UKCCSC and UKERC response to the Energy and Climate Change Select Committee inquiry on emissions performance standards (EPS)

This document is a joint response from the UK Carbon Capture and Storage Community Network (UKCCSC) and the UK Energy Research Centre (UKERC) to the Select Committee inquiry on EPS. The UKCCSC is a collective of over 200 engineering, technological, natural, environmental, social and economic academic members, whose biannual meetings and other knowledge sharing events and activities are funded by a grant from the Research Councils UK Energy Programme. The UKERC carries out world-class research into sustainable future energy systems and is also funded by a grant from the Research Councils UK Energy Programme. The text has been discussed and drafted by a self-selected group of UKCCSC and UKERC academics and researchers, each contributing according to their own particular interests and expertise, and also submitted to the whole membership for further comments. The final version was then circulated for members to sign up to if they wished; it should be noted that signatories below are signing as individuals.

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Question 1: What are the factors that ought to be considered in setting the level for an Emissions Performance Standard (EPS) and what would be an appropriate level for the UK? Should the level be changed over time?

1. A properly designed and implemented EPS has the potential to push forward development of low carbon technologies such as carbon capture and storage (CCS), and these technological advancements can in turn help curb greenhouse gas emissions. When designing an EPS, a broad range of factors should be considered and stakeholder consultation should be thorough. Any EPS design needs to be based on scientific evidence and should at a minimum consider the factors identified below (paragraphs 2-7):
2. An EPS should cover all carbon dioxide (CO_2) emitting sources of power generation (i.e. coal, gas and biomass), not just coal. If the EPS were to focus on coal alone, it would likely drive the expansion of unabated natural gas-fired power plants, rule coal out of the generation mix and thus inhibit the development of CCS. If the UK hopes to achieve even intermediate emission targets, power generation as a whole will need to be decarbonised[1]. This aim ought to be kept in mind when drafting an EPS.
3. It is important to balance needs for providing sufficient certainty to encourage CCS (and other low carbon technologies) with providing flexibility to avoid micromanagement of power providers. Given the long-lived nature of CO_2 in the atmosphere, it would be sensible

[1] For example, as outlined in analysis undertaken by and for the Committee on Climate Change. See www.theccc.org.uk for further details.

to extend compliance periods to a year (or potentially even longer). One could also add flexibility to an EPS by allowing operators to trade off over-performances amongst their various assets creating many operating options within their portfolios. There could also be some benefits associated with allowing operators to trade their over-performances with each other, although there are also concerns that this approach would effectively create a new emissions trading scheme.

4. The differences in CO_2 emissions from different power generation sources need to be considered if trying to level the regulatory burden across the power industry. Coal plants emit more CO_2 than gas plants, so if for example 85% of CO_2 is captured by a coal plant you may then emit around 150g CO_2/kWh where as if 85% is captured with gas you may emit down to 70g CO_2/kWh with the same 85% level of capture. If however different plants have different standards, an EPS could be designed to reflect the relative difficulty associated with CCS for each fuel. Differentiated standards of this sort have been implemented before, as in the EU Large Combustion Plant Directive.
5. Clear definitions of applicable EPSs at variable plant load factors should be carefully thought through. In particular, how an EPS might be applied to non-baseload plants needs to be considered, with a clear definition established to ensure clarity on what constitutes a "baseload" or "non-baseload" plant. As a result of recent and expected growth in renewables and nuclear energy, it is thought that many UK coal and natural gas plants will see declining load factors during the 2020s. If this is the case, CCS will become less financially viable since reduced operating hours tend to imply less stable revenue streams for paying off the capital investment required.
6. The timing of an EPS announcement and any step changes or other tightening in standards is important. The timing and level of a power sector EPS should, however, be set to promote large-scale CCS projects from the outset. The market might be provided with much needed clarity and have ample opportunity to prepare along a specified timeline with an early EPS. It is also important to consider specific needs of operators of early commercial-scale demonstration plants and how EPS design is linked to significant lessons that are expected from these early plants. However, a tightening in EPS as CCS and other low carbon technologies are refined could be expected to promote low carbon technology development whilst allowing power providers to deploy flexible and dynamic management of their assets. Careful consideration should be given to reductions in allowable CO_2 emissions with a clear

date of introduction and intended pathway for changes in levels and/or plants covered by an EPS.

7. Given the scale of our climate change problem, and that other industries will eventually have to be decarbonised if to meet emission targets, it would be an advantage to have an adequate piece of legislation that can easily be transferred or adapted from power to other industries such as cement or steel. For example, where metrics could be adapted for non-power based units of production, an EPS might be transferable to other industry sectors. An EPS holds a lot of potential for curbing greenhouse gas emissions and could be developed for more wide scale application.

Question 2: What benefit would an EPS bring beyond the emissions reductions already set to take place under the EU ETS?

8. An EPS could drive CCS and other low carbon technologies if implemented correctly. There is widespread concern that the EU ETS is not currently driving low carbon technologies and will not sufficiently drive them in the foreseeable future. The UK's coalition government has stated that a carbon price "floor" is one of its aims, so that the finance sector can more confidently appraise investment in the power sector. However, emerging low carbon technologies need more than just a stable carbon price to overcome challenges faced by many new technologies as they are introduced to the commercial market for the first time. In particular, there is a body of evidence pointing to market failures where innovation could lead to technology becoming cost-competitive in the future, but only after sufficient time has been allowed for mature technology to develop.[2] While the EU ETS is a minimum benchmark of sorts for power markets, an EPS could push forward CCS and other low carbon technology implementation at a faster and more reliable rate than with the EU ETS alone.

9. The infrastructure needs for commercial scale CCS are capital intensive and will require financing over several decades (e.g. capture plant, pipeline, CO_2 injection wells). A well-designed and effectively implemented EPS would bring investment certainty to the sector by providing clear and long-term standards. The fluctuating nature of the EU ETS along with

[2] Stephen Martin, John T. Scott (2000) The nature of innovation market failure and the design of public support for private innovation. Research Policy 29: 437–447.

non-specific climate change regulations have led to greater uncertainty in the power sector, which can inhibit financial investment. It is important that an EPS is designed to help reduce uncertainty if it hopes to bring forward large capital investment.

Question 3: How effective is an EPS likely to be in driving forward the development of CCS technology? Should the UK's CCS demonstration programme cover gas-fired as well as coal-fired power stations?

10. There are two technology effects that are most often discussed in conjunction with an EPS. The first is a "shut out" or elimination of coal from the generation mix if an EPS is only associated with coal fired power plants. In 2006, the State of California, in the USA, passed an EPS of 1100 lbs CO_2/MWh (equivalent to 500g/kWh) that essentially prevents unabated coal from being developed. Given the current economics of the energy market, this EPS could drive the development of unabated natural gas fired plants. Since the UK already has an implicit EPS for coal fired power plants with the "no new coal without CCS" requirement, any formal EPS for the UK would have little effect if other carbon emitting power plants (natural gas and biomass) were not covered.
11. The second technology effect could be the forcing of CCS and other low carbon technology development. If this is an aim of the EPS, one can point to historical examples where legislation has indeed helped drive the development of pollution abatement technologies. For example the improvement of flue gas desulphurisation (FGD) technologies in the last half century was a direct result of tightening pollution legislation in the US and elsewhere. Similarly catalytic converters on motor vehicles were developed on the back of strong legislation that limited automotive exhaust emissions.
12. However, this type of technology forcing only appears to work where no real alternative to the target technology is available. The reality of the UK electricity market today is that many decisions for investment in coal-fired generation have been cancelled/delayed while there appears to be another 'dash for gas' with more than 10GW of gas-fired power stations currently applying for planning consent or recently granted Section 36 planning permissions. In fact, since the late 1990s, the largest percentage of UK energy supplies has come from

natural gas.[3] Decarbonising power generation to the level recommended by the Committee on Climate Change is unlikely to be achieved without at least some CCS on gas. A demonstration project on gas would, therefore, be a much-needed step in the right direction.

13. An effective EPS set for coal, gas and biomass fired power plant coverage would give CCS technology sufficient momentum to progress towards commercial scale application of the technology. It should be noted, however, that if CCS is driven by an EPS, this technology forcing will critically depend on the details of the EPS design and implementation. It is also essential that an EPS is not seen as an alternative to adequate funding, particularly for initial commercial-scale demonstration of CCS.
14. An EPS could not only help drive development of a technology, but it could also help ensure that CCS technology is actually used once installed. If carbon prices were sufficiently low, plant operators could run unabated fossil fuel-fired plants and bypass their CCS units. However, a well-designed EPS could be one method to avoid this scenario.

Question 4: Could the introduction of an EPS pose any risks to the UK's long-term agendas on energy security and climate change?

15. As already noted, if an EPS covers only coal (like the California EPS) it is likely to reinforce investment in gas-fired generation, increasing the country's dependence on gas imports and delaying decarbonisation of electricity supplies. There are two well-established lines of thought in relation to potential impacts to energy security from an EPS that includes natural gas. One being that the introduction of an EPS on gas-fired power generation 'too soon' could reduce the capacity of gas-fired power plants actually constructed in the UK, with associated suggestions that this could lead to insufficient electricity supply to meet future demand. It will be particularly important not to discourage investment in the CCGTs (combined cycle gas turbines) needed to maintain generating margins when existing coal and nuclear plants close, from 2015-16 onwards. The second suggestion is that there is also potential for an EPS to increase long term energy security in the UK if all carbon emitting power plants are covered. Because then all fuel sources would have level regulations,

[3] http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

allowing more fuel types to remain in the overall fuel mix. A greater diversity in fuels is typically expected to increase our overall fuel security.

16. Ideally, the UK should pursue the development of an EPS at the EU level. However, should this not prove possible, it will be important that there is consistent treatment of electricity imports within an UK EPS, although there is currently limited potential to import (or export) electricity in to (or out of) the UK. This should help ensure that the UK generated power is not put at a competitive disadvantage. Successful implementation of an EPS including imports could also help to provide a model that may be appropriate for an EU EPS if this approach is pursued in the future.

Question 5: What is the likely impact of an EPS on domestic energy prices?

17. It is very likely that any measure we take to change "business as usual" will at least in the short-term increase the costs of providing electricity. Whether the measure is increasing renewable energy production or adding CCS to existing coal or gas fired power plants (or requiring it at new-build plants), they will all increase the costs of electricity supply that are likely to be passed through to both industrial and domestic customers.

Question 6: Are any other European countries considering an EPS? If so, should the standards be harmonized?

18. As stated previously in our answer to question number 3, the UK already has an implicit EPS with the "no new coal without CCS" provision. Additionally an EPS has been under discussion at European level for several years. It appears likely that if the UK were to implement an EPS rapidly then the form of a UK EPS could have a significant influence on the development of any future European EPS (or indeed an EPS introduced in other European Member States – and potentially other non-European countries/jurisdictions such as US states).
19. It is important to consider impacts to investment when designing an EPS. Since the UK power industry relies on foreign investment for large capital expenditures, a poorly designed EPS could be seen as harmful to British investment profitability. One could argue that an EU EPS would limit this threat and should be further pursued.

Question 7: Could unilateral action by the UK to introduce an EPS contribute towards global climate negotiations in Cancun in November 2010?

20. Certainly, if the UK were the first nation to implement a national EPS, it would be noted and could potentially add leverage to future climate change negotiations. However there is little time between now and November, so the effects of any UK EPS (even if implemented immediately) would not be apparent straight away. A well executed EPS in the UK with tangible and positive results could serve as a model to hold up in global climate negotiations, but it will likely require several years post EPS implementation before results at this level are understood.

Question 8: Can greater use of Emissions Performances Standards internationally help promote agreement on global efforts to address climate change?

21. International use of EPS-type measures could be a large step forward in mitigating climate change impacts, but as in the UK, the precise outcomes will depend on the detailed EPS scheme design and implementation. Consistency in regulation could also be expected to help level energy costs on a global scale and create a larger market for low carbon energy technologies that are developed and patented by early adopters.