

The Fifth Carbon Budget - Call for Evidence: Response Proforma from the British Ceramic Confederation

Questions for consideration:

A. Climate Science and International Circumstances

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

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

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

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

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

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

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

The US and China have jointly made pledges for the period beyond 2020. The US has pledged a reduction of 26-28% by 2025 versus 2005, requiring a doubling of the rate of carbon reduction compared to 2005-2020 and on a trajectory to economy-wide cuts of the order of 80% by 2050. China has pledged to peak CO₂ emissions around 2030, and to make best efforts to do so earlier.

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

The science of climate change and associated risks extends beyond BCC's area of expertise and therefore we are not in a position to comment on the relative strengths and weaknesses of the IPCC 5th Assessment Report. Nonetheless, we believe the report paints a comprehensive picture of the scale of the global challenge and have no specific reason to question the suitability of the report as a key reference point for the CCC's analysis.

BCC support the cost-effective shift to a low-carbon economy as an essential response to the acknowledged challenge of climate change and believe the UK's energy-intensive industries (EIIs) are vital to this transition. The ceramic sector is a solution provider for the low-carbon economy, including highly durable products with low lifecycle carbon footprints and critical components for low-carbon energy generation and electricity distribution¹, such as: i) wear-resistant components (for heat pumps / wind turbine bearings), ii) heat-resistant components (used in the fabrication of solar photovoltaic panels) and iii) transducers (for smart meters, temperature and flow regulators).

¹ European Commission Staff Working Paper, Materials Roadmap Enabling Low Carbon Energy Technologies, 2011
https://setis.ec.europa.eu/system/files/Materials_Roadmap_EN.pdf

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

The timing of the CCC's advice to Government on the 5th Carbon Budget is unfortunate in that it is obliged to make recommendations before the outcome of the COP21 Paris talks can be fully analysed. Therefore, it may be prudent for the CCC to recommend more than one Budget option, possibly even a range, from which the Government could choose depending on the outcome of the talks.

With respect to the international context, we urge the CCC to be very careful in interpreting countries' pledges ahead of these talks. In particular, declared 'intentions' should not be confused with commitments to impose legally binding targets.

BCC members compete in global markets. Without genuinely equivalent efforts (in terms of emission reductions, timescale and enforcement) in all competitor economies, UK/EU companies will remain at a commercial disadvantage. In the absence of comparable efforts, full mitigation is essential to retain international competitiveness.

An immediate priority is retention of EU ETS carbon leakage status post-2020. If lost, this would have a serious impact on survival, competitiveness, jobs, growth and investment. BCC estimate that costs to UK ceramic manufacturers could be around €27 million² to £70 million³ per annum by 2030. Such costs would exceed profitability putting most producers out of business. There needs to be a general principle that state-of-the-art energy-efficient installations in all EII sectors need full carbon allowances in order to be able to compete internationally.

Many of our members are in the construction sector. In recent years, we have seen bricks and clay roof tile imports escalate rapidly to meet rising UK demand. Brick imports are now at unprecedented levels, reaching 22% of total sales in 2014. More investment in new UK manufacturing capacity is now needed. Whilst it is encouraging that one new plant has been sanctioned, for many companies, it remains difficult to justify investment in the UK given the plethora of energy and climate-related issues and costs.

UK EIIs already face a significant and growing comparative disadvantage in energy/carbon costs, which are being driven by unilateral UK/EU climate policies. It is possible that the 5th Carbon Budget may result in additional increases. In the light of this, and with the uncertain international situation, it is essential that the UK EII compensation package is extended to shield all businesses facing commercial

² Assuming a carbon price of €30 / tonne, output rising by 1% per year, including installations currently in the phase III UK small emitter scheme, 2014 prices and free allocation falling to zero in 2027 as in current ETS rules.

³ Assumptions as per footnote 2, except using a carbon price of £77.66 (in real 2014 terms) taken from table 1: Updated Short-term Traded Carbon Values Used for UK Public Policy Appraisal, 2nd October 2014 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/360277/Updated_short-term_traded_carbon_values_used_for_UK_policy_appraisal_2014_.pdf

disadvantage. All of our members, (including some operating highly electro-intensive processes at temperatures >2000 °C) are completely uncompensated for the indirect costs of EU ETS and the Carbon Price Floor (CPF). Higher UK electricity prices have already resulted in the loss of ceramic manufacturing, jobs and investment to elsewhere within Europe. Although BCC would welcome extending the list of sectors eligible for indirect EU ETS and CPF compensation, we advocate abolition of the CPF since, as a UK-only measure, it undermines the competitiveness of British industry as well as the effectiveness of EU ETS.

UK proposals on compensation for the cost of renewables are likely to exclude all but a handful of our members (including some highly-electro intensive technical ceramics and refractories processes). Germany is currently compensating over 100 ceramic and kaolin/ball clay sites. Italian proposals include compensation for 140 ceramic sites including bricks, roof tiles, wall/floor tiles and refractories; none of which are being considered in the UK. Competitors in Austria and France are also going to be compensated. This places UK manufacturers at a competitive disadvantage within the EU; a matter which has not been adequately recognised in CCC's previous reports. We need a level playing field on carbon pricing, energy taxation, renewable subsidies, etc.

Over 2011-15, the Renewable Heat Incentive (RHI) has been funded through general taxation. We want this commitment to be retained and are deeply concerned that future funding may be achieved through the introduction of an additional UK levy on fossil fuel supplies (above EU ETS); a measure which would further impact the international competitiveness of UK industrial gas users.

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

The binding target to reduce EU greenhouse gas emissions by at least 40% below the 1990 level by 2030 (and more for EU ETS sectors – 43% vs. 2005 levels by 2030) is already extremely challenging, especially in the absence of similar commitments internationally. We note that the 2030 target marks a steep acceleration in ambition in that the 2020 target equates to a 20% reduction over three decades, whilst the 2030 target requires a further 20% in just one decade.

This level of ambition is extremely challenging given that the majority of measures using current technologies and which require little capital investment or exhibit commercially acceptable payback periods have largely been implemented in the sector already. In those instances where opportunities to invest in current technologies remain, measures to overcome capital constraints are needed. Asset life can be in excess of 40 years making the financial case for rapid emissions cuts very challenging.

The recent collaborative work by the eight most heat-intensive industries, Government and other stakeholders on the UK industrial 2050 Roadmaps⁴ shows the enormous challenges ahead to decarbonise and increase energy-efficiency whilst remaining internationally competitive. Major policy interventions will be required to bring about these decarbonisation pathways. We believe Government support is required to encourage both investment in current technologies as well as support for the development of a range of industrial breakthrough technologies.

Whilst we welcome the UK Roadmap, the cost models are insufficiently developed and considerable further work is required. The capital cost of some technologies has been significantly downplayed. Furthermore, many other significant costs were excluded from the calculations, such as the costs of: operation, energy, carbon, research / development / demonstration, writing-off of assets early and relating environmental costs. The total costs of low-carbon technology need to be cost-competitive otherwise they will not be developed or implemented.

Any decarbonisation targets for the sector need to be realistic, technically achievable, economically feasible and take the roadmap findings into account.

There should be no EU technology-specific targets for 2030. BCC supports the UK Government's position that Member States should be free to determine the mix of technologies to ensure their emissions commitments are met, at least cost.

⁴ Industrial Decarbonisation and Energy Efficiency Roadmaps to 2050
<https://www.gov.uk/government/publications/industrial-decarbonisation-and-energy-efficiency-roadmaps-to-2050>

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

The UK and EU's approach for legally binding mitigation targets has demonstrably failed to deliver similar binding commitments internationally. Most countries, including major competitors (China, USA, India, Russia, Canada, Australia, South America, Middle East, etc.) are not willing to make their mitigation commitments legally binding. Such countries are keen to retain the flexibility to determine the scale and pace of their emissions reductions.

Unilateral climate and energy policies create costs for EU / UK industry thereby leading to a risk of relocation to countries with less ambitious (or no) climate policy. The resulting loss of manufacturing not only costs EU / UK jobs but could also give rise to an increase in global energy use and emissions through the use of less-efficient production processes, more carbon-intensive electricity and greater transportation of goods. We must ensure that the UK is not simply decarbonising by deindustrialising.

B. The cost-effective path to the 2050 target

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

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

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

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

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

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

The Government has subsequently published various documents, including its formal response, as required under the Climate Change Act, and the National Infrastructure Plan. The Plan includes investments of around £100 billion in low-carbon power generation in the 2020s, in line with the scenarios from the EMR Delivery Plan that reach 100 gCO₂/kWh by 2030. It also has significant investments in offshore oil and gas and in the road network. This includes £15 billion of new spending on roads and around £50 billion on offshore oil and gas.

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

BCC has consistently supported the long-term goal of cost-effective decarbonisation measures. The UK Roadmaps are valuable in that they identify potential carbon abatement options, barriers to deployment, strategic conclusions and potential next steps, but (as noted in Q3) lack a rigorous, full analysis of the likely costs. A similar calculation in the European Ceramic Sector Roadmap⁵ indicates that the extra costs are prohibitive. We are happy to work with CCC to ensure you have more comprehensive cost estimates, should the UK sectoral roadmap cost models remain underdeveloped. Decarbonising EIs requires a similar scale of challenge to that for the electricity sector. To do so whilst retaining international competitiveness will require Government and industry to work in genuine partnership.

Achieving further energy / carbon savings will require major, long-term investment in new plant. Realising greater energy and carbon-efficiency is intimately linked to policies that improve the investment environment. Government has a key role to play by easing access to affordable capital, funding improvement grants, extending investment / capital allowances, incentivising self-generation and supporting the 'scrapping' of less efficient plant before it has fully depreciated.

It is also clear that meeting ambitious targets will require far greater investment in the development of breakthrough technologies. The high risks associated with investing in unproven technologies, the high level of resources required and the long timescales involved mean that individual companies or sectors are unlikely to act in isolation. Government support to incentivise technological breakthroughs will be vital. Key technologies with broad, cross-sectoral applicability include: fuel-switching to low-carbon fuels, electrification of high-temperature heat processes, further heat recovery developments and carbon capture for industry. We believe there is an increased role for Innovate UK and the Catapult Centres to foster closer links and ring-fence funding for low-carbon innovation in EIs. Given industry already contributes significant resources to Government through EU ETS allowances, energy/climate policies and other environmental taxation, we believe there should be a role for (at least) some degree of revenue recycling to support low-carbon development.

The CCC must also question the practicality and affordability of deep electricity decarbonisation targets by 2030. The UK has yet to start work on its two power sector

⁵ Paving the Way to 2050: The Ceramic Industry Roadmap
<http://www.cerameunie.eu/en/news/the-ceramic-industry-roadmap-to-2050>

"This scenario would be an extremely costly step for both capital and running costs. Under these circumstances, the European ceramic industry could not remain financially-viable and internationally-competitive. The capital cost of this option will be approximately €90 billion, assuming breakthrough technologies in electric kiln efficiency, the development of which will imply significant further costs. In addition, we estimate a cost of up to €40 billion for writing off plants before the end of their life and lost sales during downtime for plant modifications. Furthermore, the energy bill for a typical tile factory will most likely increase to about 2.5 times the current rate and the cost of biogas will be 2-3 times that of natural gas, even at current prices."

CCS demonstration projects and there are serious doubts about when (or even if) a contract might be signed to enable nuclear construction work to start at Hinckley Point. It is unclear therefore whether either technology will be deployable on any significant scale ahead of the 5th Carbon Budget period. To fund such ambitious power sector decarbonisation, electricity prices will rise significantly. Support for EIs will be essential to ensure bills remain internationally competitive.

The ceramic sector is currently gas-intensive, however electro-intensity will increase due to several demand drivers, including: i) electrification of heat, ii) fuel-switching to low-carbon fuels (gasification requires significant levels of power), iii) additional abatement requirements of the Industrial Emissions Directive and iv) increased deployment of heat recovery (and the movement of ducted hot air). In order to facilitate electrification of heat, decarbonised electricity will need to be cost effective. At current prices, using electricity (where it is technically possible to do so) entails a four to five fold increase in energy costs and the differential is rising as the grid decarbonises. As noted in Q2, the ceramic sector receives little benefit from the EI compensation package. Unless Government's approach changes, electrification of high-temperature heat is impossible as an economic solution for the foreseeable future.

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

In recent decades, the UK ceramics industry has invested heavily in measures to improve energy/carbon efficiency. The majority of proven energy-saving measures which required less capital investment or had commercially acceptable payback periods have now been implemented. Further gains are incremental or are dependent upon significant capital investment in current technologies or the development of breakthrough technologies.

Investment decisions are based on wider business considerations such as sustaining production, extending plant life, labour savings (robotics), waste reduction as well as savings from energy / carbon efficiency. Often, such decisions are made within multi-national organisations, such that UK projects have to compete internally for limited funds with core business projects overseas.

BCC appreciates that the CCC is obliged to propose a Carbon Budget based on domestic emissions production. However, this approach ignores the carbon embedded in imported goods. The UK is consuming an ever increasing amount of goods and this is increasing emissions elsewhere. BCC believe that a consumption-based methodology would provide a more realistic picture of the UK's actual emissions performance as well as providing a more level playing field for manufacturers. At the international level, consumption-based reporting in the UK may encourage other countries to follow suit and could provide an incentive for manufacturers in countries where there is little climate-related legislation to improve their environmental performance so as to remain competitive in their (UK / European) export markets. The UK must avoid meeting its carbon targets by offshoring state of the art, energy-efficient EILs. The objective should be economically sustainable decarbonisation, not de-industrialisation. We believe that the CCC should give serious consideration to expressing the Budget in terms of consumption of emissions.

In addition, when assessing the impact and contribution of ceramic products, we need to look beyond the production phase. The long lifecycle, durability and heat resistance of ceramics contribute to energy, carbon and resource efficiency over the entire lifetime of the product. Bricks⁶, clay roof tiles⁷ and clay drainage pipes⁵ have life spans in excess of a hundred years, with little or no maintenance and no end of life emissions. In flooring⁵, the expected lifetime of ceramic tile is 50 years, far longer than competitor materials. Specialist long-life refractories⁵ have the durability to outlive more conventional products, saving the emissions associated with manufacturing many times over. Tableware manufacturers and suppliers have also worked collaboratively to

⁶ Brick Development Association: Sustainability
<http://www.brick.org.uk/resources/brick-industry/sustainability/>

⁷ Clay Roof Tile Council: Quality Control
<http://www.clayroof.co.uk/quality-control.htm>

improve the energy-efficiency of manufacturing by reducing the firing temperatures and number of firing cycles required⁸. Policymakers need to take a lifecycle view of emissions. Without a policy shift to measure emissions based on the whole lifecycle rather than during production only, there is a danger that legislation will misguidedly drive consumers to either ceramic materials made in less environmentally-stringent countries or to other less durable products with higher annualised emissions. This approach would be detrimental both to the UK economy and global emissions.

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

The UK ceramic industry has already made significant efforts and it is becoming apparent that continued improvements of the scale called for will become increasingly hard as many of the easiest gains, the so-called 'low-hanging fruit', have already been taken. Further improvements will be dependent on significant capital investment or radical changes in technology. Although the economics for a given project will evolve over time, by 2032, it is anticipated that cost-effective options will have been deployed. The remaining options are likely to be exceptionally expensive.

⁸ The Energy Efficiency Strategy: The Energy Efficiency Opportunity in the UK, Strategy and Annexes, Case Study 2, pp 57
[Dudson / Endecka] "were able to launch the new range claiming a 79% reduction in carbon emissions and substantive energy savings compared to the production of an equivalent porcelain product."
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65603/6928-the--energy-efficiency-strategy-statistical-strat.pdf

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

The UK needs a long-term strategy that recognises the strategic economic benefits of maintaining energy-intensive sectors within the UK and the contribution they make towards an energy-efficient low-carbon economy. Given their importance to the UK economy, the vision should be to develop and grow the world's most carbon-efficient EIs. This will require open, ongoing dialogue and partnership between Government (various departments), industry and other stakeholders, such as technology developers / academics, trade unions etc. This EI strategy also needs to be linked to energy policy, environmental policy and other industrial policies (e.g. construction).

The ceramic sector is a capital-intensive industry with long investment cycles (plant typically has a lifetime of over 40 years). Consequently, long-term clarity on energy, climate, environmental and innovation policy is vital to underpin high-cost, long-term investments in new equipment and innovation required to deliver energy/carbon savings. Continuous alterations to policies and targets leads to uncertainty, deterring such investment and can render existing investments unviable. The implementation of current and future measures, such as the rules on EU ETS new entrants and allowance retention, must not hinder new investments, plant improvements and growth. A simpler, more transparent and consistent regime would be welcomed by our industry and would presumably reduce the bureaucratic burden for UK government.

As noted earlier, throughout all stages of the transition to a low-carbon economy, energy and carbon costs must remain internationally competitive. Manufacturing capacity cannot be maintained under a unilaterally high cost environment since this damages profitability and stifles investment.

Bioenergy feedstock (biomass, waste etc.) will become an increasingly sought-after commodity due to its ability to fulfil numerous uses, e.g. combustible fuel (heat, electricity, CHP, transport) and green chemicals manufacturing. Given the range of competing demands and the sheer quantities required, it is clear that there will be insufficient availability to service demand. Supply is also likely to be tempered by concerns regarding land-use change from forestry, food and feed. For large-scale deployment in low-carbon, industrial heat production (e.g. syngas gasification), a secure supply of competitively-priced, sustainable feedstock is critical. Without supply security for the duration of the asset life, the required investment will not occur; even if there is an economic case for fuel switching. The lack of purchasing power is acute for our members, especially SMEs. It is essential that scarce feedstock / land is prioritised by Government for 'best uses'. In the UK, most feedstock is currently burned to produce electricity since this has the fewest technical and regulatory barriers combined with the most financial support. However, this is an inefficient use, since efficiency of power-only use is approximately 35%. Bioenergy use should be limited to heat generation for energy-intensive industry in order to ensure optimal use of limited resources.

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

Longer term there needs to be greater emphasis in the NIP on electricity storage.

Gas will be required in cost-effective options at least in the short to medium term for industrial and domestic heating as well as back up for intermittent renewables. Therefore development of the gas network and ensuring adequate gas storage remains a priority too.

As noted above, barriers in the ceramic sector inhibiting fuel switching to low-carbon alternatives include feedstock availability, cost and land availability. Without a secure and affordable supply of bioenergy this decarbonisation option cannot be implemented.

B. Budgets and action

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

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

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

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

All UK ceramic businesses compete in fiercely competitive global markets. By their very nature, the international success of EILs is reliant on competitive energy/carbon prices and therefore EU/UK policies are required to achieve this. High unilateral UK energy prices or carbon prices cannot be passed through to our customers. Divergence in these costs relative to competitor nations is leading to: i) relocation of production, ii) loss of jobs / skills, iii) financial costs to Government (e.g. benefit payments, lost revenue to HM Treasury) and iv) the potential for net increases in global emissions. The current cost of energy and climate policy regime is extremely challenging for the UK ceramic sector and threatens company viability in the medium-term. Action on the following is urgently required if the sector is to retain an internationally competitive position: i) international agreement on greenhouse gas emissions with truly comparable burdens for competitor economies (or, in the absence of such an agreement, retention of EU ETS carbon leakage status for all ceramic sectors with full allowances for best performers), ii) early repeal or phasing out of the UK-only CPF (which is uncompensated for our sector) and iii) compensation from the indirect cost of renewables for all electro-intensive sites.

The existence of Carbon Budgets and the policy actions to which they give rise, are a deterrent to industrial investment in the UK generally and to EILs in particular. Rather than acting as a spur, the rising cumulative cost of climate change-related taxes and policies on UK energy bills acts now, our members tell us, as a barrier to investment, hampers international competitiveness and increases the likelihood of carbon, investment and job leakage. The need to promote energy/carbon efficiency must be balanced against the ability of manufacturing industry to pay.

Even where demand has increased for some products as the recession ends, it is proving increasingly difficult to justify investment in state-of-the-art energy efficient assets in the UK since higher costs and increased uncertainty render the business model less attractive compared to investments in other competitor economies (e.g. USA, Asia and some other EU countries).

Question 11 *What challenges and opportunities do carbon budgets bring, including in relation to your ability to compete internationally? What evidence do you have for this from your experience of carbon budgets to date?*

As stated above, in the absence of global action on emissions or full compensation to mitigate the effects, the policy actions that arise in order to meet unilateral Carbon Budgets directly undermine the ability of UK EITs to compete in global markets. This has directly affected jobs and investment in many businesses, which are often key employers in economically challenged communities.

BCC has identified several highly electro-intensive technical ceramic and refractory sites making energy-saving products that have recently relocated some operations outside the UK, with the loss of several hundred jobs, in order to benefit from significantly lower electricity costs elsewhere in Europe (such as France and Germany). UK sites remaining are being starved of further investment (even where sales are expanding) with investment instead being directed towards sites in countries where electricity prices are lower. In recent months, several other UK electro-intensive sites have had to rationalise their product range and make significant redundancies (up to 40% of the workforce in one case) as they can no longer compete manufacturing electro-intensive products in the UK. One such firm had recently invested in a state-of-the-art energy-efficient factory. We are concerned that more will follow and from a broader range of ceramic sectors.

Investment leakage is also evident across the sector. Investment in UK plants has been extremely limited over a number of years, however it is clear that investments are taking place in neighbouring countries outside the EU, particularly for those sectors in EU ETS. The cumulative impact of the EU/UK's energy and climate policies are imposing significant costs on the UK's energy-intensive industries which presents a major challenge to the viability of the sector.

Question 12 *What would you consider to be important characteristics of an effective carbon budget? What is the evidence for their importance?*

An effective carbon budget is one that is credible (i.e. technically feasible with current technologies), affordable and likely to prove politically tolerable throughout its duration and beyond. Assuming the ultimate objective is to address climate change and not simply to meet a unilateral national target regardless of the wider consequences, the most important characteristic of an effective carbon budget is its ability to reduce global emissions, rather than simply displacing UK emissions. Full costs need to be measured including the value of current businesses to the UK economy and its regions. A realistic proposal for adaptation by industry needs to be addressed explaining how costs will be covered as they cannot be passed through to customers without deleteriously impacting international competitiveness.

C. Other issues

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

- **Competitiveness** risks for energy-intensive industries over the period to 2020 can be addressed under policies already announced by the Government. Incremental impacts of the fourth carbon budget are limited and manageable.
- **Fiscal impacts.** The order of magnitude of any fiscal impacts through the 2020s is likely to be small, and with adjusted VED banding and full auctioning of EU ETS allowances could be neutral or broadly positive.
- **Fuel poverty.** Energy policies are likely to have broadly neutral impacts on fuel poverty to 2020, with the impact of increases in electricity prices due to investment in low-carbon generation being offset by energy efficiency improvement delivered under the Energy Company Obligation. Incremental impacts through the 2020s are likely to be limited and manageable through a combination of further energy efficiency improvement, and possible income transfers or social tariffs.
- **Security of supply** risks due to increasing levels of intermittent power generation through the 2020s can be managed through a range of flexibility options including demand-side response, increased interconnection and flexible generation. Decarbonisation of the economy will reduce the reliance on fossil fuels through the 2020s and thus help mitigate any geopolitical risks of fuel supply interruption and price volatility.
- **Devolved administrations.** Significant abatement opportunities exist at the national level across all of the key options (i.e. renewable electricity, energy efficiency, low-carbon heat, more carbon-efficient vehicles, agriculture and land use).

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

As noted already, the UK roadmaps for the eight heat-intensive sectors (including ceramics) should also be included in the assessment as they focus on decarbonisation pathways / scenarios and competitiveness, as well as covering a number of related areas such as the need for industrial energy policy and supply security. However, the reports are somewhat incomplete as more work is needed to account for the full costs of the various decarbonisation options.

The CCC should take into account the findings of ICF's current report (for BIS) on climate policy impacts on international energy prices as well as the revision BIS has commissioned which we understand will be published later this year. CCC's own most recent analysis shows a significant increase in industrial electricity prices for energy-intensive industries by 2030 as a result of climate policies.

The impacts on competitiveness have already been covered in Q10.

The CCC's proposals must consider the probable consequences for security of energy supplies. Energy security is essential to the ceramic sector. At times of energy shortage industrial users are particularly vulnerable both in terms of physical supply security and the financial impacts of extreme wholesale price volatility. Loss of gas or electricity causes damage to kilns costing millions of pounds. BCC believe that an energy strategy that establishes long-term security of supply is essential to increase resilience against shortages and buffer against price volatility. Supply risks (or their perception) undermines future investment decisions. We support the building of more gas storage supported by a Public Storage Obligation and the use of indigenous fossil fuel resources such as shale gas and other unconventional resources where this can be extracted in an environmentally responsible and safe manner.

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

The devolution of energy policy varies around the UK. In Scotland and Wales, energy is a mixture of devolved and reserved provisions. Promotion of renewable heat and energy efficiency are devolved issues, whilst regulation (e.g. reliefs, compensation and incentives) sit with the UK Government. Although, the Climate Change Act 2008 does not set specific targets for the devolved administrations, it places a duty on them to contribute to this long-term emission reduction goal. The devolved administrations have adopted different emission reduction policies as well as different strategies for monitoring their progress towards emission targets. Whilst some of these strategies resemble carbon budgeting (e.g. Scotland), the Welsh Government does not use statutory targets or carbon budgets.

Energy policy is fully devolved to the Northern Ireland Executive (apart from nuclear energy, of which it has none), including powers to design and operate systems of market support. Northern Ireland does not have a system of carbon budgets in place.

Such differences should not undermine the long-term objective of cost-effective decarbonisation across the entire UK economy. We believe proposals for energy infrastructure (unconventional gas, new nuclear, renewables, gas storage etc.) should be studied on their relative merits according to similar criteria across all the home nations.

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

In the ceramic sector, a significant proportion of emissions (approximately 25% in the case of clay construction products) are associated with process emissions caused by the decomposition of carbonates and oxidation of organic content in the raw materials. As these are inherent in the raw materials, process emissions are a natural by-product of the firing process and cannot be avoided. CCS could be a solution to reduce carbon emissions from the largest ceramic sector installations (and indeed is the only technology able to reduce process emissions). However, technology development will be necessary to address specific challenges within the sector, such as: acidic contaminants in the exhaust gas stream, low concentration of CO₂ in the exhaust stream and the comparatively low volume of emissions at each site. Consequently, CCS in the ceramic sector is likely to remain prohibitively expensive for some time after it has been installed in other energy-intensive sectors.