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CCC call for evidence: 'Building a zero carbon economy'

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Introduction

RWE stands for security of energy supply and provides flexible, firm capacity, making it a key partner to enable the UK to transition to a low carbon electricity future. We are the UK's second largest generator, supplying over 10% of the UK's electricity with over 8.5GW of installed capacity. The portfolio includes the UK's largest fleet of gas-powered stations, along with some coal and a small amount of biomass. Our sites are located across England, Wales and Scotland and the business provides around 1,600 highly skilled jobs in the UK.

The need for all countries to reach net zero is underlined by the recent IPCC report, which suggests that in order to limit global warming to 1.5 degrees, global emissions would need to reach net zero by around 2050; or in the second half of the century, if it is to be limited to 2 degrees.

With the Climate Change Act, which celebrated its 10 year anniversary on 26 November 2018, the UK demonstrated leadership in tackling climate change by setting legally binding, challenging emissions reduction targets. Arguably, the UK has set itself the most challenging targets in terms of emissions reductions which could be seen as setting an example to other countries.

In deciding when to reach net zero emissions, the UK will need to take into account a range of factors, including the costs, risks and opportunities arising from setting deep and far-reaching emissions targets across all sectors. Any target to reach net zero should also be kept under review, in light of significant change in circumstances.

In the power, we would observe that the UK has already been very successful in dramatically reducing emissions, and that further significant reductions are foreseeable. As set out in the recent study by Eurelectric 'Decarbonisation Pathways',[1] it is possible to achieve carbon neutrality in the power sector across Europe, by 2045.

The biggest challenges for achieving net zero remain in heating, industry and transport (including aviation). For these sectors, to meet the UK's existing target of 80% reduction by 2050 will be a major challenge. Very careful and detailed consideration of the costs and benefits of different measures will be required to determine how and when the UK should strive to reach net-zero emissions across the whole economy. The aforementioned Eurelectric study found it is possible to achieve up to a 95% reduction in emissions across Europe, by 2050, but to do so requires an in-depth electrification of the whole economy (with more than 60% electrification of final energy consumption) based on a 'cost breakthrough' which assumes accelerated cost reductions for a range of technologies including renewables, nuclear, CCS and storage (although these measures mainly create emission reductions in the energy sector). The specific circumstances of the UK will need to be weighed up when considering the UK's contribution to EU-wide target for 2050 (notwithstanding Brexit).

A further important factor to consider is whether there are commensurate efforts by other countries to reach net zero. Going it 'alone', and setting too ambitious a target for the UK without the right international framework in place, could be harmful - more stringent targets might simply cause industry to migrate to cheaper locations with higher carbon emission intensities. Therefore, it is vital that efforts to tackle climate change are done so within an appropriate international framework, i.e. a global emissions trading scheme. In the absence of coordinated global action, a mechanism is required in order to protect against such 'carbon leakage' to avoid unintentional negative consequences.

[1] The summary report was published in November, available here, building on a more detailed study published in May 2018, here.

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Any target for achieving net zero emissions in the UK should therefore be contingent on commensurate effort from other countries, with consideration of the international framework. Unilaterally setting a net zero target now, would further demonstrate UK's leadership in this area, but there is a great risk to the UK economy if it rushes too far ahead of adjacent trade and interconnected markets.

We limit our responses to the areas where we have specific expertise.

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?

As with the development of any policy measure, the assessment of the UK's appropriate contribution to global temperature goals needs to take into account feasibility, benefits and costs. For the electricity sector, this includes consideration of security of supply and affordability for consumers as well as the implications for other policy areas – for example, the benefits of improved air quality resulting from increasing electrification of e.g. transport.

Consumption emissions accountancy can help to ensure that the impact of policy measures are fully understood when decisions are taken and that measures are optimised in terms of overall impact beyond a purely territorial perspective.

For the electricity generation sector, interconnectors play an increasingly important in the UK electricity system. Currently the UK imports ~6% of its electricity from Europe, but in the coming years imports are expected to increase significantly. For example, in some National Grid "Future Energy Scenarios" electricity imported through the interconnectors can be as significant as generation from UK gas-fired power stations, potentially without any indication of the actual carbon emissions relating to those imports. Therefore the implications of increased electricity imports for our broader carbon footprint should be understood, alongside territorial emissions accountancy.

In the UK, there is also a need to ensure that the management of carbon budgets across the Devolved Administrations drives a co-operative optimum UK outcome, rather than simply reducing emissions in an individual Devolved Administration at the expense of another. From a UK electricity system perspective, it is clearly important that when dispatchable plant is required then the most efficient, lowest carbon plant is deployed, and that the policies of individual Devolved Administrations do not act as a disincentive (see Q13)

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?

Emissions trading offers significant advantages over other initiatives:

- Agreed caps on emissions provide certain environmental outcomes;
- The ability to trade allowances ensures that emissions are reduced at least cost to the economy;
- Emissions trading results in a common international price for carbon which reduces the barriers to efficient trade and ensures effective competition in international markets;
- Emissions trading ensures that capital is channelled toward efficient investments in emissions reduction technologies and processes;
- The financial burden for reducing emissions can be shared equitably between different countries and emitters through the process for agreeing caps and allocating allowances.

Emissions trading is an essential complement to other initiatives based on partner countries, capacity building and climate finance. Emissions trading provides the means, the funds and efficient incentives to invest in reduction technologies where it is effective and efficient to do so.

Ongoing membership of the EU Emissions Trading Scheme (EU ETS) – currently the largest international market – is an essential pre-requisite to the UK providing this leadership on carbon markets. The ETS has successfully reduced emissions across 28 member states and has proven the concept

for the fundamental building blocks of emissions trading: effective monitoring reporting and verification; efficient allowance allocation and auctioning; and liquid traded allowance markets.

Post Brexit, the UK has indicated that it will consider developing a UK emissions trading scheme which is linked to the EU ETS. While a UK ETS successfully linked to the EU ETS would be a satisfactory outcome, we would note that:

- The UK government cannot be certain to conclude a linking agreement with the EU;
- The probability of successfully negotiating a link to the EU ETS reduces in proportion to any divergence in the design of the UK ETS from the EU ETS;
- The UK has recently negotiated Phase 4 of the scheme to achieve an effective compromise package with the other 27 Member States which suggests the scope for further beneficial re-negotiation and a successful link is going to be limited;

There is very little practical scope to negotiate links between UK and other international ETS schemes. Given the uncertain delivery and the limited scope for improvement, a UK ETS linked to the EU ETS therefore remains a distant second-best solution. By contrast, remaining in the ETS provides a far more certain means to deliver the UK's climate ambition.

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?

International linking and credit purchase should be required, expected and allowed in meeting the UK's long-term targets whether the UK remains within the framework of the EU ETS or pursues an alternative UK scheme. Internationally linked schemes give the best chance of delivering the ultimate objective – the reduction of global emissions – at the lowest possible cost to the UK economy. As we approach carbon neutrality, there will still always be some residual sources of emissions and a trading system which allows these to be offset from carbon removal or storage projects elsewhere will be essential. Credit purchase should therefore not just be expected and allowed to deliver long-term reduction targets efficiently, it is a necessary component of any long-term UK reduction programme out to 2050.

The UK should support efforts to develop an effective global market in carbon credits in line with the architecture provided under Article 6 of the Paris Agreement. The agreement provides the building blocks to facilitate the linkage of national schemes and the development of project-based crediting schemes. Many countries and regions have also already adopted carbon trading schemes and there is increasing interest in linking those schemes and providing the ability to offset obligations in those schemes with credits from emissions reduction in other jurisdictions. The UK can provide leadership in this area, both in supporting the development of the Article 6 rules and in leading from the front by ensuring that the UK is open to linking with other schemes and using international credits.

The UK should remain in or closely linked to the EU ETS to further evidence this leadership on carbon trading. The EU ETS has already amply proved how an effective global market can support massive investment in projects in developing countries. The Clean Development Mechanism (CDM) has led to investment of more than $330 billion in 8,100 projects across 111 developing countries and the reduction or avoidance of over 2 billion tonnes of carbon dioxide. This success was driven by demand for credits in the EU ETS during Phase 2. While the use of international credits is currently restricted in the EU ETS given concerns about the lack of market scarcity, an increase in ambition during Phase 4 and further efforts towards neutrality beyond 2030 should be accompanied by the reopening of the EU ETS to credits from other linked schemes to ensure that the increased ambition can be delivered at the lowest possible cost to the economy.

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?

We would agree that it will be extremely difficult to reduce emissions to close to zero in these sectors. We would make the following observations:

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Aviation:
Improvements in IT technology are already facilitating improved virtual / online meetings and are reducing the amount of business travel. In addition, in the aforementioned Eurelectric study 'Decarbonisation Pathways', synthetic fuels (produced via H2-electrolysis with low-carbon electricity or from biomass) could also play a significant part in reducing GHG emissions from aviation.

Agriculture:
In addition, to changes in consumer habit and farm management practice, there is scope for solid and gaseous by-products to be utilised for heat, biofuel and chemical feedstocks thereby displacing fossil fuels. Technologies that could be significant in managing GHG reduction include: anaerobic digestion, gasification as well as biofuel production from crops or crop residues.

Industry:
Hydrogen produced via biomass gasification or from low carbon electricity, either in the UK or elsewhere, as well as direct electrification (see again Eurelectric study) could be important for UK industry to help in achieving a net zero emissions target. Harmonisation of strategy on zero carbon across traded goods will be important in driving lowest carbon production, innovation and lowest carbon technology. With increasing electricity interconnection between the UK and the EU, harmonisation of carbon pricing will be a critical driver towards near zero emissions across Europe. With time, global regulation will need to incentivise zero carbon in industries producing internationally traded goods.

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?

Technologies such as bioenergy CCS (BECCS) clearly have the potential to produce power and reduce greenhouse gases in the atmosphere simultaneously. However, it is important that this is used in the optimum way to move towards net zero. Currently, biomass is probably best deployed to effect quick carbon reductions in switching away from coal generation in power. However, for the future, it is expected that the most efficient biomass usage will be not in power but as a valuable feedstock when coupled with CCS to decarbonise industry, e.g. hydrogen production via gasification with CCS to effect reduction in difficult sectors and to reduce greenhouse gases.

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?

As the question implies, the magnitude of the challenge is global and one that the UK cannot resolve alone. However the quality of R&D in our universities, and supporting commercialisation in industry, could help drive innovation in new low carbon and carbon removal technologies. Furthermore it is not clear that bringing forward the UK's long-term target from 80% to net zero by 2050 would per se drive significantly increased innovation and, as implied by the question, any change in the target would have to be supported by government action for it to be meaningful.

Government policy would need to be structured to encourage networks of research and development, cooperation, and multi-national initiatives in order to deliver the innovation and cost reductions required to help meet that target.

However, it is worth remembering that the current 80% reduction target will also need these types of policy, as the current target is unlikely to be fulfilled without significant cost reductions against the status quo. The CCC should recommend that government look to leveraging the quality of R&D in our universities and industry regardless of whether or not the 2050 emissions target is tightened.

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?

Reaching net zero emissions (or close to net zero) in power will require the following:

- **Sufficient support for low-carbon generation, in particular onshore and offshore wind.** Currently onshore wind does not have a route to market, and it is very difficult to see how fur-

ther deployment of this technology will materialise, without some form of support, e.g. a market stabilisation mechanism;

- **Ongoing implementation of the Capacity Market - i**t is an important component of the policy framework as a means to appropriately remunerate firm, flexible capacity that is required to 'back-up' intermittent renewables;

- **CCUS -** could have a significant role in industry and RWE welcome the UK government plans to consult on the barriers to CCUS as set out in the recently published 'action plan'. Our ability to store carbon e.g. in the North Sea could be an advantage over other countries. In power, CCUS is unlikely to have a significant role. A very limited amount of unabated gas-fired power plant could remain on the system, running very few hours in a critical security of supply role - decarbonising these plants could have disproportionately high costs compared have little net gain in terms of carbon reduction;[2]

- **Biomass CCUS** – could be used as way of removing CO_2 from the atmosphere. However, as the CCC has noted, biomass is a finite resource, therefore we support using it for advanced processes with CCS, such as gasification (rather than CCS for converted coal plant). To date, gasification has not yet been widely used, but this use of biomass coupled with CCS could provide part of the solution to both carbon reduction/off-setting and as a source of hydrogen for a range of sectors.

- **Hydrogen** - production with low carbon could offer a means to decarbonise the gas infrastructure for not only existing power plants but also the 'hard to reach' sectors that have the highest carbon emissions: heating, industry and transport. The role of hydrogen in power will crucially depend on costs – it is likely that hydrogen production costs means it is best deployed in the difficult to reach sectors. Innovation and R&D to reduce production costs of clean hydrogen could significantly increase deployment and UK industry competitiveness with this fuel. The costs and benefits of a requirement for new gas turbines in power to be 'hydrogen ready' need careful consideration. Such turbines need to be as efficient as the state of the art gas turbine technology, otherwise they will operate with increased carbon (due to their lower efficiency) in the period before hydrogen is available.

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?

Setting ambitious targets now could drive investment and deployment in the UK and set an example to other countries. It could support the UK becoming a world leader in low-carbon technologies, such as offshore wind and CCUS.

However, going it 'alone', and setting too ambitious a target for the UK without the right international framework in place, could be harmful. We consider there to be a real risk that unilaterally tightening the UK's already ambitious decarbonisation objectives for 2050 might disproportionately increase costs to industry and commerce, causing migration of carbon intensive industries to locations with lower costs and higher emission rates. This would hurt UK industry and consumers at the same time as increasing global GHG emissions. Any tightening of targets must therefore be combined with measures to avoid export of carbon emissions if it is to have an overall positive effect. In the absence of coordinated global action, a mechanism is required in order to protect against such 'carbon leakage' to avoid unintentional negative consequences.

Regarding the potential economic benefits from UK leadership of key low-carbon technologies - realising these benefits would require targeted investment, which in itself is not driven by targets per se but by government policy and support. International co-operation, possibly led by UK organisations, could allow such leadership and share the likely huge costs for the development and demonstration of key technologies needed for zero carbon.

[2] In the Euereletric 'Decarbonisation Pathways' study, a small share (4-6%) of power supply from unabated fossil fuels remains on the system in 2050, which must be offset by CO2 reduction technologies to reach net zero.

We would highlight heat as a particular challenge and it is not clear how and when the UK will be able to reach net zero in this sector. To decarbonise heat would require moving excess zero-carbon energy production from summer to meet winter demand, which would require the development and deployment of seasonal storage at scale, which does not exist at present. When and how to achieve net zero emissions across the whole economy will be contingent on the development of seasonal storage at reasonable cost.

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?

Fundamentally, RWE do not believe that the Devolved Administrations should set their own carbon emissions targets, since regional targets could lead to carbon leakage by potentially setting regions against each other, rather than encouraging them to work collaboratively towards fulfilling the UK-wide carbon budgets.

Setting long-term targets on a regional basis has a high risk of creating perverse outcomes. The 4 Devolved Administrations are starting from different initial positions with regards to both absolute CO_2 emissions and emissions per capita, have different mixes of sectoral sources of those emissions based on the structure of their current economies and have different availability of natural resources such as locations suitable for renewables build.

Whilst the UK does have an overarching carbon emissions target in the form of the carbon budgets under the Climate Change Act, there is no mechanism to account for carbon leakage between the Devolved Administrations. Consequently there is no mechanism to value the relative costs and benefits of different carbon abatement measures in different regions. When advising the Devolved Administrations on how to meet the UK's long-term targets, the Committee should advise the Devolved Administrations to work together to meet the UK-wide carbon budgets. Any additional targets will increase the costs of decarbonising whilst having no benefit.

This response is non-confidential.