ETI submission to the ECC Committee inquiry on setting the 5th Carbon Budget

Introduction

1. Over the past eight years the Energy Technologies Institute (ETI) has developed strong credentials in national energy system analysis, informed by the latest industrial and engineering expertise. This enables the ETI to explore lowest-cost decarbonisation pathways, under a range of assumptions, constraints and uncertainties. Our analysis has been widely cited by academics, government and by the Committee on Climate Change in its advice to government.

What is your view on the Committee on Climate Change's advice on the fifth carbon budget?

Level of the 5th carbon budget

2. We agree with the CCC's advice on the level of the 5th Carbon Budget. The CCC's approach and analysis is well-reasoned and evidenced. Our analysis of the cost effective pathway for the UK's energy transition, based on our energy system analysis, points to a 2030 level of UK (actual) emissions very similar to that recommended by the CCC in its advice.
3. While it is encouraging that in its recent letter to the Secretary of State the Committee on Climate Change believe current measures will be enough to meet near and medium term targets for now, we share their concerns about the effect that uncertainty around certain technologies, particularly CCS and nuclear, will have on future delivery of the targets.
4. Now is the time to establish a clarity of direction which enables targeting of industrial and public sector innovation and deployment activity towards critical areas which will reduce the cost of a low carbon energy system transition.
5. In the decade before the 5th Carbon Budget takes effect we need to prepare for this transition, which cannot be materially delayed without multi-billion £ long-term cost implications. Whilst clarity of direction will help draw in investments for early deployments we also need to ensure there are strong collaboration incentives which will enable rapid, effective reaction to new, unexpected market developments and consumer propositions which will inevitably arise.

Approach to setting the budget constraint

6. We support the CCC's broad approach to setting carbon budgets – in particular it is right to be cautious about the potential role that emissions trading can play, and to set budgets accordingly.

7. The CCC has recommended using Carbon Accounting regulations to implement a fixed budget for the level of emissions reductions required in the non-traded sector, thereby removing uncertainty related to the UK's eventual share of the European Union Emissions Trading Scheme cap in future years. This is preferable to leaving uncertainty about the scale of emissions reductions needed in the heat and transport sectors.
8. However, we agree when the Committee states "It is clear that in order to stay on track to the 2050 target in the Act, actual emissions must be reduced. The accounting rules should not be used to mask the real progress to the UK's legal commitment."
9. Therefore, we think the Committee and the Government should consider the case to go further and set the overall 5th Carbon Budget constraint in gross terms (i.e. based on UK actual emissions across both traded and non-traded sectors, excluding net trade in carbon credits). This would provide greater clarity about the total level of emissions reductions effort required in the UK over the timeframe of the 5th Carbon Budget. It would also allow maximum flexibility in the allocation of effort to meet the budget across different UK sectors (regardless of whether they are covered by the EU ETS). Otherwise there is a risk that traded credits could provide a short-term way to meet carbon budgets set on a net account basis, but that the actual reductions achieved in UK emissions would not be consistent with those required for a balanced pathway to 2050 targets (or with global reductions consistent with international agreements).

The sectoral balance of emissions reductions

10. We support the broad thrust of the CCC's advice on the priorities for delivering the emissions reductions, notably its emphasis on the need to substantially decarbonise power generation, to develop carbon capture and storage (CCS) and to drive the shift to low carbon heat solutions. In particular we agree with the CCC's assessment that 'CCS must make significant progress by 2030'.
11. While there is a strong alignment overall between our analysis of the options for transitioning the UK energy sector and that presented by the CCC, there are some areas where the ETI would adopt a different emphasis to that presented by the CCC.
12. In particular, we would ask both the Committee and Government to consider the following:
    - ***Stronger emphasis on the importance of progress in CCS before 2030*** – the importance of developing CCS to a cost-effective UK transition has been a consistent theme from our analysis, including evidence we recently presented to the Energy and Climate Change Committee[1] on the cancellation of the CCS Commercialisation programme. The CCC's advice implies that the importance of CCS mainly relates to achieving the 2050 target, but our analysis also shows that it is vitally important to containing the costs and risks of the UK's decarbonisation pathway even in the period before 2030. In addition, the success or failure to deploy CCS has a fundamental influence on choices about long-term infrastructure and energy system architecture, so it is vital to achieve greater clarity on this before 2030. We would therefore advise the government that it should give the highest priority to promoting commercial scale deployment of CCS before 2030.

[1] http://www.eti.co.uk/eti-letter-to-energy-and-climate-change-select-committee-on-ccs

- ***Stronger emphasis on building a UK bioenergy sector in the period to 2030*** – our analysis also consistently points to the importance of bioenergy as one of the two most important system-wide opportunities to reduce emissions cost-effectively (along with CCS). Bioenergy could provide up to 10% of the UK's primary energy needs by 2050, with the majority of this sourced domestically, substantially reducing the costs of meeting carbon targets. We would advise the government to give the development of the UK bioenergy sector greater priority than implied by the CCC's advice. Importantly this includes the need to make progress with developing bioenergy plantings, value chains and technologies before 2030 if the potential of bioenergy is to be realised. Immediate priorities for this parliament include a renewed focus on stimulating domestic plantings, as well as a comprehensive review of agricultural and energy policies to improve incentives for sustainable production of biomass for energy (e.g. in thinking about the post-2020 shape of EU common agricultural policy and the UK's use of 'pillar 2' environment and rural development funds).
- ***A measured approach to decarbonisation of transport, particularly light transport pre-2030 –*** we agree with the CCC's advice around the need to continue efficiency improvement in vehicles, especially by shifting towards ultra-low emission (e.g. electric and plug in hybrid) vehicles. However, we would also caution that a rush to decarbonise transport, particularly light transport, could risk imposing significantly higher costs on UK consumers and businesses. Our analysis suggests that abatement costs are more likely to be lowered by taking a more gradual approach to the adoption of ULEVs than that implied in the central scenario presented by the CCC in its advice. This suggests the focus during 5th Carbon Budget period should be on building preparedness for subsequent mainstream adoption of ULEVs, by testing and proving business models and commercial scale technologies. This more gradual approach to transport decarbonisation also reflects our view of the primary importance of developing and deploying CCS and bioenergy. Current evidence suggests that these technologies could deliver emissions reductions more cost-effectively than a rapid move to widespread adoption of ULEVs before 2030.

Should the Government set the fifth carbon budget in line with the Committee on Climate Change's advice?

13. Broadly we think the Government should adopt the CCC's advice as presented, subject to:

- consideration of the case (and legality) of expressing the budget constraint in gross terms as suggested above
- the CCC's advice on the implications of the higher level of ambition emerging from the Paris agreement – which may point to the need for greater ambition in the UK in the future.

What challenges will the Government face in meeting the fifth carbon budget?

14. We would point to five key challenges that the Government will face in meeting the fifth carbon budget.

    a) Reconciling the 5th Carbon Budget with the current thrust of energy policy (particularly the emphasis on new gas capacity and containing costs).

    b) Developing and implementing a new strategy for timely commercial scale deployment of CCS.

    c) Allocating limited resources efficiently for maximum decarbonisation benefit at lowest cost.

    d) Limiting risks by preparing a portfolio of low carbon options.

    e) Reforming governance and regulation of network infrastructure.

We discuss each of these challenges in turn.

a) Reconciling the 5th Carbon Budget with the current thrust of energy policy

15. Our analysis suggests that low cost pathways to decarbonisation imply a relatively limited role for unabated gas in power generation by 2030. Most balanced pathways require fitting a substantial proportion of gas generation capacity with CCS, with remaining unabated capacity running at low load factors mainly at times of high demand.

16. The government's recent energy policy 'reset' emphasises the central importance of investment in new gas capacity over the next 10 years (as well as development of shale gas production).

17. Reconciling this new thrust of energy policy with the 5th Carbon Budget will be a challenge in a number of respects:

- The emissions from a significant new tranche of unabated gas capacity will mean greater pressure to achieve early emissions reductions elsewhere in the energy system, in heat or transport sectors. The evidence suggests that this will almost certainly lead to either higher overall energy service costs for UK consumers, taxpayers and businesses, or pressure to set a looser 5th carbon budget than reflected in the CCC advice. Higher costs would conflict with the government's stated concern to prioritise affordability for consumers, while a less demanding carbon budget would conflict with CCC advice and risk exposing the UK to higher carbon abatement costs in the long term.

- Investors in new gas capacity will be aware of these policy tensions. New gas investors are likely to demand policy interventions to limit their exposure to risk around load factors and future changes in policy (which could be driven by pressures to reduce emissions that come into sharper focus during future administrations, but within the economic lifetime of new gas assets). Alternatively investors may demand higher rates of return to allow them to recover investments over a shorter period. This would also lead to tensions with government objectives around affordability.

- Reconciling these tensions suggests the government should give attention to a new strategy for CCS (discussed below) as well as a stronger focus on CCS readiness requirements.

b) Developing and implementing a new strategy for timely commercial deployment of CCS

18. As we emphasised in evidence recently submitted to the ECC Committee, delaying the commercial deployment of CCS in the UK is highly likely to increase the costs and risks of meeting the 5th Carbon Budget. Failure to develop a strategy for CCS will also store up longer term risks and pressures in the 2030s and 40s. We cannot identify any countervailing benefits from delay because the prospects for immediate cost reduction are overwhelmingly dependent on UK deployment.

19. A key immediate challenge for the government is therefore to develop and implement a new strategy within this Parliament to support timely commercial deployment of CCS. Our previous letter to the select committee sets out early thinking on what is required, and we continue to develop thinking on this.

20. Implementing a decisive new strategy for CCS would be a strong complement for the government's emphasis on role of investment in new gas, providing a visible pathway to a longer term role for gas in a low carbon energy mix. Creating this visibility within a credible medium term framework would reduce investors' exposure to policy risks during the economic lifetime of new gas capacity, and therefore lower the cost of capital and the demand placed by incentives for new gas investment on limited policy support resources.

c) Allocating limited resources efficiently for maximum decarbonisation benefit at lowest cost

21. The government rightly emphasises the importance of containing the costs imposed on UK businesses and energy consumers by energy policies in the near and medium term. To do this, policy mechanisms need to target limited resources on the most promising energy options, which offer maximum decarbonisation benefits at lowest cost and risk.

22. Currently, the mechanisms for allocating policy support are complex, fragmented, mainly technology-specific and poorly shaped to identify and target best value for broader UK decarbonisation. Under the levy control framework, policy support allocation is dominated by award of contracts for difference under electricity market reform (EMR), but without any mechanism to reflect the system costs and benefits of technologies. Recent analysis for the CCC by NERA and Imperial College[2], for example, shows marked differences between the system cost impacts of different low carbon electricity options (differentials of up to £20 - £25/MWh between CCS and intermittent renewables such as wind and solar). Similar principles also apply in terms of the wider energy system benefits of flexible, versatile options (such as CCS or bioenergy) which can deliver decarbonisation benefits beyond the electricity sector, in heat, industry or transport. Contract allocation under EMR is driven by technology and electricity-sector specific considerations, with excessive focus on partial cost metrics (e.g. levelised costs or £/MWh strike prices) which do not reflect system cost impacts.

[2] System Integration Costs for Alternative Low Carbon Generation Technologies, report for CCC by NERA and Imperial College, November 2015 www.theccc.org.uk/publication/system-integration-costs-for-alternative-low-carbon-generation-technologies-policy-implications/

23. Unless policy mechanisms and incentives internalise these wider system considerations resource allocation decisions are likely to drive costs to a level which is higher than necessary. There is therefore a major challenge for government to meet the fifth carbon budget at best value, by bringing greater coherence to policy and resource allocation decisions within a proper energy system-wide framework. Reforms need to be holistic to enable best value to be delivered from limited policy support. Arguably recent years have witnessed successive piece meal reforms, such as the introduction of capacity market mechanisms to compensate for the impact on investment signals from policies to promote the market penetration of renewables. Beyond the electricity sector, the rewards for delivering emissions reductions remain much less clear cut (e.g. in heat or industry) inhibiting incentives for investment and innovation.
24. If the government wishes to maintain close oversight and administrative control over an essentially technology-specific approach, then it needs to develop an improved energy system-wide framework and set of analytical tools to guide resource allocation decisions. Auctioning of contracts within different 'pots' of support, based on simple £/MWh style metrics, will not do the job.
25. Alternatively, the government could explore the creation of a clearer long-term framework to underpin economy-wide carbon price signals, as a way to internalise system-wide considerations and place private sector investment and decision making at the heart of decarbonisation investment. For example, national carbon budgets could be translated into carbon constraints which are binding within markets (e.g. via technology-neutral carbon intensity targets applied across electricity, heat and transport fuels). With trading of carbon credits across these sectors (covering around 85% of emissions), this could create a near economy-wide framework for carbon price signals. These price signals could in turn emerge as the primary driver for investment in low carbon innovation, technology development and deployment.

d) Limiting risks by investing in the preparedness of a portfolio of low carbon options

26. Achieving the 5th Carbon Budget will present a wide range of risks and uncertainties, including the cost and performance of some key technology options, implementation risks, social acceptability, siting and consenting risks, uncertainty around consumer acceptability and adoption and the need to prove business models and propositions. Therefore, a key challenge for the government will be to limit risks by investing in preparing and proving a portfolio of the most promising low carbon options, such that they are genuinely 'deployment-ready' at large scale thereafter (since our analysis points to the need for heavy investment in the 2030s and 40s).
27. Developing a basket of options rather than a single blueprint will help to limit inevitable implementation risks. In addition to the crucial importance of CCS and bioenergy (which we have already set out), key technology options which will require investment in early deployment and preparedness include:

    - **New nuclear** (both large-scale and small modular reactors): Our analysis suggests a key role for large-scale new nuclear for low carbon baseload electricity, with strong potential for smaller reactors in the longer term. There is an additional potential to use small reactors to energise district heat networks.

- **Offshore wind**: Continuing to drive down the costs of offshore wind should be a key priority, as it remains a key 'hedge' technology should implementation risks limit the ability to deploy other options. It is important that early deployment of offshore wind does not absorb a disproportionate share of available policy support, potentially crowding out support for less mature approaches, principally CCS.
- **Gaseous systems**: There is a need to invest in developing and proving a range of new options to use gaseous fuels (natural gas, hydrogen and syngas) in heat and transport.
- **Efficiency of vehicles**: Continued gains in conventional vehicle efficiency will be important, as well as early development and deployment of plug in hybrid vehicles, testing of business models, consumer propositions and system integration approaches.
- **Efficiency and low carbon heat for buildings**: Investment is needed to develop and prove low carbon heat solutions (heat pumps, heat networks and potential alternative approaches to use of the gas distribution grid), to test the design approach, build evidence and create confidence and capability to deliver consumer-friendly integrated local area system solutions.

28. It is critical to focus resources in the next decade on preparing these options for wide-scale deployment. Preparedness entails not just technology development and first of a kind deployment, but also the development and proving of viable business models, operating and regulatory frameworks to underpin stakeholder and investor confidence. Inevitably resource availability will constrain what can be achieved across the portfolio, so a balanced approach is vital to prevent any particular option absorbing a disproportionate share of available policy support, and to avoid a rush to large scale deployment prematurely which could magnify both costs and risks.

e) Reforming governance and regulation of network infrastructure

29. The final key challenge for the government in meeting the 5th Carbon Budget that emerges from our analysis is the need to reform the governance and regulatory framework for energy network infrastructure. Our analysis suggests that there is substantial potential to cut the cost of the UK's energy transition, by enabling the use of a broader and more flexible mix of energy vectors (across heat, power and gaseous fuels). These kinds of future energy mixes would raise new and different issues that go beyond the current essentially 'vector-specific' statutory and regulatory regimes (e.g. electricity and gas acts) for energy network infrastructures.

30. The need to consider reforming governance and regulation of energy network infrastructures, reflects the need to:

- Enable and incentivise investment in substantially adapting and enhancing existing network infrastructures (e.g. efficient configuration of electricity networks to meet needs of decarbonised generation, adapting and repurposing the gas grid).
- Enable and incentivise the creation of entirely new (and efficiently configured) network infrastructures (e.g. new heat networks and/or heat-based energy storage).
- Configure and operate networks in an integrated way to enable flexible interplay of low carbon power, heat and gaseous fuels to balance supply and demand and to minimise costs.

About the ETI

31. The Energy Technologies Institute (ETI) is a public-private partnership between global energy and engineering firms (BP, Caterpillar, EDF Energy, Rolls-Royce, Shell) and the UK Government.

32. Our mission is to accelerate the development, demonstration and eventual commercial deployment of a focused portfolio of energy technologies which will increase energy efficiency, reduce greenhouse gas emissions and help achieve energy and climate change goals.

33. We carry out three key activities:
    - modelling and strategic analysis of the UK energy system to identify the key challenges and potential solutions to meeting the UK's 2020 and 2050 targets at the lowest cost to the UK
    - investing in major engineering and technology demonstration projects to de-risk and build capability both technology and supply-chain solutions for subsequent commercial investors
    - enabling effective third party commercialisation of project outcomes.

34. The ETI has developed an internationally peer-reviewed national energy system design tool (known as 'ESME' - Energy System Modelling Environment), to underpin our strategic techno-economic analysis of the UK energy system. ESME models choices across power, heat, transport and infrastructure sectors and is informed by evidence drawn from our private sector members, our technical projects and a range of expert advisers. As such it enables the ETI to deliver evidence-based insights on how to deliver affordable, secure and low carbon energy for Britain in the decades ahead, including identifying credible, lowest-cost pathways to secure low-carbon energy in future.

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