, all economies will need to decarbonise. The level of commitment that is needed from every country to deliver the objectives of the Paris Agreement mean that the "headroom" in national accounts that allows the sale of carbon credits will no longer be available. This transitional nature, combined with a poor track record in delivery of actual carbon emissions, means that, in our view, the UK should not allow credit purchases in the delivery of long-term targets.

One option that has been mentioned in stakeholder discussions to accept the use of carbon credits to secure agreement on a tighter/earlier UK carbon reduction target. In our view, if this were to come down to a choice, it would be better to have a less onerous reduction target that is based solely on UK actions only. A target based only on UK actions will provide greater certainty of the emissions reductions that will actually be delivered.

In contrast to carbon credits, the mechanism of international carbon trading, combined with effective carbon pricing, is a proven mechanism that can deliver emission reductions cost-effectively.

Part 3: Reducing emissions

Question 6 (Hard-to-reduce sectors): Previous CCC analysis has identified aviation, agriculture and industry as sectors where it will be particularly hard to reduce emissions to close to zero, potentially alongside some hard-to-treat buildings. Through both low-carbon technologies and behaviour change, how can emissions be reduced to close to zero in these sectors? What risks are there that broader technological developments or social trends act to increase emissions that are hard to eliminate?

ANSWER:
In the energy sector there remains the challenge of achieving energy efficiency and reducing carbon emissions in "hard to reach" buildings, which are classified as such either

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due to their lack of proximity to the electricity distribution grid or due to the vulnerability of the consumer. At present, the cost to install measures such as heat pumps at these properties is usually prohibitive for the consumer, especially when compared to fossil fuel alternatives, such as gas or oil. In response, and as the electricity supply is progressively decarbonised, Government needs to address the balance of subsidy costs, so that a greater share is raised from gas supplies and a lower proportion from electricity. This would reduce total emissions, as well as support the 'polluter pays' principle.

EDF Energy supports partnership working on community energy projects which bring added value to energy consumers and communities. A potential benefit of community projects is that multiple objectives can be achieved by bringing together different organisations and aligning their objectives. Through the Energy Company Obligation scheme, we have experienced the value of establishing effective partnerships between energy suppliers, energy services providers and local authorities. This can help to target energy efficiency measures and emerging technologies toward those most in need. Partnership working should deliver projects in a manner that is cost effective to ensure that they do not impose additional or unnecessary costs on other consumers. Such projects can offer an effective means of engaging with vulnerable and hard to reach householders.

The key barriers in establishing local involvement will be the limitations of resource and capability within local authorities and communities. Clear support from central government is required to ensure local government bodies have not only the funding to resource initiatives but also the national direction. Much of the latter could be set through the National Planning Policy Framework to ensure planning authorities are utilising planning and development plans to incentivise and enforce action on energy efficiency and renewable alternatives.

Government should reform existing planning and building regulation to ensure that developers are actively considering energy efficiency within new developments and major refurbishments. For instance, there may be scope to ensure funding is made available through requirements under Section 106 agreements. These agreements require the developer to provide a percentage of affordable housing, but this could be extended to include a percentage of energy efficiency improvements in the local area of the proposed development. This could particularly be targeted, again through partnership working with public sector bodies, to those most in need.

Question 7 (Greenhouse gas removals): Not all sources of emissions can be reduced to zero. How far can greenhouse gas removal from the atmosphere, in the UK or internationally, be used to offset any remaining emissions, both prior to 2050 and beyond?

All techniques for greenhouse gas removal from the atmosphere that have been identified so far have very high costs per tonne of carbon removed, along with major challenges that are specific to that technique. For example, sequestration through forestry and agriculture has a fundamental constraint of available land for use solely for this purpose. Direct Air Removal of carbon dioxide remains technically unproven.

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Given the major uncertainties in the feasibility and affordability of greenhouse gas removal, the emphasis must be on the reduction of emissions at source. There is no credible evidence yet available that greenhouse gas removal will ever be feasible at the mass scale required, whether prior to 2050 or beyond. It is likely that there will be a need for some degree of greenhouse gas removal in the long term to achieve net zero, but it is essential to keep this to an absolute minimum.

Bio-energy with Carbon Capture and Storage (BECCS) has the potential to deliver negative emissions in some scenarios; however, it is important that the contribution that BECCS makes to emissions reduction is accurately assessed. This means that complete lifecycle emissions of this technology must be considered, especially Land Use, Land Use Change and Forestry contributions, in order to ensure that efforts to decarbonise the economy do not inadvertently incentivise deforestation or drive biodiversity loss (in the UK or abroad).

As well as the impact that BECCS has upon existing forests' ability to sequester CO2 and the delayed contribution to CO2 sequestration made by replacement forest, the wider socio-environmental impact of a significant increase in demand in the commercial forestry sector that would develop in response to widespread adoption of BECCS should be assessed. The impact upon the availability and price of food crops both globally and domestically should also be considered carefully in developing UK and international policy on BECCS. The Government's policy of requiring developments to deliver 'environmental net gain' should be applied to BECCS projects, commercial forests, and their supply chains to ensure that ostensibly sustainable projects and technologies do not inadvertently cause environmental harm.

Question 8 (Technology and Innovation): How will global deployment of low-carbon technologies drive innovation and cost reduction? Could a tighter long-term emissions target for the UK, supported by targeted innovation policies, drive significantly increased innovation in technologies to reduce or remove emissions?

ANSWER:
Investment in strategic R&D programs is one of the key elements to achieve significant cost reduction in low carbon generation technology. Tighter emissions targets for the UK, if coupled with increased funding for R&D programs, could drive reductions in costs for innovative technologies, with the following examples.

Batteries: Past investment in battery storage technologies, mainly for the mobility sector, has driven significant cost reduction during the last years, leading to new innovative chemistry options that are cheaper with a higher performance.

Nuclear: Nuclear energy plays an important role to help curb greenhouse gas emissions and meet the increasing energy needs of future generations. Nuclear fusion is a new experimental technology with the goal of developing a safe and abundant sustainable energy source. The ultimate challenge for fusion research is the demonstration of electricity generation from magnetic confinement fusion by 2050 and the European Commission has developed a partnership with a consortium of fusion laboratories from all

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EU Member States and Switzerland. Under the Horizon 2020 Programme, the EU will provide support for the implementation of a comprehensive Joint Fusion Programme, which includes education and training as well as an integrated industrial policy in addition to basic fusion research. It would be essential for UK, after BREXIT, to continue to be part of this European Programme, by coordinating the research carried out by UKAEA on this field with the aim of positioning the UK as a leader in sustainable nuclear energy.

Offshore Wind: The offshore wind industry has moved from an emerging status, with 0.7 GW cumulated European capacity in 2006, to a significant source of generation, with 12.6 GW of cumulated European capacity in 2016. In the last 15 months, costs of Offshore Wind project to be installed by 2020-2025 have dramatically decreased and the industry will continue to mature and evolve in the future. Targeted price for 2018 projects are now as low as 60 €/MWh. This has been driven by positive feedback between innovation, increasing deployment and cost reduction.

Digital Technologies: The use of emerging digital technologies, such as artificial intelligence and blockchain, have the potential to enable a higher performing low carbon energy system and consumer behaviour change. For example, blockchain can form the foundation of peer-to-peer systems in which consumers or business trade spare renewable energy, flexibility or stored electricity. Equally, Artificial Intelligence can be used to optimize consumers' use of energy in the home, leading to effortless sustainable behaviours. EDF Energy is actively working in these areas.

Electric Vehicles: The development of electric mobility, using low carbon electricity, is key to the future reduction of GHG emission, as the transport sector is one of the main sources of carbon emissions. In October 2018, EDF Group launched a mobility plan to emphasis its effort in this field and objective of driving the electrification of transport. This will go through development of the charging infrastructure, the management of the charge, development of the battery technologies and deployment of solutions for mobility as a service.

Electric mobility can not only reduce transport emissions but will also support the energy system, through smart charging and vehicle to grid (V2G) supply. V2G, for which EDF Energy R&D UK Centre leads an Innovate UK demonstrator in Oxford (V2GO), supports the integration of renewables and the decarbonisation of grid electricity by providing Demand Side Response (DSR) services.

Hydrogen: The use of hydrogen has great potential for decarbonising a number of the "hard to reduce" sectors, alongside widespread electrification. We welcome the findings and recommendations in the recent CCC report on hydrogen.

Question 9 (Behaviour change): How far can people's behaviours and decisions change over time in a way that will reduce emissions, within a supportive policy environment and sustained global effort to tackle climate change?

ANSWER:
Based on our experience over the last two decades in engaging with customers, one of the key foundations for behaviour change is regulation. Regulation builds on early voluntary actions that reduce emissions and "locks in" initial innovations. However, it is important to

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allow sufficient time for consumers and businesses to prepare and adjust, so an early signal of policy intent is essential, followed by regulation.

Recent examples of this approach are the Government's decision to end unabated coal generation in the UK by 2025 and its commitment to end the sale of all new conventional petrol and diesel cars and vans by 2040.

The move away from fossil fuel heating is an example of an area that will need regulation to drive long term change, with a clear policy signal up front. A long term signal from Government on ending the installation of fossil fuel heating will start to drive investors to cleaner alternatives. EDF Energy would agree with any approach that prohibited new installation of high carbon fossil fuel heating systems (oil and coal), but with an implementation date that sets a reasonable period of transition for both consumers and the supply chain. Given that the move away from gas central heating is a more sizeable challenge and a significant cultural shift for many, a longer timescale for any such move will be needed. This could take the form of strict emissions performance standards on the installation of new or replacement heating systems. An important step forward has already been taken through the introduction of the Boiler Plus standards.

Another appropriate action would be to place requirements on manufacturers to improve the efficiency of products and on installers to ensure additional energy efficiency measures are also provided. This will help to improve the efficiency of heating systems at a household level, rather than just an individual product level. Continuing to introduce standards over time should allow consumers and supply chains to adjust and avoid any cliff edge impacts.

Clear regulatory signals would in time support the only proven and scalable approach to decarbonising heat: electrification. In the short to medium term, the main technology choice for reducing heating emissions from off gas grid properties is the installation of heat pumps. This represents a low-regret approach and installation rates should be scaled now so that the supply chain can further develop. The significant uplift in demand for electricity that this will generate can increasingly be used in combination with smarter technologies and battery or thermal storage.

In all areas consideration should be given to use of heating networks whenever it is possible to develop large scale heat production from renewable and/or low carbon sources. This should be reflected in planning policy to ensure a consistent approach. However, as with many heating networks, the key barriers for district heating networks are the upfront capital costs and the level of initial "seed" demand required to make a project economical. The funding and support provided to potential projects through the Heat Network Investment Project and the Heat Network Delivery Unit are welcome and should continue while the market for district heating in the UK is still developing.

Government should reform existing planning and building regulation to ensure that developers are actively considering energy efficiency within new developments and major refurbishments. Equally, designing efficient heat distribution systems in new buildings (i.e. low temperature profiles) is critical to maximise energy efficiency in general and the performance of heat pumps. This will then need to be enforced through a clear national framework that incentivises local authorities to set and meet targets on energy efficiency and decarbonisation within new builds.

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Air and ground source heat pumps present both spatial and aesthetic challenges to developers and home owners, which can make them a less appealing option. The appropriate use of Building and Planning Regulations can help to overcome this through enforcing the need to pursue energy efficient and renewable measures.

Question 10 (Policy): Including the role for government policy, how can the required changes be delivered to meet a net-zero target (or tightened 2050 targets) in the UK?

Our parent company, EDF Group, the world's second biggest electricity producer, has confirmed a goal of pursuing carbon neutrality by 2050. France is working on a national low carbon strategy that aims to achieve neutrality in 2050.

In keeping with this, in early 2018, EDF Group made the commitment to reduce the CO2 discharged into the atmosphere from 51 million tons in 2017 to 30 million tons by 2030 (direct CO2 emissions). This programme involves closing down carbon- and oil-fired power plants and further developing renewable generation capacity. The Group's CO2 emissions are well below those of other electricity producers, and are steadily declining. After passing under the 100 g of CO2/kWh (direct emissions excluding the life cycle analysis of generating plant and fuel) mark in 2015, EDF Group's specific carbon emissions delivered the figure of 82 g/kWh in 2017. The Group's carbon intensity is now six times lower than the sector's average worldwide.

As the UK's largest low-carbon energy generator, EDF Energy has committed to have a carbon intensity from our electricity generation ahead of the UK's 2050 targets. This has resulted in a carbon intensity of our electricity generation to 94g CO2e/kWh in 2017, which is in line with our forecasts through to 2030 as our generation fleet evolves.

In line with our own commitments, we support in principle the tightening of the UK's climate change targets in line with the Paris Agreement and the latest evidence on climate science. We support a UK target of net zero as a long term goal, but we do not think that there is sufficient information available yet to fix a target date to achieve this. The setting of new targets must be based on a thorough consideration of the relevant evidence.

That consideration should take account of the fact that the whole of the world economy will eventually need to achieve a net zero balance of carbon emissions in order to deliver the goals set out in the Paris Agreement. The economies that can achieve net zero earlier should not hold back.

In this context, a net zero target could help the UK to retain its current position of international leadership on climate change policy and to position itself to maximise the economic opportunities.

Setting a net-zero target would provide a long term market signal in support of zero or negative emission technologies, as opposed to those that can merely deliver lower emissions than existing technologies. Lower emission technologies can make significant contributions to 2030 carbon reduction targets, but will not be sufficient to the deep decarbonisation required for 2050 targets and net zero. To deliver net zero across all sectors, the electricity sector must be fully decarbonised. We would highlight that, to

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deliver a fully decarbonised electricity system at least cost, a substantial contribution from nuclear power will be needed.

We consider that carbon pricing and other market-based mechanisms, applied where appropriate, are the most efficient mechanisms for driving reductions. A consistent long term carbon price signal has been an important driver of UK power sector decarbonisation to date and will have a key role to play in providing a market-based signal for the wider decarbonisation of the UK economy.

We note that the 4th and 5th UK Carbon Budgets have been excluded from the scope of advice sought from the CCC. Nonetheless, we recommend that, if a tighter long-term target is set for 2050, then the CCC should set out emission reduction pathways to deliver the new target and these pathways should include the reductions required over the timescales of the existing carbon budgets, which may need to be over-achieved.

Delivery of a net zero target will require the electricity sector to be completely decarbonised, given that there will be remaining "hard to treat" sectors, that cannot completely remove CO2 emissions. The UK electricity sector is already committed to delivering a very low carbon intensity by 2030, but not net zero. One effect of a UK net zero target at a future date will further increase the urgency for the earliest possible complete decarbonisation of the electricity sector.

Another effect of a net zero target will be to focus far more attention on the "hard to treat" sectors, bringing forward the date when these will need to implement more profound measures to reduce carbon emissions, rather than the limited incremental changes made to date.

Part 4: Costs, risks and opportunities

Question 11 (Costs, risks and opportunities): How would the costs, risks and economic opportunities associated with cutting emissions change should tighter UK targets be set, especially where these are set at the limits of known technological achievability?

ANSWER:
As foundation for decarbonisation of the whole economy, the UK must find a solution that delivers reliable, affordable, low carbon electricity. Our analysis suggests that a diverse mix of renewables and nuclear, combined with a limited role for gas, offers the best solution. The UK should make the most of the potential of renewable technologies (principally onshore and offshore wind and solar), which could provide up to 60% of electricity demand by the mid-2030s. This should be complemented by nuclear power, providing reliable low carbon power which is not dependent on the wind blowing or the sun shining, and could provide around 25-30% of electricity demand.

The need to deliver a balanced, stable and reliable generation mix must underpin all decisions on the support for the development and deployment of low carbon electrical technology. The extent to which Government should support specific technologies or pursue a 'technology neutral' approach should be considered against this overarching objective, with Government using Value for Money assessments which take account of "whole system costs", including requirements for back-up generation and grid infrastructure.

Question 11 (Costs, risks and opportunities): How would the costs, risks and economic opportunities associated with cutting emissions change should tighter UK targets be set, especially where these are set at the limits of known technological achievability?

In particular, Government should ensure that it does not support technologies to the extent that they produce too much of their power when it is not needed, leading to excessive costs of managing intermittency of generation. Our analysis shows that maintaining a balanced mix of the intermittent renewable technologies (rather than allowing one to dominate) substantially reduces the rate at which system costs increase with their deployment.

The IPCC report on 1.5 degrees clearly establishes the need to accelerate decarbonisation. To deliver tighter UK targets at the least cost to the consumer, it is essential that the full range of available low carbon technologies is deployed. This includes onshore wind, which is currently excluded from support under the low carbon Contract for Difference (CfD) support scheme, despite being one of the lowest cost technologies and immediately available for further deployment. We recommend that onshore wind is included in future auctions for low carbon CfDs as an immediate action to underpin tighter targets.

As well as enabling low cost, low carbon technologies, it is equally important that all sources of carbon emissions are subject to a consistent carbon price. For example, the use of natural gas for domestic heating is not subject to a carbon price (in contrast to the electricity consumed by the same households) and is a priority for early action to reflect its full cost.

The experience of the power sector over the last 20 years has been that innovation can deliver new, cost-effective techniques and technologies to reduce emissions. Initially, these technologies are often considered to be at the limits of technological achievability, but have ultimately delivered low cost, low emission options. Of course, not every emerging technology will be viable, which emphasises the need for diversity in promoting innovation.

Examples from the power sector of technologies that have developed all the way from high cost concepts through to low cost mass production include onshore wind, offshore wind and solar. A key driver for this innovation and transformation has been an early pressure on the power sector to decarbonise ahead of other sectors.

Consequently, setting a tighter UK target does not necessarily increase costs and risks and is very likely to provide substantial economic opportunities by driving innovation. However, it is essential that there is strong and enduring commitment to any target for this to pull forward innovation and development.

Question 12 (Avoided climate costs): What evidence is there of differences in climate impacts in the UK from holding the increase in global average temperature to well below 2°C or to 1.5°C?

ANSWER:
Climate impacts will vary depending on the specific hazard under consideration. Currently, the main natural hazards with robust evidence for differences between the 1.5 degree and 2 degree scenarios are:

- Air temperature - factor of 2 difference for hot extremes in summer (increases of up to 3 degrees C), factor of 3 difference for hot extremes in winter (increases of up to 4.5

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degrees C);
- Sea level rise - global sea level rise will be 0.1 m less under 1.5 degrees C compared to 2 degrees C increase, also a reduced chance of sea level acceleration from sea-ice melt;
- Precipitation/drought - reduction in the severity and frequency of intense precipitation and droughts under 1.5 degrees C as opposed to 2 degrees C increase.

There are likely to be changes in the intensity and frequency of other hazards (e.g. wind, storminess, wave climate), but currently there is not as robust evidence of the differences between the 1.5 degree and 2 degree increases.

Changes in the intensity and frequency of any of these hazards is likely to have an impact on people and infrastructure. Increases in summer and winter temperatures are likely to put more strain on the grid during the summer but maybe less during the winter (although it should be noted that when temperatures are colder than average in winter, they may be more extreme, i.e. colder than previously). Sea level rises are likely to disrupt coastal communities and cause issues to coastal infrastructure. Changes in the amount of precipitation and the likelihood of drought is likely to lead to water resources issues in the future.

At a UK scale, we welcome the recent release of the UK Climate Projection 2018 (UKCP18), which considers these hazard categories and quantifies them at a UK scale.

Part 5: Devolved Administrations

Question 13 (Devolved Administrations): What differences in circumstances between England, Wales, Scotland and Northern Ireland should be reflected in the Committee's advice on long-term targets for the Devolved Administrations?

ANSWER:
We do not have any information on differences in circumstances between England, Wales, Scotland and Northern Ireland. We would like to emphasise that the importance of consistency of policies across devolved administrations, even if it is appropriate to set differing targets. Without consistency, there is a significant risk of market distortions and unintended outcomes.

Part 6: CCC Work Plan

Question 14 (Work plan): The areas of evidence the Committee intend to cover are included in the 'Background' section. Are there any other important aspects that should be covered in the Committee's work plan?

ANSWER: We have no comment to make on this question.