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Emissions Performance Standards

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Additional written evidence

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The Energy and Climate Change Committee

The Energy and Climate Change Committee is appointed by the House of Commons to examine the expenditure, administration, and policy of the Department of Energy and Climate Change and associated public bodies.

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The Reports of the Committee, the formal minutes relating to that report, oral evidence taken and some or all written evidence are available in a printed volume. Additional written evidence may be published on the internet only.

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Written evidence

Memorandum submitted by Professor Richard Macrory

Submission from Richard Macrory, Hon, QC, Professor of Environmental Law, Faculty of Law, University College London and Director, UCL Carbon Capture Legal Programme.

1. I am director of the UCL Carbon Capture Legal Programme which aims to provide authoritative and independent analysis of legal developments relevant to the regulation of carbon capture and storage. Its freely accessible resource site (<http://www.ucl.ac.uk/cclp/>) is designed to provide a comprehensive collection of legal and policy material relevant to CCS, with a particular emphasis on Australia, Europe, and the United States, the jurisdictions to date that have seen the most development in this area. The views expressed here are personal.

CO₂ PERFORMANCE EMISSIONS STANDARDS

2. As far I am aware, the only CO₂ performance emission standards currently in existence are those found a small number of States in the USA. The appendix provides a summary of the provisions and the industries to which they apply. There are currently two models underlying the design of emission performance standards for CO₂—one based on equivalent emissions from combined-cycle gas turbine plants with the figure of 1,100 lbs CO₂/MWh being adopted; the other is based on the percentage of CO₂ emissions captured and sequestered.

3. California led the way with legislation passed in September 2006 (Senate Bill (SB) 1368) with more detailed regulations made in the following year. The legislation did not specify an emission standard in numerical terms as such, but required that the performance level must be no higher than the emissions rate of a combined-cycle gas turbine plant. The California Public Utilities Commission subsequently determined this to be 1,100 lbs CO₂/MWh based on a review of emissions from combined-cycle gas turbine plants. The standard reflects the emission levels of older existing plants compared to the emission limits of around 800 lbs CO₂/MWh that can be reached by new natural gas combined cycle plant (Rubin (2009)). Meeting the standard for a new efficient coal fired plant would require a CO₂ emission reduction of between 30 and 40% (ibid).

The main motivation behind the California legislation appears to have been the view of both the legislature and the California Public Utilities Commission that greenhouse gas controls would inevitably tighten up in the future and that emission performance standards were needed now to protect the ratepayer from higher costs at a later date. According to Simpson and Hausauer (2009) “*Both the California Legislature and the California Public Utilities Commission (CPUC) concluded that if utilities or other load-serving entities were allowed to enter into new long-term commitments with high-greenhouse gas (GHG) emitting power plants, California ratepayers would be exposed to high costs of retrofits (or the need to purchase expensive offsets) under future emission control regulations. California ratepayers would also be exposed to potential supply disruptions when these high-emitting facilities are taken off line for retrofits, or retired early, in order to comply with future regulations.*”

The State of Washington modelled its 2007 legislation largely on the Californian law, and contains a performance standard of the lower of 1) 1,100 pounds of GHG per MWh; or 2) the average available GHG emissions output as determined and updated by the Washington Department of Community, Trade & Economic Development which is obliged to carry out a survey every five years of new combined cycle gas turbines available and offered for sale in the US.

Oregon’s 2007 legislation also follows the Californian model applying a performance standard of 1,100 lbs CO₂/MWh to baseload power stations. New Mexico’s 2007 legislation adopts the same standard for CO₂ but with additional financial incentives in the form of tax credits for certain plants.

4. Montana’s 2007 legislation adopts a different approach to defining an emission performance standard which is more explicitly aimed at carbon capture and storage. Applying essentially to coal fired generating stations to be constructed after 1 January 2007, it requires that the facility must capture and sequester 50% of the carbon dioxide produced. In terms of actual emissions this appears to be slightly tighter than the Californian approach. The 2009 legislation of Illinois is also focussed on carbon capture and storage standards, and requires state utilities and electricity suppliers to obtain 5% of their power from the proposed Taylorville clean coal facility with a goal of 25% of electricity for CCS coal-fuelled power stations by 2025. A clean coal facility is defined as one that sequesters 50% of CO₂ emissions if commencing operations before 2016, 70% for those commencing operations between 2016–17, and 90% for post 2017 plants.

LEGALITY OF NATIONAL EMISSION PERFORMANCE STANDARDS UNDER EU LAW

5. The 2003 EU Emissions Trading Directive (2003/87/EC) amended the 1996 Directive on Integrated Pollution and Prevention Control (IPPC) (96/61/EC) by providing that where greenhouse gas emissions from a plant subject to IPPC permit requirement fell within the EU Emissions Trading Scheme, “*the permit shall not include an emission limit value for direct emissions of that gas unless it is necessary to ensure that no*

significant local pollution is caused.” The European Commission legal services argued that this meant that a national CO₂ emissions performance standard for a plant subject to the ETS scheme would be illegal under Community law.

6. In January of this year, Derrick Wyatt QC and I were commissioned by WWF to write a legal opinion analysing the meaning of the amendment and whether the Commission was correct in its view. In particular we were aware that both the IPPC Directive and the ETS Directive had been made under the environmental provisions of the Treaty, and that Art 193 of the Treaty permits Member States to impose stricter standards in relation to such measures. One of the issues was whether a provision in a Directive could exclude the operation of this Treaty provision. In the event it was not necessary to rely upon Art 193, and we concluded that Member States still possessed the freedom to impose national emission standards under non-IPPC laws, and that the European Court of Justice would uphold this view if it came before them. But we felt that the position should be made absolutely clear in any subsequent revision or replacement of the IPPC Directive.

7. The legal opinion was made public to the European Parliament during its debates this year on the Industrial Emissions Directive, which will replace the IPPC Directive, and as a result agreed an amendment to the Industrial Emissions Directive giving Member States the residual discretion to impose national emission standards.

8. In June this year, during the co-decision procedure, agreement has been reached between Member States and MEP on the Directive leading to its 2nd Reading in Parliament in July, and likely agreement by Council (ENDS Report 425 June 2010 p 55). Article 9 of the agreed text provides again that “*Where emissions of a greenhouse gas from an installation are specified in Annex I to Directive 2003/87/EC in relation to an activity carried out in that installation, the permit shall not include an emission limit value for direct emissions of that gas, unless necessary to ensure that no significant local pollution is caused*”. But then the Preamble provides that, “(10) *In accordance with Article 193 of the Treaty on the Functioning of the European Union (TFEU), nothing in this Directive prevents Member States from maintaining or introducing more stringent protective measures, for example greenhouse gas emission requirements, provided that such measures are compatible with the Treaties and the Commission has been notified*”.

9. It is clear then national greenhouse emission standards are legal, provided they are not discriminatory and are notified to the Commission. Case-law of the European Court of Justice indicates that the level of standards adopted by Member States under the stricter standards provisions is left to their discretion and not subject to an overarching Community principle of proportionality—see Case C-6/03 Deponiezweckverband Eiterkopfe ECR 2005 I-2753

IMPACT OF NATIONAL EMISSION PERFORMANCE STANDARDS

10. Emissions trading schemes, such as that for SO₂ in the United States, have generally allowed for local emissions standards to prevent local pollution or unfair burdens being carried by some localities. Indeed the European ETS Scheme allowed for national emissions standards to deal with “significant local pollution”, though in the case of greenhouse gases it is difficult to envisage the circumstances in which this might apply.

11. It is perhaps rather less easy to predict the impact of national emissions standards on an emissions trading scheme operating throughout the European Union. If only one or two countries introduce such standards, and industries requiring to comply with such standards are still permitted to hold and trade in any allocated allowances, then the immediate effect on overall greenhouse reduction targets is likely to be neutral. Industries subject to standards will have surplus allowances to sell on the market allowing industries in countries without such standards to emit up to the limits of the allowances purchased. The addition of extra allowances on the market may well depress the price, reducing the economic incentive for investment in abatement as an alternative route for meeting obligations.

12. The main purpose of introducing national emission performance standards is to quicken the pace of investment in abatement technology on the assumption that the ETS scheme cannot itself deliver the correct price signals within the time-scales required by policy-makers dealing with climate change, or with the consistency required by industry for long-scale large investment. Assuming that the performance standard does encourage such investment, then its main impact on the emissions trading scheme is likely to be felt when the overall caps are calculated for the next trading period. Emission performance standards can drive technological innovation and in fields such as NO_x reduction for power plants, they have led to dramatic reductions in costs. (Taylor et al 2003, Yeh et al 2005). The actual operational experience and availability of abatement technology, albeit in one or two countries, is likely to encourage a tightening of overall caps, leading to an overall reduction of greenhouse gases. But it follows that the integrating the timing of the introduction and implementation of a national emission performance standard in relation to the next trading periods under the EU ETS Scheme may be significant.

13. It is also important to ensure that the design and application of an emission performance standard does not have a perverse or unintended effect. For example, if an emission standard applied only to coal-fired power stations within the United Kingdom, and generators still retained the option of choosing the type of power station they invested in, there might well be a greater investment in gas fired powered stations if that were a less expensive or troublesome option. If the emission standard for coal-fired stations was essentially the same as the rate of emissions reached by combined cycle gas powered stations (the approach currently adopted under the Californian model), then presumably from a purely climate change perspective

a move to gas at the expense of coal is neutral in policy terms. But if an additional policy objective is security and/or diversity of supply, then it is clearly important that the introduction of an emission performance standard does not have unintended consequences. In the absence of portfolio requirements obliging suppliers to purchase certain proportions of electricity from coal-fired stations, then the introduction of selected performance standards might well give rise to significant shifts. For a start it is therefore probably important that the performance standard for greenhouse gases applies equally to generating stations or other processes whatever the source of power.

Richard Macrory

September 2010

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I am grateful to Richard Foulsham of the UCL Carbon Capture and Legal Programme for his assistance in preparing the Table in the Appendix and sourcing US material.

APPENDIX

SUMMARY OF CO₂ EMISSION PERFORMANCE STANDARD CURRENTLY IN FORCE

	<i>In force</i>	<i>Plant type</i>	<i>Regulated entity</i>	<i>Mechanism</i>	<i>Level</i>	<i>CCS Specified</i>
California SB1368	Y	Baseload	Utilities subject to Commission approval	Approval of power purchase agreement (PPA)	1100 lbs/CO ₂ /MWh	Not compulsory but does count as not emitted
Illinois SB1987	Y	Coal only	EPS: The Taylorville facility and any facility that achieves the standard Portfolio: Utilities subject to Commission approval.	EPS: Ability to take advantage of preferential PPA if they meet the EPS. Portfolio: Imposed on all utilities	Prior to 2016, those that capture 50% of emissions.	Yes, as the law is targeted at a CCS station—Taylorville.
Montana HB25	Y	Coal only	Utilities subject to Commission approval	Approval of PPA and investments.	Capture 50% of emissions	Yes—required to meet the standard
Washington SB6001	Y	Baseload	Utilities	Approval of PPA and investments.	1100 lbs/CO ₂ /MWh	Not compulsory but does count as not emitted
Oregon HB3283 SB101	Y	Baseload & non baseload	Utilities	Approval of PPA	Baseload: 1100 lbs/CO ₂ /MWh Non baseload gas 675 lbs/CO ₂ /MWh	There appears to be an exemption but it is not explicit
New Mexico SB0994	Y	Coal only	Private investor	Tax credit	1100 lbs/CO ₂ /MWh	Not compulsory but does count as not emitted

Memorandum submitted by UK COAL Mining Limited

1. UK COAL Mining (UKC) welcomes the opportunity to submit evidence to the Energy and Climate Change Select Committee looking into proposals for Emission Performance Standards (EPS). UKC is Britain's biggest producer of coal, supplying around 4% of the country's energy needs for electricity generation. The Group operates three deep mines and five surface mines located in Central and Northern England with substantial reserves and employs 3,100 people. Around 95% of the Group's 7Mt/year production supplies the electricity generation market and as such we are heavily influenced by policy objectives affecting the electricity sector.

2. Coal-fired power stations provide security and diversity of supply. They are also able to respond more quickly to peaks in demand on the electricity grid than either gas or nuclear stations. This provides a vital load following capability, which ensures that the National Grid is able to meet fluctuations in electricity demand.

3. In 2009 coal generation provided 28% of the UK's electricity needs, however European environmental legislation to reduce NOx and SOx will have a dramatic affect on the existing coal generation fleet.¹ The UK presently has 28GW of coal plant on the system. 8GW of plant will close by the end of 2015 and the majority of the remainder will close during the period 2016–23. The replacement of this capacity with new coal is essential if the UK is to maintain a diverse and secure energy mix.

4. The UK is facing energy security challenges presented by a dramatically changing global economic, geopolitical and energy landscape. Global reserves of oil and gas are increasingly concentrated in a limited number of countries and there is a clear risk that global supplies will not keep pace with demand.

5. Last winter's cold spell has highlighted our reliance on gas, with four national balancing alerts in the first weeks of January and many industrial consumers having their supply cut off. Future planned gas build will exacerbate this position.

6. Coal generation, therefore is vital to the UK's diversity and security of energy supplies especially at time of dwindling indigenous gas supplies and volatile international energy markets.

7. However for coal to play its part in the UK's energy mix, within a low carbon economy, requires the development of carbon capture and storage (CCS). A fleet of clean coal stations with CCS would allow indigenous coal production to contribute to the UK's security of energy supply by limiting energy imports from either unstable or potentially unstable countries.

8. Therefore swift progress on the four coal CCS demonstration projects announced in the Coalition Agreement and re-affirmed² in Parliament by Charles Hendry, the Minister of State, Department of Energy and Climate Change, is imperative.

9. The current planning regime forbids the building of new unabated coal plant, but yet allows new gas stations to be built without carbon capture. An EPS on all plant would send out a clear signal with regard low carbon generation, however Government must be confident that the technology exists to achieve the required goal in the timeframe envisaged.

10. Most importantly an EPS must not discriminate against coal in favour of gas. If an EPS is set at a level that simply allows the target to be met by fuel switching to unabated gas, this would have an adverse affect on the UK's diversity, security and affordability of energy supply.

SPECIFIC QUESTIONS POSED BY THE COMMITTEE

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?*

Emissions performance standards (EPS) have been in place in California since 2006 when a limit of 1,100lbs CO₂/MWh (500g/kWh) was introduced on all baseload electricity generation. This is often used as a point of reference for proposed limits in other parts of the world. At this level, it essentially prevents the construction of unabated coal-fired power plants (efficient modern plants emit around 1,500lbs while older plants emit around 1,800lbs CO₂/MWh), whilst allowing unabated gas plant to be built.

A blanket EPS, at the level set in California, would not encourage power plant operators to invest in technologies such as CCS. Rather it will lead operators to simply switch to the cheapest, short-term option to meet energy demand and the standards set by an EPS, which is unabated gas. It is therefore essential that an EPS does not discriminate against coal and allows unabated gas to be built as a result. This would adversely affect the UK's diversity, security and affordability of energy supply.

A standard should be set which forces abatement to be applied to both coal and gas. This should only be applied to new build. An EPS on existing coal generation, at the Californian level, would immediately close stations with resultant blackouts and power shortages.

Because CCS technology is still largely unproven in the generation sector, EPS levels have to start high and be ratcheted down over time as more experience and confidence is gained. Ultimately a level of 150g/kWh could be introduced for all new fossil generation built after 2020, which would force carbon abatement to be installed on all stations.

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

The EUETS is currently the primary instrument to deliver Europe's carbon reduction commitments. It is market based and technology neutral and delivers the necessary reductions required.

An EPS would have the effect of removing higher carbon emitters earlier than would be the case within the EUETS. But under the EUETS's cap and trade system there would be no absolute benefit, as there is already an absolute limit on the amount of CO₂ emissions that can be emitted. An EPS would therefore limit emissions from UK coal plant, which would be utilised elsewhere either within the UK or across Europe.

Eastern European nations within the EUETS are still heavily coal based and are unlikely to agree to an EPS scheme which would limit use of their indigenous energy resources and threaten economic recovery.

¹ Large Combustion Plant Directive/Industrial Emissions Directive

² Hansard: Column 987, 1 July 2010

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?*

An EPS is one way of driving CCS within the UK. Other alternatives include a CCS obligation similar to the Renewables Obligation (RO) or the introduction of a low carbon obligation, which would replace the RO, open to all technologies. An EPS in conjunction with other mechanisms may provide a more flexible approach to delivering the deployment of CCS technology.

The Committee on Climate Change (CCC) recommends the inclusion of CCS demonstration on gas plant within the CCS demonstration projects 2–4. The CCC argue that the “emergence of unconventional gas supplies, particularly shale gas in North America has called into question the previous view that coal is inherently more secure and lower cost than gas for the longer term”.³

However two recent events have highlighted our exposure to the imported gas market and illustrates that short term price trends cannot always be relied upon. Firstly the UK is now a net gas importer. In the first quarter of 2010, and for the first time since 1968, gas imports exceeded indigenous production. This was driven by high demand combined with a general decline in UK production.

Secondly the UK has also recently been exposed to volatile wholesale gas prices at a time of the year when traditional gas prices have been low. In June/July day ahead prices have exceeded 50p/therm, in response to interruptions in Norwegian gas supply. These prices are 25% higher than those experienced last January when the UK was experiencing the coldest temperatures of the last 30 years. As the UK becomes more and more dependent on imported gas there is a danger that prices will become even more volatile as countries start to compete for international gas supplies.

Poory in their report to DECC, “Global Gas and LNG Markets and GB’s Security of Supply” (June 2010), highlighted a number of reasons why unconventional gas may not expand at the rapid rate predicted by many analysts. These include:

- Environmental impact—unconventional gas extraction, and in particular that for shale gas, will typically result in disruption to a large area of landscape as a result of the high number of wells required to maximise gas production. In this respect, the environmental impact would typically be greater than for other energy infrastructure projects such as a gas storage facility or a power station. In addition, the extraction technique of hydraulic fracturing will require very large volumes of water, whose treatment and disposal are likely to provide significant environmental challenges. In addition, where chemicals are used in conjunction with the water, there is the potential for the water table to be affected and a risk of contaminating the supply of drinking water. Given these environmental implications, projects may be subject to delay or additional cost as a result of the licensing and permitting processes, particularly in ecologically sensitive areas.
- Geological uncertainty—in many cases, the potential for significant unconventional gas reserves is yet to be conclusively proven. In addition, some resource areas are likely to provide only limited reserves which prove to be either technically or commercially unexploitable.
- Proximity to existing pipeline infrastructure—this has proved to be an important factor in the rapid development of unconventional gas in the US. Where potential new reserves are remote from existing pipeline infrastructure, this may deter the necessary level of investment to exploit the unconventional gas sources.

In addition conventional gas prices are also likely to rise as LNG demand recovers particularly in the rapidly developing economies, ie China, SE Asia and South America, diverting away supplies from NW Europe.

By their very nature demonstration projects carry higher technical risks; and there is a better chance of proving a commercial technology, which can be rolled out worldwide by supporting four rather than three coal projects.

Globally coal is the fastest growing fossil fuel in particular in China and India where it is driving economic growth. In the developing world the IEA⁴ have identified CCS on coal generation as a necessary part of the pathway to a 50% reduction in CO₂ emissions by 2050, in order to limit atmospheric concentrations to 450ppm as identified by the G8 in 2007.⁵

Therefore CCS on coal is the technology that needs to be proven quickly and rolled out, as it will have greatest impact on global emission reductions. As a consequence this sector offers the greatest market opportunity for UK export and if the UK were to diversify its initial efforts this market could be lost.

UK COAL believes that there is no reason to change the stated position of the Government and it should be reaffirmed that first four demonstration schemes should be undertaken on coal plant. Should subsequent funds be available, the next CCS demonstration programme should be undertaken on a gas fired station.

³ CCC letter to Rt Hon Chris Huhne, Secretary of State for Energy and Climate Change, 18 June 2010

⁴ IEA CCS Technology Roadmap, 2009

⁵ G8 Communiqué, Heiligendamm Summit 2007

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

It is now generally accepted by groups including the G8 that governments and the private sector must work together to deploy CCS. This needs to involve policies that reduce the commercial risk of CCS and enable the private sector to make the massive investments that are required. To many investors an EPS does not reduce commercial risk, but adds another regulatory risk which increases the challenge of investing in first-of-a-kind plants.

At present there is 28GW of coal plant on the system. By 2016, 8GW will have closed under the LCPD. The Industrial Emissions Directive as proposed could see substantial further closures, possibly down to zero by 2023. Ofgem estimate that investment of around £200 billion⁶ is required in the electricity sector to meet this generation shortfall. At present outside of the four demonstration CCS coal power stations proposed, replacement fossil fuel generation capacity will be met by the building of unabated gas generation.

There are six large companies which dominate the UK electricity market namely; E.ON, RWE Npower, Scottish Power, EDF, Centrica and SSE. The first four in the list are foreign owned, based in Germany, Spain and France. These multinational companies invest in schemes based on return and regulatory risk. If investment the UK is deemed as too risky, these companies will simply switch their attention elsewhere with the upshot that nothing is built and a generation gap results.

5. *What is the likely impact of an EPS on domestic energy prices?*

The impact of policies designed to ameliorate climate change is to raise domestic energy bills. DECC estimate⁷ that their existing policies will raise domestic electricity bills by 24% by 2020, before energy efficiency measures are taken into account.

An EPS is likely to increase prices further as substantial investment will be required in new generation capacity. This is difficult to quantify as it depends on the running regime of the plant and in particular the load factor assumed. If a new fossil fuel plant is built as backup to renewable generation then it will be looking to generate at high prices in order to make a return over lower running hours. An EPS would further exacerbate running costs.

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

To the best of our knowledge no other European countries are proposing to introduce an EPS.

Europe's leading economic power German, still encourages the building of high efficiency unabated coal plant to replace older coal coal stations. This policy can reduce CO₂ emissions by up to 25%, the efficiency difference between older sub critical and modern ultra super critical plant.

Many European countries are highly dependent on power generation from coal and lignite as can be seen from the table below. In particular in Eastern Europe coal and lignite is seen as essential to economic development and provides energy security against reliance on neighbouring Russian energy supplies.

Coal Share of Electricity Generation⁸

Poland	91%
Czech Republic	60%
Greece	55%
Bulgaria	52%
Germany	47%
Romania	41%

It is highly unlikely that European Member States would agree to an EPS at the level envisaged by the Committee for Climate Change/UK Government as this would have an adverse affect on their economy and threaten security of energy supply.

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

At the recent Copenhagen talks, the EU unilaterally proposed a 20% CO₂ reduction target with an additional offer to increase its emissions reduction target to 30% if an international agreement was reached. This initial 20% offer was unable to kick start the negotiations and in the end the EU was marginalised, as the final text was brokered by China, South Africa, India, Brazil and the USA.

In reality any international deal will centre on China and the USA. A unilateral declaration by the UK on an EPS scheme is unlikely to sway their opinion, if the agreement is not in their national interest.

⁶ Ofgem: Project Discovery, 9 October 2009

⁷ DECC: Estimated impacts of energy and climate change policies on energy prices and bills, July 2010

⁸ European Commission, EU Energy and Transport in figures 2010

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

Coal is the world's most abundant fossil fuel, with the majority of the reserves residing in USA (29%), Russia (19%), China (13%), Australia (9%) and India (7%). Coal will continue to dominate these economies for the foreseeable future and it is therefore imperative that policy frameworks to address climate change and CO₂ emissions also ensure continued energy security through a role for coal in the energy mix.

Globally coal currently supplies 26%⁹ of primary energy and 40%¹⁰ of electricity generation. The International Energy Agency¹¹ (IEA) forecast that coal will remain the main fuel for power generation throughout the period to 2030, where its share will increase to over 44%. Most of this growth in coal fired generation occurs in non OECD countries which are projected to generate over two thirds of all coal fired electricity, compared to less than half now. Overall coal generation capacity is forecast to increase from 1,261GW to 2,101 GW by 2030.¹²

In developing countries, where economic growth is strong, coal drives these economies. China is the world's biggest coal consumer, currently at 2.76 billion tonnes¹³ which is 70% of its primary energy demand. By 2030 this production will have almost doubled,¹⁴ giving an indication of its dependence on coal to drive its economy.

It is highly unlikely that developing countries would adopt policies that will limit their economic growth. As an EPS on coal effectively can only be achieved through the introduction of CCS and is therefore only likely to be considered if supported by funds from developed countries.

Establishing emission standards for CO₂ would place an immediate restriction on coal-fired electricity generation without consideration for the long-term consequences for the global power generation fuel mix and energy security.

Consequently because of the scale of investment required by developing countries to fit CCS, it unlikely that an EPS would promote an international agreement. A better solution would be to allow CCS to be included within the Kyoto project mechanisms such as the Clean Development Mechanism (CDM). This would allow operators in developing countries to generate Certified Emission Reduction (CER) credits. These CER credits can be used by industrialised countries to meet a part of their emission reduction targets under the Kyoto Protocol and the EUETS.

September 2010

Memorandum submitted by the Confederation of UK Coal Producers

1. The Confederation of UK Coal Producers (CoalPro) represents member companies who produce over 90% of UK coal output. CoalPro is pleased to be able to respond to the Committee's invitation to provide written evidence to their inquiry on Emissions Performance Standards.

EXECUTIVE SUMMARY

2. It is important to drive CCS for both coal and gas if the objective of an 80% reduction in carbon emissions is to be achieved by 2050. This objective will require near total decarbonisation of electricity generation and this must be achieved well before 2050 if decarbonised electricity is to replace fossil fuels elsewhere in the economy, eg for heating and transport. All fossil fuel generation must therefore be equipped with CCS.

3. Coal-fired power stations provide security and diversity of supply. They are able to respond more quickly to peaks in demand than either gas or nuclear stations. Renewables, whilst they can provide a major portion of UK electricity demand, cannot, by their nature, respond to peaks in demand. Coal-fired generation thus provides an essential load following capability.

4. The UK presently has 28GW of coal-fired generation plant. 8GW of this will close by the end of 2015 as a result of the Large Combustion Plants Directive and much of the remainder may close during the period 2016–23 as a result of the Industrial Emissions Directive. Without the construction of new coal-fired plant, the UK will lose this vital component of electricity supply and be subject to severe security of supply risks at periods of peak demand.

⁹ BP, Statistical Review of World Energy 2010

¹⁰ IEA, World Energy Outlook 2008

¹¹ IEA, World Energy Outlook 2008

¹² EIA International Energy Outlook 2009

¹³ IEA, Key World Energy Statistics 2009

¹⁴ IEA, World Energy Outlook 2008 p128

5. The Government has stated that no new coal-fired power plant will be constructed unless it is at least partially equipped with CCS. It will, however, help fund the construction of four such power stations by means of a levy on electricity consumers. It is implied that, once the technology has been proven at commercial scale, those four stations, and all other new coal-fired plant, should be fully equipped with CCS and CoalPro expects this to be the case by the mid-2020s.

6. However, without further new coal-fired plant, which will have to be constructed without such support from electricity consumers, there is a real risk that the proportion of coal-fired generation in the electricity mix will fall from the present level of some 30% to less than 10% by the early to mid 2020s. This would pose security of supply risks, particularly at periods of peak demand.

7. Gas-fired power plant is cheaper and quicker to construct than coal-fired plant although the CCS component of any new fossil fuel plant, coal or gas, can be expected to be similar in both time and cost. On the other hand, in recent years, coal prices have tended to be cheaper than gas prices. As a result, coal and gas fired plant have been broadly competitive with each other. However, coal reserves, are abundant and geographically diverse, including significant indigenous reserves, compared with gas reserves, which are relatively scarce and geographically concentrated, with rapidly declining indigenous reserves. Over time, therefore, coal can be expected to become cheaper compared with gas.

8. If restrictions are placed on coal-fired plant which do not apply to gas-fired plant, then all new fossil fuel generation capacity will be gas-fired. Apart from the security of supply risks that this will impose, the construction of a large amount of unabated gas-fired plant will prevent the objective of an early decarbonised electricity generation system from being achieved.

9. This problem can be addressed by ensuring that all new gas-fired plant should also be constructed partially equipped with CCS, with full CCS applying once the technology has been proved at commercial scale. CoalPro therefore supports the proposal to extend the programme to fund CCS on coal via a levy on electricity consumers to support CCS on some new gas-fired plant.

10. Within this scenario, Emissions Performance Standards can play a part, particularly in determining the maximum level of CO₂ emissions from fossil fuel plant, coal or gas, fully equipped with CCS, and hence in determining the standards that need to be met to achieve a decarbonised electricity supply. However, any interim EPS designed to promote partial CCS which does not differentiate between coal and gas will merely drive new gas-fired plant with consequent security of supply risks and later achievement of electricity decarbonisation.

11. Coal is a more carbon-rich fuel than gas. Hence, whilst an EPS can be derived to ensure that a given proportion of a new coal-fired plant (say one quarter, one half or 100%) is equipped with CCS, applying a similar EPS to new gas-fired plant will mean that a lower proportion of such plant will need to be equipped with CCS. For example, an EPS requiring one quarter of a coal-fired plant to be CCS equipped will not require any such investment in a gas-fired plant. Similarly an EPS requiring one half of a coal-fired plant to be CCS equipped will only require CCS to be fitted to one quarter of a gas-fired plant, and so on. In these circumstances, it is clear that only gas-fired plant will be built. This will be so even if there is a clear implication that more restrictive EPSs will require (eventually) all new plant to be fully retrofitted with CCS. In this case, gas plant will only need to be CCS equipped later than coal-fired plant. Investment dynamics are such that in these circumstances, only new gas-fired plant will be built.

12. An EPS approach can therefore have real value in signalling to the industry what is (and what will be) required in terms of carbon abatement. However, any EPS regime which favours gas over coal will result only in new gas-fired plant being built and in later achievement of full decarbonisation. This implies different EPS levels for coal and gas to achieve the same proportion of CCS. Any other approach would merely result in fuel switching from coal to gas, heightened security of supply risks and later achievement of full decarbonisation.

SPECIFIC QUESTIONS POSED BY THE COMMITTEE

What are the factors that ought to be considered in setting the level for an EPS and what would be an appropriate level for the UK? Should the level be changed over time?

13. A blanket EPS, at any level other than that requiring 100% CCS on both coal and gas-fired plant, will drive gas at the expense of coal and lead to later overall decarbonisation. Different EPS levels should therefore be set for coal and gas designed to ensure that, at any point in time, the same proportions of both new coal and new gas-fired plant are CCS equipped. A blanket of 150g/kWh can be applied by, say 2040 as this will require full CCS on both coal and gas plant and near-zero carbon electricity generation.

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

14. None, unless the differential approach referred to above is adopted. Driving UK emissions below the level necessary to achieve the overall EU cap will merely make more carbon allowances more cheaply available to other Member States. Some Central and East European states are heavily dependent on coal and lignite. They will not agree to a regime which makes it more difficult to rely on their abundant coal and lignite reserves. However, the differential approach set out above could provide both a model which other Member States will follow and earlier, Europe-wide decarbonisation.

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?

15. An EPS could be extremely effective in driving forward the development of CCS technology but not if a blanket approach is adopted which requires CCS to be fitted to a higher proportion of new coal-fired plant than gas-fired plant. In that case, initially, only new unabated gas plant will be built and CCS will be delayed rather than driven forward. For this reason CoalPro fully supports the extension of the demonstration programme to cover gas-fired as well as coal-fired power stations.

16. It should be recognised however, that other approaches could also be equally effective, including a CCS obligation or a low-carbon obligation.

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

17. Yes, to both if a blanket approach is adopted. A blanket EPS will merely drive unabated gas-fired generation. This will pose energy security risks and delay full decarbonisation of the sector. However, a differential approach could both maintain security and diversity of supply and drive early decarbonisation.

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

18. All forms of low carbon electricity generation will increase domestic energy prices, be it renewables, CCS on fossil fuel generation or unsubsidised nuclear generation. A blanket EPS will, in the longer run, increase domestic energy prices because the UK's electricity generation will become more dependent on increasingly scarce, imported gas. A differential EPS designed to maintain a reasonable proportion of coal in the mix will minimise price risks over the medium to long term.

Are any other European countries considering an EPS? If so, should the standards be harmonised?

19. As far as CoalPro is aware, no other European country is considering an EPS. Several Central and East European countries are heavily dependent on coal-fired generation and are likely to be fundamentally opposed to an EPS. Their opposition may be less if a differential approach rather than a blanket approach is adopted. What they will emphatically NOT do is agree to any approach which will make them more dependent on Russian gas!

20. If a European EPS approach does emerge, the approach should be differential and the standards harmonised.

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

21. This is most unlikely given the dependence of some of the world's largest economies on coal, eg USA and China as only the first two of a very long list. If the UK adopts a blanket EPS unilaterally it can be conclusively assumed that the contribution will be zero. However, the adoption of an approach which differentiates between coal and gas may be seen by such countries as a positive step towards driving CCS across the globe without losing the benefits of low-cost coal-fired generation.

CONCLUDING REMARKS

22. CoalPro is willing to discuss this response further with the Committee should they wish to do so.

September 2010

Memorandum submitted by the Institution of Mechanical Engineers

A. GENERAL COMMENTS

The Committee wants to find out about the implications of emissions performance standards on energy markets and future investments, and whether they could encourage the deployment of CCS technologies. The Committee is also interested in the role to be played by UK emissions performance standards in international negotiations on climate change.

As a general principle, an emissions performance standard (EPS) should be feasible to meet; it should involve performance improvement not encourage avoidance of meeting the regulation. The overall effect should be the phased introduction of new technology with more desirable performance characteristics over a reasonable period of time, whilst maintaining continuity of energy supply.

As the answers to the following questions set out, this inquiry raises the question of the electricity and energy markets in which the EPS is applied. This is critically important since an EPS will be effective only as long as it is economically viable for project developers to meet it by using CCS. An EPS cannot therefore properly be considered in isolation and the Institution strongly endorses the Government's decision to consider an EPS in the context of wider energy market reforms.¹⁵

Such a comprehensive and holistic treatment of an EPS is beyond the scope of the present inquiry, but it would be extremely valuable if in advance of this more complex policy debate a discussion of the principles and practical implementation of an EPS were to take place.

If a well-designed EPS that drives CCS technology development and deployment is ultimately introduced as part of a broader set of market reform measures then this may contribute significantly towards the direction taken by international negotiations on climate change. This is because, in the more general sense, it is likely that major countries participating in global climate change negotiations will be much more significantly influenced by actual operating UK CCS plants rather than by UK regulations (that may or may not lead to a negative result (ie nothing being done to meet them; the need to do so is just avoided).

B. RESPONSES TO SPECIFIC QUESTIONS RAISED

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?*

The question of "level" cannot be considered in isolation from the basis for the EPS; what are the emissions based on? Possible bases and units include:

<i>Basis</i>	<i>Example units</i>
i) Per unit of primary energy supplied/used at a particular site	kgCO ₂ /MWh thermal (HHV or LHV basis)
ii) Per unit of electricity produced	kgCO ₂ /MWh electricity
iii) Per unit of CO ₂ produced	fraction of CO ₂ captured and stored
iv) Per unit of electricity generating capacity	tCO ₂ /MW/year

Other factors that need to be considered in connection with the level are:

- Can compliance with an EPS be transferred and/or traded and what are the details of how this can be done?
- What is the time period over which compliance is measured; at least a year is strongly suggested.
- What is the size of the entity to which the EPS applies, eg a generating unit, a plant, a company, an industry sector?

Once these questions have been answered it becomes at least technically feasible to define a level that is intended to meet a desired outcome or outcomes. But the nature of the market in which the plant operates is also extremely important. In the UK context a particular area of uncertainty, for which open and generally accepted peer-reviewed data is surprisingly lacking, is the operating patterns which will be forced on fossil fuel plants by different levels of wind and other uncontrollable (or limited control) renewable generation. Part load operation and starting and stopping all affect achievable emission levels, particularly from unabated (ie without CCS) fossil generation (as well as resulting in additional costs due to the displacement of one low-emissions generation source by another if CCS operation has to be stopped during periods of higher wind generation output).

The "level", together with the other factors required to define an EPS, such as changes to the "level" over time, need to be examined as to their suitability for achieving the required objectives in terms of driving technology and infrastructure changes.

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

If an overall emissions cap and trade scheme (EU ETS) is in place, the primary objective for an EPS should not be to reduce emissions directly. This is because the presence of the EU ETS is likely to nullify any tendency of the EPS to reduce emissions within the bounds of the cap. This happens due to a strong tendency for the total amount of allowable emissions under a cap to be used, thus emissions cuts in one part of the EU ETS can be offset by emission increases in another part, as "freed up" allowances are traded.

¹⁵ "We consider planning applications thoroughly and will not allow any new coal power station to be built unless equipped with carbon capture and storage. While we will consult on the final details of an emissions performance standard, I am clear that without CCS it would be impossible to meet such a standard. However, an EPS on its own is not a magic bullet to decarbonise our economy. We have inherited an energy system that has suffered from a lack of clear direction and was not fit for purpose. That is why we will be implementing comprehensive electricity market reform to ensure that we can have a secure, low-carbon, affordable electricity mix for decades to come."
Chris Huhne MP, Secretary of state for energy and climate change
Letter to the Guardian, 17 August 2010, <http://www.guardian.co.uk/environment/2010/aug/17/policy-on-clean-energy-clear>

An EPS should only be used to do something that an ETS cannot do. It should drive technical change ahead of it being unavoidably required to meet an ETS, with the objective of making it cheaper to meet a given cap in the future or making a tighter cap feasible for the same cost. The cap in question could be national or be interpreted more generally as global emissions.

An EPS does not meet the above criteria if the effect is to preclude totally certain types of power generation plant. A simple ban would be more appropriate in this case. It is also disingenuous to impose an EPS which could theoretically be met but which never will be for commercial reasons; again a ban would be more appropriate and likely to lead more rapidly to the development of the appropriate overall energy policy.

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?*

For clarity, an EPS should drive CCS deployment as well as development. It will be effective only as long as it is economically viable for project developers to meet an EPS by using CCS. This question cannot be separated from wider market reforms.

The first stage in implementing a successful EPS is to decide—and agree—what it is intended to achieve, in the context in which it will actually be applied. For the UK it is suggested that this should be the rapid development of CCS as a proven option for deployment in the UK (and elsewhere, except that some local factors will always differ); an objective which will require two generations of technology to establish proven reference projects. Subsequently, progressively more individual power plant sites should be converted to full CCS implementation or all new power plants should be built with full CCS. It is also critical that the appropriate strategic CO₂ transport and storage infrastructure to support CO₂ capture projects (including both demonstration and deployment phases) should be put in place in a timely manner.

The Institution has already suggested strongly that the current market conditions in the UK indicate that CCS development and deployment on natural gas plants should proceed as quickly as possible,¹⁶ with the objective of having 2nd generation reference plants in operation before 2020. This is a prerequisite for routine deployment of CCS on gas power plants, either as new build or retrofit, in the 2020s.

It should be noted that, if the UK were to develop and deploy CCS on gas, then technically it could be relatively easy to “plug in” coal based CCS technology provided that suitable versions of this were developed abroad. However, availability of suitable coal CCS technology is not a foregone conclusion as no large-scale coal power plant full scale CCS projects are currently committed anywhere in the world¹⁷ and relatively few are even near to making an investment decision. With this proviso, an existing UK CCS infrastructure for gas should make subsequent introduction of CCS for coal possible, provided that suitable sites for new build and retrofit coal plants with CCS had been retained.

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

An EPS which encouraged deployment of unabated natural gas generation, in preference to CCS development and deployment would delay the introduction of CCS in the UK. Even if suitable CCS technology was developed elsewhere it would still take significant learning time to apply routinely from scratch in the UK due to local factors such as UK-specific regulations, power plant mix and other market conditions. (It is doubtful, however, that significant work on CCS from gas will take place elsewhere in the world; Norwegian plans for its Mongstad plant have recently been postponed.¹⁸) Although less critical for energy security, such a scenario would create risk of failure of meeting long-term agenda objectives for climate change.

5. *What is the likely impact of an EPS on domestic energy prices?*

Any well-crafted EPS should ultimately result in lower domestic energy prices, relative to where prices would be without the EPS. It appears likely that CCS projects on gas or coal (under current market conditions) could produce low-carbon electricity more cheaply than the higher-cost offshore wind sites that will have to be considered to meet national emissions targets.¹⁹ Therefore an EPS that drives CCS development has the scope to reduce domestic electricity costs relatively.

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

The EU parliament voted for the introduction of a general EPS, but this was rejected by the Council of Ministers.²⁰ This would have applied a harmonised standard to all EU countries.

¹⁶ Institution of Mechanical Engineers policy statement, Carbon Capture & Storage: natural gas power plants, May 2010 <http://www.imeche.org/media/PPA/Energy/Policy/Carbon+Capture+and+Storage+Gas+Power+Plants.htm>

¹⁷ <http://www.globalccsinstitute.com/downloads/general/2010/The-Status-of-CCS-Projects-Interim-Report-2010.pdf>

¹⁸ <http://www.reuters.com/article/idUSTRE6410YM20100502> “Norway delays Mongstad Carbon Capture and Storage project”, Sun, May 2 2010, “Norway said it would delay the decision to finance a top carbon capture project to 2014, after the life of the present parliament, in a major setback for a technology seen as key to mitigate climate change”.

¹⁹ <http://www.decc.gov.uk/en/content/cms/statistics/projections/projections.aspx>, UK Electricity Generation Costs Update, Mott MacDonald, June 2010.

²⁰ <http://www.platts.com/IM.Platts.Content/ProductsServices/Products/powerineurope.pdf> Platts, “Power in Europe”, Issue 546/March 9, 2009

It is, however, apparent that unless the technology development requirements of the different EU members are in harmony—which they certainly are not—an EPS ought to be left as an optional tool for national governments to use to meet their individual energy supply infrastructure requirements. It is logical to apply a comprehensive EU ETS, but this does then leave available relatively few further regulatory tools for electricity supply developments at the national level, especially when the restrictive effects of the EU Renewables Target also have to be taken into account.

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

It appears likely that legislation for an EPS will now not be considered as part of UK legislation before negotiations in Cancun in November 2010. The approach taken by the UK to carefully consider EPS design and implementation could be noted by negotiators at Cancun (and in the preparations leading to it), but it is difficult to assess what type of impact this may have on global negotiations.

If a well-designed EPS that drives CCS technology development and deployment is ultimately introduced as part of a broader set of market reform measures then this may contribute significantly towards the directions taken by international negotiations after Cancun in the area of mitigation technology development.

This is because, in the more general sense, it is likely that major countries participating in global climate change negotiations will be much more significantly influenced by actual operating UK CCS plants rather than by regulations.

The influence of UK CCS plants would arise in two main ways. The obvious one is to show working CCS power plant and full chain technology. But this is probably less important than the irrefutable evidence that the UK is prepared to pay significant amounts of money simply to make a major reduction in CO₂ emissions from fossil fuel utilisation.

A motivation to access additional sources of energy from renewable generation is well understood and universally shared across the globe. A demonstrable motivation to spend money (even if less than on the equivalent renewable generation) solely to cut emissions to atmosphere would be a tangible confirmation of how serious the UK is about tackling the major cause of anthropogenic climate change.

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

Greater use of an EPS is of itself unlikely to promote such agreement. However, work by professional engineers and scientists to design and build two successive generations of CCS technology, to the point where reference CCS power plant projects exist as the basis for subsequent routine deployment, is likely to help. Indeed, it is hard to see how the largest national emitters of fossil CO₂, China and the USA, as well as the EU, will be able to agree to the necessary cuts in emissions unless they can rely on CCS being available as an option.

If greater use of an appropriate local EPS leads to CCS becoming a real option in a timely fashion then it will give politicians a key tool to negotiate deliverable agreements to tackle fossil fuel emissions and reduce the consequent risks of dangerous climate change.

August 2010

Memorandum submitted by the National Grid

INTRODUCTION

1. National Grid owns and operates the high voltage electricity transmission system in England and Wales and, as National Electricity Transmission System Operator (NETSO), we operate the Scottish high voltage transmission system. National Grid also owns and operates the gas transmission system throughout Great Britain and through our low pressure gas distribution business we distribute gas in the heart of England to approximately eleven million offices, schools and homes. In addition National Grid owns and operates significant electricity and gas assets in the US, operating in the states of New England and New York.

2. In the UK, our primary duties under the Electricity and Gas Acts are to develop and maintain efficient networks and also facilitate competition in the generation and supply of electricity and the supply of gas. Our activities include the residual balancing in close to real time of the electricity and gas markets.

3. Through our subsidiaries, National Grid also own and maintain around 18 million domestic and commercial meters, the electricity Interconnector between England and France, and a Liquid Natural Gas importation terminal at the Isle of Grain. We have also formed National Grid Carbon Limited which is a wholly owned subsidiary advancing the transportation and storage elements of the Carbon Capture and Storage (CCS) supply chain.

EXECUTIVE SUMMARY

4. National Grid welcomes the opportunity to provide input into the Energy and Climate Change select committee's hearing on Emissions Performance Standards (EPS). National Grid analysis suggests that to meet Government's 2050 targets all coal-fired generation would need to be CCS-equipped by 2030 with all fossil fuel generation being abated by 2050. We support Government plans to maintain a diverse energy mix while delivering emissions reductions.

5. Emissions reductions can be brought about by either; i) Cap and Trade schemes; 2) environmental taxes; 3) mandatory emissions standards; or 4) some combination of these. National Grid believes that an Emissions Performance Standard could play a future role as part of a full regulatory system. However, in the first instance energy market reform as part of a future Energy Bill should encourage low carbon investment, and provide a platform for a future EPS. A better immediate strategy would be to await definitive results from the CCS projects to enable a clearer picture to inform EPS development. Setting the level of EPS at too early a stage could have unintended outcomes, applying it at one blanket level could force all coal stations to implement CCS but allow Combined Cycle Gas Turbines (CCGT) to continue to operate unabated. This has the potential to trigger a dash for gas which would lead to volatile price changes and reduced fuel diversity which in turn has potential implications for energy security.

6. In summary National Grid believes there may be a beneficial future role for Emissions Performance Standards, but on balance the time is not yet right. We consider that in the immediate term, the objectives of the select committee would be better served by continuing/expediting the CCS demonstration policy, expanding it to include at least one gas plant, clarifying an acceptable regime for storage and providing incentives for investment in CCS infrastructure with a view to the future wider scale roll out of CCS when commercially and technically proven, facilitating the potential introduction of an EPS once the infrastructure exists to make it viable and sustainable.

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?

7. The goal of an Emissions Performance Standard (EPS) should be to maintain a diverse energy mix while delivering carbon reductions; it should be a realistic but challenging target concentrating on absolute levels of emissions rather than output per energy.

8. An EPS is likely to work best in the presence of a funding mechanism to provide funds to substantially cover the difference between the cost of low carbon generated power and unabated power. Without this it is likely that while generators will be forced to build CCS to meet the EPS target they will operate it as little as possible because it is uneconomic compared to the competing unabated fossil fuel generation. Funding needs to make CCS competitive with unabated plant to ensure that its operation is maximised. Our analysis suggests that to meet 2050 targets all coal would need to be CCS equipped by 2030 with all fossil fuel generation being abated by 2050.

9. However it is not clear that an EPS would encourage CCS investment; in fact there is a risk that the introduction of an EPS could have unintended consequences of prompting a dash for unabated gas plant, thereby diverting potential investment away from CCS. Instead National Grid considers that the stated objectives of the select committee would be better achieved by:

- Clarification of an acceptable regime for long term storage liabilities;
- Retaining existing policy that requires CCS demonstration on any new coal plant and the consideration of an extension of CCS demonstration requirement to new gas fired plant;
- Expedite award decision for construction of the first CCS demonstration project;
- Expedite process for selection of coal CCS demonstration projects 2–4;
- Making an additional commitment to at least one gas CCS demonstration project;
- Implement a floor price for carbon as committed to in the Coalition government policy—this together with ETS should be the primary policy instruments to drive investment in low carbon technologies.
- Stimulate investment in storage characterisation; and
- Stimulate investment in shared user CO₂ transportation infrastructure where the economies of scale render this a least regrets anticipatory approach to investment.

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

10. The EU-ETS remains unproven as an effective tool to drive reduction in emissions, the surplus of certificates has led to low carbon prices. The potential advantage of an EPS is that it could provide a glide path for the industry in terms of volume of low carbon generation needed. An EPS would give the UK unilateral ability to exceed EU Emissions Trading Scheme (EU-ETS) targets if set accordingly.

11. Industry has considerable uncertainty regarding the level of carbon prices into the future and so investment decisions in low carbon technology are very difficult. An EPS on the other hand can provide a clear volume signal setting out the future requirement. The price of carbon becomes only indirectly relevant

because the EPS provides an absolute requirement to reduce emissions. It is our view that if an EPS were to be introduced, then there should be scope for companies to trade their EPS obligations and this should ensure that those that can develop low carbon technology at the lowest cost will do so in order to earn revenues from selling the EPS certificates.

12. However, it is not clear that an EPS would bring any additional benefits; in fact it could bring unintended detrimental consequences such as deterring investment in UK clean coal technologies. Its disadvantage is that the volume will be delivered regardless of cost (ie an EPS could drive the (successful) delivery of emissions reductions but at great expense due to technology not being sufficiently mature.) The stated objectives would be better achieved by expediting/extending government commitment to CCS demonstration projects to prove and refine the technology and introduction of a carbon floor price.

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?

13. National Grid does not think an EPS would be effective in driving forward the development of CCS technology at this time. However there may be a point in the future when an EPS will provide a useful "line of sight" to the industry regarding the roll out of a more mature technology. This would then help with the development of large scale transport and storage infrastructure to be delivered to meet the targets in a timely and efficient manner.

14. We believe that the UK CCS demonstration programme should be extended to cover gas fired as well as coal fired power stations. Preferably this would be by the addition of one or more gas fired demonstrations in addition to the four coal fired demonstrations already mandated. If an EPS were to be introduced consideration should be given to the introduction of different EPS levels for coal and gas fired generation. In this way both forms of fossil fuel generation might be equally incentivised to adopt CCS in order to maintain a diverse energy mix and avoid a dash for unabated gas.

15. Rather than focussing all policy measures upon CO₂ emitters (capture plant) there is merit in considering complementary policy measures to stimulate investment in CCS transport and storage infrastructure. At present we perceive the lack of maturity of offshore storage site characterisation, the lack of clarity over long term storage liabilities and the consequent residual uncertainties to be significant barriers for investment in the other parts of the value chain. The additional costs of CCS (compared to unabated fossil fuel generation) also pose a significant barrier to CCS market development. In this regard we believe there are substantial economies to be realised through multiple emitters in the same area sharing the same pipeline transportation infrastructure. It therefore seems to us that the objective of expediting CCS development could be served by complementary policy initiatives to procure the early "investment grade" characterisation of potential storage formations and the early development of "cluster sized" pipeline networks. These measures would significantly reduce barriers to entry for capture investments at both power station and industrial premises and pave the way for a fast roll out of CCS upon completion of the demonstrations.

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

16. An EPS for new plant may result in a delay in new plant being built until CCS technology becomes proven at a large scale commercial level. Coupled with the EU's Industrial Emissions Directive (IED), which will tighten the rules on SO₂ and NO_x emissions from large combustion plant, this may result in lower plant margins with no plant able to fill the gap relatively quickly due to large scale plant being "new" technology—abated gas and coal or nuclear. A decision will need to be taken whether to retro-fit abatement equipment in order to comply with the new legislation. The economics of this decision will be affected by any need to retrofit CCS and may result in further plant closures, lower plant margins and higher prices.

17. The majority of the coal plant that will still be open in 2020 will be 50 years old and coming to the end of its planned lifespan. Consequently, forcing the retrofitting of CCS, because of the EPS, would more than likely result in the early closure of plant due to the economic viability of retrofitting CCS to plant coming towards the end of its operational life.

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

18. National Grid believes it should be a Government objective that the transition to a low-carbon economy is achieved at the lowest cost possible to UK tax payers. Low carbon generation in general is likely to result in an increase in end-user energy prices and the cost increase brought about by an EPS may not be significantly greater than that arising from high carbon prices in the EUETS. UK wholesale power prices are currently closely related to underlying fuel and carbon costs, in particular gas due to the amount of existing plant and the plant currently under construction.

19. We believe that proposed Government policies, such as the Green Deal, should be given time to ensure consumers can maximise their energy efficiency in the first instance.

20. Additional CCS equipment will increase the capital cost of new plant and reduce overall fuel efficiency, thus increasing the breakeven price of new stations. Even with carbon prices of €30/tonne, CCGT and unabated coal are likely to be the lowest cost options for generation. An EPS would remove these options from the marketplace and/or a higher carbon price would make CCS abated plant more competitive—both are likely to result in higher prices passed through to the end consumer.

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

21. National Grid are unaware if any other countries are considering an EPS however we believe that there is merit in working with the EU to coordinate development as we operate within a wider European market for energy.

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

22. The UK has an important role to play within the EU, therefore any action taken by the UK leading to EU-wide positions would send out a strong signal ahead of the climate negotiations in Cancun. However it is National Grid's view that a better approach would be to continue with our current CCS demonstration projects and clarify an acceptable regime for long term storage liabilities.

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

23. Emissions reductions can be brought about by either; i) Cap and Trade schemes; 2) environmental taxes; 3) mandatory emissions standards; or 4) some combination of these. Carbon dioxide emissions can in theory be regulated in the same way as other atmospheric emissions such as sulphur dioxide where absolute emissions limits have been set. In the US, the EPA mandate sulphur emissions reductions and this leaves operators with decisions to make on whether it is more cost effective to upgrade or close existing plant (note that the US EPA has recently tightened sulphur emission limits). The Large Combustion Plant Directive is having the same effect in Europe. Both set standards for new plant.

24. An EPS would fulfil a similar function and therefore, in principle, could be used as one of a basket of measures to help with efforts to reduce global CO₂ emissions. Using the precedent set for sulphur, negotiations around the carbon equivalent might gain support. However, research would need to be carried out to understand the costs and benefits of such a strategy over other approaches such as cap and trade (although they are not necessarily mutually exclusive). In particular, what would energy prices, security and the energy mix be if such a strategy was introduced? This would probably be different for each country as each has a different proportion of coal generation in their energy mix.

September 2010

Memorandum submitted by Scottish and Southern Energy

1. EXECUTIVE SUMMARY

(1) An Emissions Performance Standard (EPS) imposes a limit on the amount of CO₂ emitted from power stations. The UK Government has committed to imposing this Standard, and is currently considering the details as part of its wider review into reforming the energy market.

(2) Whilst sharing the Government's commitment to reducing CO₂ emissions and to preventing new unabated coal plants from being built, SSE is concerned about the unintended and potentially damaging consequences that seeking to deal with these issues through the introduction of an EPS could have. All of the main EPS models have serious flaws and create a number of problems for both the UK energy market and UK energy policy—for example they could jeopardise security of supply by forcing existing stations to close and prevent investment in new gas plant, and unnecessarily increase costs for consumers.

(3) As such SSE would encourage Government to look at alternative options to an EPS, as introducing measures in primary legislation when the same ends can be achieved through other means does not fit with the principle of introducing fewer, but more effective, regulations outlined by the new Government. Enhancing existing policies and targets—new coal could be ruled out through changes to the planning system, and decarbonisation targets could be met through a strong carbon price—might achieve Government aims without creating the same difficulties.

(4) However SSE is aware that this might be unacceptable politically. If this is the case and Government feels that an EPS has to be introduced for political reasons then it should be done in a way that has as little negative impact as possible on the UK, whilst achieving Government objectives. SSE believes that the best option would be:

- A Portfolio EPS covering a generator's entire fleet of generations assets (coal, gas, nuclear, renewables).

(5) However, if Government is determined to introduce a plant level EPS—either a Per kWh or an Annual Emissions Bubble—then it would have to follow these two principles:

- It should only apply to new plant; and
- Any plant built when a particular EPS was in place would have this grandfathered if the level was subsequently reduced.

(6) SSE believes that of the two plant-level EPSs available the Bubble is the better option. This is because it allows generators to build cheaper plants which would have low running hours, will be able to meet peaks in demand, and act as a back-up for renewables.

2. INTRODUCTION

(1) The Government's proposal to introduce an EPS into the energy market imposes a limit on the CO₂ emissions from power stations in GB.

(2) Any intervention by Government of this type into any market has the potential to create inflexibilities and stifle investment and therefore should only be made if it is able to achieve Government aims without adversely affecting wider policy objectives, such as security of supply. It is obviously counter-productive to introduce measures that have significant adverse effects on other policies, and are unnecessary to achieve a desired result.

(3) Whilst it is unknown as to exactly what Government would want an EPS to achieve, it appears likely that it would be for one of two reasons:

- To rule out new unabated coal plant (a move SSE fully supports).
- To use an EPS as part of a suite of measures to enable it to meet its 2030 decarbonisation ambitions.

(4) [N.B. These ambitions (set by the Government's own Committee on Climate Change (CCC)) are for the UK to emit, on average, 100gCO₂ for every unit of electricity produced by 2030. In 2008 the average was 482gCO₂.²¹]

(5) As such this submission examines each of the main three EPS models, and some of their different variants, in terms of:

- whether they can achieve either of the Government's potential objectives; and
- their potential effects, both positive and negative, on UK energy policy.

(6) It then offers SSE's view on what the best way forward would be, taking into account whether an EPS would be necessary to achieve objectives. It may be that these aims can be achieved just as comprehensively through alternative methods—eg a sufficiently high carbon price could ensure that the UK met its 2030 ambitions—without the need for an EPS. Given the potentially negative effects that an EPS could have in the UK (detail below) SSE would encourage Government to consider suitable alternative approaches.

(7) In addition the introduction of an EPS may be inconsistent with European legislation (Article 9(1) and Recital 9 of the Industrial Emissions Directive) and therefore open to legal challenge, a fact which must be given careful consideration.

3. A "PER UNIT" EPS

(1) A Per "unit" (kWhr) of electricity generated EPS is generally perceived as the standard EPS model, and is currently used in California. It places a limit on the emissions that can be produced by each unit of electricity produced ie for each kilowatt hour (kWh) a certain number of grams of carbon dioxide (gCO₂) can be emitted. Currently an unabated coal station has an emissions level of around 850gCO₂/kWh, a modern gas plant is around 380gCO₂/kWh, and nuclear is 7-22gCO₂/kWh.

(2) A Per Unit EPS would be set at a certain level—eg 450gCO₂/kWh which would rule out a modern unabated coal plant—and then be reduced to meet the 2030 ambitions. This reduction would mean that other types of carbon generation would gradually be ruled out.

3.1 *Potential Effects of a Per Unit EPS*

(1) SSE believes that a Per Unit EPS is fundamentally incompatible with wider policy goals, particularly regarding security of supply. It also offers few long-term benefits, as it does nothing to reduce overall emissions, and does not encourage CCS; all it does is stop new plant from being built.

²¹ DECC: Autumn Performance Report 2009 (Jan 2010) p. 25

Security of Supply:

(2) There is a need to build new generation capacity to replace old plant, predominantly coal and nuclear, that is coming offline before 2020. Without this replacement capacity there is a risk of an “energy gap” where the UK would not have the ability to meet demands for electricity, potentially resulting in scenarios such as enforced black-outs. No new coal with CCS, or nuclear, will be available until 2020 at the earliest and therefore the UK will have to fill the potential energy gap with new gas plant—this will be done through efficient CCGT plant.

(3) In addition the UK will need to build a number of plants to provide back-up for increased renewable capacity and to meet system peaks. The inherent intermittency of most renewables means that a substantial proportion of renewable capacity will need to be backed up by either biomass, pumped storage, coal, or gas so that the UK can cope with scenarios when demand is very high and renewable output is very low. Whilst this plant is unlikely to run all of the time (see below) it is still key for the UK’s security of supply—currently there is no new coal capacity with planning consent or in construction and therefore the only option for back-up plant over the next decade will be gas. This will need to include less efficient OCGT plant which is cheaper to build but has low running hours.

(4) However a Per Unit EPS could prevent this investment in new gas. Whilst initially it would be set below the level of a new coal plant, it could eventually reduce to below the level of a new gas plant—this would either force a) existing plant to close; or b) the retrofit of CCS technology. Given that CCS is as yet still unproven and uncosted it would probably force plant to close.

(5) Therefore if an EPS of this type was introduced now then it would create a huge amount of policy and regulatory risk for investors in gas plant—they would be unsure as to when the level of the EPS might change and whether this might render their investment obsolete, or force them to retrofit CCS. Whilst reassurances from Government about EPS levels and timescales are helpful investment decisions are taken over decades, not five year Parliaments, and therefore risk still remains.

(6) As such an EPS could a) force existing stations to close before they are due to, thereby reducing the UK’s overall generating capacity; and b) prevent investment in gas power stations. This would happen at a time when the UK needs these plants to ensure its energy security through to 2020 and beyond, and to provide back-up for renewables.

Affordability

(7) One general point regarding affordability that is worth noting is that any piece of regulation that restricts certain types of plant will inevitably lead to less flexibility when attempting to meet low carbon and security of supply goals. This lack of flexibility means that the most cost effective routes are often ruled out.

(8) The increased costs specifically associated with a Per Unit EPS are dependent on the level at which it is set. If it is set at a level that rules out new gas plant, or forces new gas plant to have some heat recovery (CHP), as advocated by some environmental groups, then this will significantly increase the costs of security of supply. This is because investors will either not build new gas necessary to meet the potential gap thereby forcing Government to intervene and incentivise developers to build expensive low-carbon baseload plant which would be paid for by the consumer.

(9) Even if the level was set at a level above a modern gas plant (but below a new coal plant) the risk and uncertainty associated with an EPS would make investors unsure about the safety of their returns thereby driving up the cost of capital for these investments. This would inevitably be reflected in higher electricity bills for consumers.

Emissions

(10) It is very important to remember that an EPS only tackles the carbon intensity of electricity generation; it does not tackle the volume of CO₂ emissions produced by the UK power sector, which is already constrained by the EU ETS. Additional measures that reduce emissions from power generation simply mean that other carbon intensive industries covered by the EU ETS, both in the UK and the EU, can emit more. SSE believes that Government should focus on those industries not covered by the EU ETS, as measures to decarbonise these will actually reduce overall emissions.

(11) As such an EPS would not limit the volume of CO₂ emissions from the UK power sector—it would just rule out certain types of power stations, or limit their running hours, which some groups have argued could help to prevent high carbon “lock-in”.

CCS

(12) It is extremely unlikely that a Per Unit EPS will encourage the development of new technologies such as CCS. An EPS will force generators to invest in low carbon technology, but nuclear and renewables, both of which are proven technologies, will appear far more appealing than a high risk CCS project for any developer. Alternatively investors, many of whom have the option to invest outside of the UK, will delay or scrap UK investments and/or invest elsewhere.

(13) As such an EPS will not on its own deliver CCS. Therefore, policymakers must focus on a separate mechanism for developing CCS as a technology option for deployment. The main mechanism chosen to do this is the CCS Demonstration Competition. The CCC has advised Government to consider including at least one gas plant in the demonstration, which is allowed under the Energy Act 2010.

(14) SSE supports this recommendation as it believes that gas with CCS will have a role to play post-2020. In a world of cheap prices gas CCS (running at baseload, as back-up, or both) could be economically competitive with other low-carbon technologies such as nuclear and renewables—developers would therefore want to build it, and it might be preferable politically to nuclear. There is also potential for the technology and learning regarding gas CCS to be exported, particularly given the predicted transfer of many countries from coal to gas generation. As such it would seem logical to include gas in the demonstration as it is a technology that the UK will need and/or want in the future.

High Carbon Lock In

(15) There is a fear that by not introducing a Per kWh EPS, or by introducing an EPS which is not stringent enough, the UK will build high carbon plant before 2020, namely gas and coal, and therefore be “locked in” to a high carbon future with plants that will run into the 2040’s. The result will be that the UK’s ambitions for decarbonising most of the power sector by 2030 will not be realised, thereby jeopardising its emissions reduction target of 80% by 2050.

(16) The CCC has recognised this concern in its recent letter to the Secretary of State Chris Huhne, in which it recommended that all new gas plants built post 2020 should have CCS fitted to ensure that a) high carbon lock-in does not occur; and b) that the UK is able to meet its 2030 decarbonisation ambitions. However it does not believe that a Per kWh EPS on gas needs to be introduced before 2020 to ensure this.

(17) Although many of the gas plants which are set to be built pre-2020 will initially run continuously in order to meet baseload demand (the minimum level of demand that the UK always requires), in the future they will run less and less; instead of trying to generate income from running at baseload they will run at times when demand, and therefore price, is high but output from other sources of electricity (eg renewables) is low. Therefore they will produce fewer and fewer emissions over time.

(18) The reason for this choice to run less is based on the modelling that investors do to calculate potential returns before they take the decision to build a plant—such modelling includes the possibility of a high carbon price going forward. Given that the carbon price looks set to rise over the coming decades it makes sense to try and generate greater quantities of income in short bursts when the electricity price is high, rather than running the plant continuously which would incur large carbon costs and consequently significantly lower returns.

(19) As such, whilst SSE understands the concerns of environmental groups about new gas plant being built pre-2020 it feels that decarbonisation targets can still be met without a Per kWh EPS being introduced now.

(20) Regarding coal SSE does not believe that an EPS is necessary to prevent high-carbon lock-in. Chris Huhne recently stated that the Government will not allow new coal plants to be built unless they have a portion of the plant covered by CCS from day one—given that CCS is unproven and uncoded building new coal currently presents too much of a risk for developers and is therefore extremely unlikely to happen. However, to guarantee this Government could rule out new coal without 100% CCS from day one through changes to the planning system, a move SSE would support.

3.2 SSE’s View on a Per Unit EPS

(1) A Per Unit EPS could achieve both of the Government’s potential aims of preventing new unabated coal; or being used to help meet the 2030 decarbonisation ambitions. However, SSE believes that a Per Unit EPS is fundamentally incompatible with wider policy goals as:

(2) It could jeopardise security of supply by preventing new plant being built pre-2020 to replace old plant which is shutting down, and/or to act as back-up plant for renewables/peaking plant.

- It could increase the costs of security of supply significantly for consumers.
- It does not encourage CCS development.
- It does not reduce overall emissions.
- It is not necessary to introduce one now to meet the 2030 decarbonisation ambitions.

(3) However Government may feel that it has to introduce a Per Unit EPS. If this is the case then it would have to follow two principles—without these the policy risk for investors and developers would simply be unmanageable.

- (i) The level set for the EPS would only be applied to new plants (and could be set now at the level of a modern, efficient gas plant—380gCO₂/kWh); and
- (ii) Any plant built when a particular level was in place would have this grandfathered if the level was subsequently reduced.

(4) If these two principles are followed then Government would avoid some of the problems outlined above regarding Per Unit EPS's—it would rule out new coal now; new gas plant could be built between now and 2020 thereby helping to ensure security of supply; and it would reduce the risk and uncertainty regarding future investments associated with an EPS and therefore the cost of capital.

(5) In addition if a trajectory for the level to be reduced over time (known as a “glide path”) was put in place it could ensure that post 2020 new gas plant would be required to fit CCS, and the average of 100gCO₂/kWh would be met in 2030, in line with the CCC's recommendations.

(6) However there are still fundamental flaws with this model. The largest problem is that the level would have to be set high enough to allow for OCGT's to operate—they currently run at up to 575gCO₂/kWh—which may be unacceptable politically. It could also result in a rush to build plant before the level of the EPS reduces (eg 2020) resulting in overbuilding, supply chain bottlenecks, and margins falling as a result. This type of unstrategic approach could weaken the generation market and seriously jeopardise future investment by creating uncertainty and increasing risk.

4. A COMPANY-WIDE/PORTFOLIO EPS

(1) Most companies operating in the electricity generation sector in the UK has different generation assets eg coal and gas plant, wind farms, hydro-electric projects, which produce different quantities of CO₂ each year.

(2) A Portfolio EPS is effectively a Per Unit EPS but on a company's entire portfolio. Instead of restricting the average emissions level per unit of electricity produced, it restricts generators to a portfolio which had a set average emissions level per unit of electricity produced—eg 500gCO₂/kWh. This is then brought down over time.

4.1 *Potential Affects of a Portfolio EPS*

Security of Supply

(1) As a Portfolio EPS covers a generator's entire portfolio of generation assets, rather than a single plant, it allows high carbon plant such as unabated gas and coal to run for limited periods. This allows for new gas to be built now to secure supplies and/or act as back-up plant to renewables and system peaks in the future. It also encourages companies to invest in low carbon technologies, particularly renewables, which will help to ensure security of supply in the long-term.

Affordability

(2) A Portfolio EPS allows generators to plan how and when they decarbonise their generation, which means that it is done in the most cost-effective way possible. In addition it would obviate the need to distinguish between new and existing plant because the emissions from both would be covered—this would make the legislation simpler and reduce regulatory uncertainty and consequently the cost of capital.

High Carbon Lock-In

(3) The Portfolio model does allow new unabated coal to be built now, and new, unabated gas to be built post 2020. Despite this SSE does not believe a Portfolio EPS would lead to high-carbon lock-in. In fact it would be easier to meet the 2030 decarbonisation ambitions with this type of EPS because its glide path (the amount the EPS level reduces by over time) could be aligned with the CCC's desired glide path to 2030. This would be very straightforward to do and would provide clarity for generators, allowing them to plan investments strategically and at least cost.

(4) In addition, in order to rule out new coal the Government could issue an additional statement which required all new coal to have 100% CCS from day one of operation, a move SSE would support.

Unintended Consequences

(5) The major problem with the Portfolio model is the unintended consequences it could produce. Given that all companies would be starting from different positions—some with very high average emissions and some with very low—it could result in a number of unwanted mergers and acquisitions in the market. Drax, which generates with a mixture of coal and biomass, could be put in a position where it is forced to merge with a wind developer to ensure that its average emissions met the EPS; alternatively it would have to be acquired by a larger, less carbon intensive generator.

(6) This could potentially be dealt with through setting a common level at a point in the future eg 2020 which all generator's portfolios would have to meet. However, up to this point generators would be free to decarbonise as they chose.

(7) Alternatively a trading scheme—whereby for example Drax paid another utility to decarbonise for it—would have to be developed. This type of scheme would effectively be a UK EU ETS, albeit on a tighter and more easily regulated market, which could present difficulties for the UK Government.

4.2 SSE Views

(1) Although a Portfolio EPS would not on its own rule out new coal this could be achieved through an additional policy statement, a move SSE would support. It could also help to achieve the 2030 decarbonisation ambitions by aligning its glide path (the amount the EPS level reduces by over time) with that of CCC's desired glide path.

(2) In addition a Portfolio EPS:

- Is compatible with policy on security of supply as it allows for new gas plant to be built; and
- Allows for generators to decarbonise cost effectively and strategically.

(3) However, the problems that could be created through unwanted mergers and acquisitions and a cap and trade system would need to be carefully examined.

5. A PLANT-BASED EMISSIONS “BUBBLE”

(1) This proposal would limit a plant's annual total operational emissions of CO₂, essentially creating a “bubble” that each plant is able to emit within a year—this model is already used in the EU's LCPD. The level set would be determined by Government based on emissions modelling and would limit the running hours of higher carbon plants, whilst allowing renewable plant to run indefinitely. Regulations would be in place to prevent a plant over-emitting and bursting the bubble.

5.1 Potential effects of a Bubble EPS

(1) The potential effects of a Bubble EPS depend on whether it is introduced with or without a glide path to 2030. The reason for introducing a glide path would be to ensure emissions from power stations came down over time. Without one industry could in theory emit a large amount of emissions until 2030, before making a dramatic reduction to meet the required level.

(2) However it is extremely difficult to set such a meaningful glide path at this stage as the viability and costs of CCS are as yet unknown. This means that even if a glide path is set now there will be uncertainty as to whether it might be changed in the future once these costs are known. In addition different glide paths would be needed for existing and new plant, which adds further uncertainty into the model. This uncertainty and increased risk could lead, as with the Per Unit model, to new gas plant not being built.

(3) Therefore SSE would favour an emissions bubble which was only set for new plant, and had its particular limit grandfathered if the level was ever reduced. Government could also set a signal that the level would be reduced in 2020, and that in 2030 the level will be sufficiently reduced to meet the CCC's decarbonisation ambitions target. The effects of such an approach are detailed below:

High Carbon Lock-In

(4) SSE believes that this type of EPS would be strong enough to rule out new unabated gas post 2020 running at baseload. It would allow unabated gas to be built as back-up plant but this would mean it would run very limited hours within its bubble. In addition most of the plant built between now and 2020 will not be running at baseload in the 2020's because of the carbon price, and the fact that older plant is less efficient—as such the danger of large amounts of CO₂ being emitted between now and 2030 is limited.

(5) However this approach does not completely rule out new coal; a Bubble EPS could rule out new coal running at baseload, but would not rule out new coal running as back-up/peaking plant. An additional statement would therefore be required, and SSE would support such a move.

Security of Supply

(6) As with the Portfolio model a Bubble EPS on new plant does not jeopardise security of supply as it allows unabated high carbon plant to run for limited hours within their “bubbles”. This would allow new gas plant to be built now to meet the potential energy gap. Also, by only restricting annual emissions rather than emissions per unit of electricity, in the future it would allow older plant to stay open/incentivise new plant to be built to act as back-up plant for renewables and system peaks.

Affordability

(7) Any policy that results in different plants having different bubbles will not give best value for money as it does not allow generators to decarbonise at least cost—rather its options are

(8) limited by the size of a particular plants bubble. In addition, as with the Per Unit model, a Bubble could result in a rush to build plant before the level reduces (eg 2020) resulting in supply chain bottlenecks and increased cost and uncertainty as a result.

Other Concerns

(9) Certain plants are better suited to CCS than others due to locational and other factors. Therefore setting a blanket limit on emissions from certain types of plant will prevent the best locations being chosen for CCS projects, thereby increasing costs and risk. The only way to overcome this problem is to set different bubbles for different plants but given the variables involved this is nearly impossible.

5.2 SSE's View

(1) The Bubble EPS can, with an additional statement, rule out new, unabated coal. It could also ensure that the average emissions from the UK power sector in 2030 are compatible with the CCC's ambitions.

(2) In terms of compatibility with wider policy a Bubble EPS does fit with security of supply goals. However there is a risk that it will unnecessarily increase the cost of decarbonisation, particularly CCS, and lead to supply chain pinch points at times when the Bubble level is reduced.

6. CONCLUSIONS

(1) It is clear that no EPS model is perfect. All three, whilst they might achieve Government's potential aims, create a series of additional problems that must then be solved. SSE's concern is that this could result in a situation where policies are implemented to solve problems created by earlier policies. This adds a great deal of complexity to an already complex area, and is clearly not a sustainable model of Government. In addition the introduction of an EPS may be inconsistent with European legislation and therefore open to legal challenge.

(2) As such SSE would urge Government to consider whether it believes an EPS is necessary to achieve its aims. If it is not, and these can be achieved through alternative approaches which do not create these additional problems, then SSE would suggest that these options should be implemented instead—introducing measures in primary legislation when the same ends can be achieved through other means does fit with the principle of introducing fewer but more effective regulations outlined by the new Government.

(3) For example if the aim of Government is simply to rule out new coal then a change to the planning system, or an announcement in the National Policy Statements requiring new coal stations to have 100% CCS fitted from day one would be sufficient; and a high enough carbon price could achieve the UK's 2030 ambitions. Ultimately Government should be focussing on implementing policies which best achieve its aims, not vice versa.

(4) However SSE understands that this might not be an acceptable position for Government and that it might have to introduce an EPS for political reasons. Whilst this is unfortunate SSE appreciates that it could be the political reality and, based on the potential aims of the Government outlined above it would recommend the following:

Potential Aim 1—Government wishes to introduce an EPS to rule out new unabated coal.

Best Option—No EPS; use the planning system.

Best EPS Option—A Per Unit EPS which specifically rules out new coal but not other plant, and does not reduce over time.

This EPS would not have a glide path and it would be enshrined in primary legislation that it only applied to new coal. Without this assurance the policy risk would be unmanageable. The level for this type of EPS should be set at the level of a modern gas plant.

Potential Aim 2—Government wishes to introduce an EPS as part of a suite of measures designed to ensure that it meets its 2030 decarbonisation ambitions.

Best Option: A high enough carbon price could achieve these ambitions without the need for an EPS.

Best EPS Option: A Portfolio EPS with cap and trade. Whilst this option could create problems for the Government SSE feels that this is the least harmful of all the EPS options as:

- It is compatible with the UK's security of supply agenda.
- It allows generators to decarbonise at least cost, thereby keeping costs for consumers to a minimum.
- Its glide path can easily be aligned to fit with the CCC's trajectory to 2030.
- It would be simpler than the other two models to implement in legislative and regulatory terms as it covers both existing and new plant.
- The Government could use the existing powers in the Climate Change Act 2008 to introduce a cap and trade scheme in secondary legislation.
- New coal could be ruled out through an additional Government statement, thereby strengthening the EPS overall.

The level should be set at the UK's current average level of emissions—approximately 482g CO₂/kWh—and then brought down in line with the CCC's trajectory to meet the 100g CO₂/kWh target in 2030.

Alternative Option—if the Government wants to choose an alternative EPS model, despite the problems that this would inevitably cause, then it would have to follow these two principles:

- (1) the level set for the EPS would only be applied to new plants.

- (2) Any plant built when this level was in place would have this grandfathered if the level was subsequently reduced.

Given that OCGT plant has relatively high CO₂ emissions per kWh of electricity produced, it would seem logical that an annual emissions bubble should be introduced.

The limit for this bubble should be set to ensure that:

- New efficient CCGT gas plants can run 100% of the time; but that
- New OCGT's can run at low load factors to provide back-up.
- The level can then be reduced in 2020 to require all new gas plant running at baseload to fit CCS.

This option could rule out new coal, encourage new plant was built until 2020 thereby ensuring security of supply, and help the UK achieve its ambitions for decarbonisation in 2030.

Memorandum submitted by the Wood Panel Industries Federation

EXECUTIVE SUMMARY

1. The Wood Panel Industries Federation believes that Emissions Performance Standards are necessary to ensure that the forthcoming generation of power plants based on renewable technologies, in particular biomass, deliver real cuts in the UK's carbon emissions.

2. The Wood Panel Industries Federation notes that the direct CO₂ emissions from the combustion of wood chip for electricity production are over six times that of coal as measured on a kg/MWh basis.

3. The Federation notes that the markedly lower life-cycle CO₂ figures claimed for electricity produced from biomass are heavily reliant on the replanting of carbon-absorbing biomass ie trees.

4. It further notes that, in order to absorb the carbon released from the initial combustion of woody biomass, replacement trees would need to be left to grow for a number of decades.

5. Therefore, the Wood Panel Industries Federation believes that in order to achieve real reductions in levels of CO₂ in the short to medium term, there is a demonstrable need for Emissions Performance Standards and their application to large-scale (< 50MW) electricity-only power plants.

ABOUT THE WOOD PANEL INDUSTRIES FEDERATION

6. The Wood Panel Industries Federation (WPIF) is headquartered in Grantham, Lincolnshire. It is the representative organisation giving voice to the industrial manufacturers in the United Kingdom and Ireland of Wood Chipboard, Oriented Strand Board (OSB) and Medium Density Fibreboard (MDF).

7. Total gross UK employment attributable to wood panel manufacture amounts to just under 8,700 full-time equivalent jobs. Its total economic impact is around £1 billion per annum.

THE EMISSIONS PERFORMANCE STANDARD

8. According to the Biomass Energy Centre, managed by the Forestry Commission, the direct CO₂ emissions from combustion of wood chip for electricity in a large-scale plant are 2100 kg/MWh. The direct CO₂ emissions for the combustion of hard coal are 345 kg/MWh.²²

9. The Biomass Energy centre does state that the approximate life-cycle CO₂ emissions for large-scale electricity production utilising biomass are 58 kg/MWh compared to hard coal's 484 kg/MWh. However, this figure of 58 kg/MWh is wholly dependent on the replanting of new trees to produce fresh biomass. Furthermore, these new plantings would require around 30–40 years before they had absorbed the carbon initially released in the combustion of biomass. Therefore, in the short to medium term, new large-scale biomass plants will massively increase carbon emissions.

10. Given this life-cycle, without carbon capture and storage technology in place, the proposed new generation of large-scale electricity-only biomass power plants will not be operating on a carbon neutral basis by 2030—the point at which the Committee on Climate Change says that the UK will need to have decarbonised its power sector.

11. Whilst the WPIF accept the conclusions of the Biomass Energy Centre that burning biomass is nearly carbon neutral *over the life-cycle* compared to fossil fuels, it is still the case that, compared to wood panelboard production, electricity produced from the burning of biomass is a significant source of carbon dioxide.

12. The comparison of carbon emissions between electricity from biomass and panelboard manufacture is vital because of the combination of an extremely tight supply of domestic wood and the distortion of the wood market caused by the Renewables Obligation. The UK wood panel sector is entirely reliant on domestic sources of wood (virgin and recycled fibre). The Renewables Obligation gives biomass energy

²² http://www.biomassenergycentre.org.uk/portal/page?_pageid=75,163182&_dad=portal&_schema=PORTAL

companies much greater purchasing power in a market experiencing supply problems. Therefore, if the current subsidy regime remains, there is a distinct chance of displacement of both the wood panel industry and the important contribution it makes to both carbon sequestration (in wood products) and renewable heat (it is the largest industrial sector generator in the UK).

13. The enclosed report by CarbonRiver shows that, if the wood panel industry were displaced by the renewable biomass energy industry, the UK would see a net increase in its carbon dioxide emissions of six million tonnes per annum. This is equivalent to a 1% increase in the UK's carbon dioxide emissions.

14. Given the much greater carbon emissions arising from the combustion of biomass in the short to medium term, an EPS is essential for meeting the emissions targets set to take place under the EU ETS. Without Emissions Performance Standards, the continued development of large-scale electricity-only biomass plants will result in vastly increased levels of carbon dioxide being produced in the UK.

15. At present, large-scale electricity-only biomass power producers can merely promise to invest in replanting forestry or defer their obligation to account for their carbon emissions by relying on forestry companies to manage a sustainable supply of feedstock. In effect, there is no guarantee that carbon neutrality will be achieved, even in the long term.

16. Large-scale growth of biomass usage for electricity production will not only be detrimental to the wood processing industries, including the sawmills. It will likely start to put greater pressure on land presently used for farming food crops, both in the UK and abroad.

17. The UK needs to make reductions in its carbon emissions in the short to medium term. The large-scale production of electricity from biomass will, in this timeframe (10–20 years), lead to a significant rise in carbon emissions.

SUGGESTED ACTIONS

18. The Wood Panel Industries Federation urges the Committee to recommend that Government make provision for legislating for Emissions Performance Standards.

19. It urges the Committee to ask that Emissions Performance Standards apply to all power generators regardless of feedstock.

20. It further requests that that the Committee work with colleagues both at home and abroad to push for a harmonized Emissions Performance Standard throughout the European Union.

September 2010

Memorandum submitted by Prospect

INTRODUCTION

1. Prospect is a trade union representing 122,000 scientific, technical, and managerial and specialist staff in the Civil Service and related bodies and major companies. In the energy sector, we represent scientists, engineers and other professional specialist staff in the nuclear and radioactive waste management industries, the wider electricity supply industry and, increasingly, also in the gas industry. Our members include experts developing carbon capture and storage technologies and those with regional responsibility for promoting sustainable energy systems. They are engaged in operational and technical management, research and development and the establishment and monitoring of safety standards, environmentally and in the workplace. We are fortunate in being able to draw on this broad range of knowledge and expertise to inform our views.

2. Prospect welcomes the Select Committee's decision to investigate the effectiveness of Emissions Performance Standards (EPS). We believe that the need for action to deliver secure and sustainable energy policies is urgent, and that a step change in policy is necessary to deliver the necessary emissions reductions to curtail dangerous climate change. Control of carbon is the key issue and, with growing evidence that "cap and trade" schemes do not work to maximum effectiveness, we believe that "cap and regulate" should also be an option.

3. It is against this background, and our longstanding support for investment in a secure, balanced low carbon energy supply for the UK, that Prospect convened an expert-led seminar at The Royal Society in October 2008 to discuss "The Future for Clean Coal". At that seminar Charles Hendry, then Shadow Minister for Energy, stated that "To me this debate is not about whether clean coal is possible or desirable. The fact is that it's vital. Our job has got to be to push forward and deliver it because we are 35–40% dependent on coal for the generation of electricity. We will continue to be an economy reliant on fossil fuels and hydrocarbons for many years". The report of this seminar is enclosed with the hard copy of this evidence and can be accessed at <http://library.prospect.org.uk/id/2009/00025>

How effective is an EPS likely to be in driving forward the development of CCS technology?

4. As set out in Prospect's seminar report, there are a number of factors that would help in driving forward the development of CCS technology. We do believe that there is a role for the market. However, as Charles Hendry stated "If the government leaves it purely to the market there is a real risk that homes and businesses will be left without fuel or energy in a few years to come". He argued persuasively for an EPS to set a clear direction for investors of what the industry is working towards and what is required of it. Prospect has certainly supported the need for a clear, long-term and stable policy direction to support investment decisions. In addition, government should be prepared to commit public financial support, at least at demonstration stage to prove that the technology works to scale. Among other issues that need to be addressed, practitioners at our seminar identified a clearer regulatory policy framework for key issues such as long-term liabilities and greater clarity around health, safety and environmental issues in order to reduce design and other costs.

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

5. Against this background of broad support, we do want to sound a note of caution about the potential practical implications of introducing an EPS. For example, the technology within gas turbine plant is such that installed plant would require significant and costly adjustment to achieve the EPS aim of reducing or restricting emissions. This would affect energy security as all plants were modified within similar timescales. A move to achieve EPS through installation of CCS technology would not be viable at all sites, for reasons such as not having enough land available, and these would have to be closed. For plants that do have CCS fitted or retro-fitted there will be a learning curve as CCS has yet to be proven on large-scale systems. In the event that issues of reliability or high maintenance costs emerge, there could be an impact on security of supply.

6. In terms of the impact on climate change, carbon capture would beneficially reduce emissions from the plant. However as with other EPS routes, such as fuel pre-processing or plant redesign, there will be a negative impact on plant efficiency. It will therefore be important to assess sustainability and impact on emissions over the whole life cycle.

What is the likely impact of EPS on domestic energy prices?

7. There is a general expectation that much needed investment in the UK's energy infrastructure will increase costs, though there is a separate debate to be had about how to apportion the impact of price increases—not least to guard against a regressive outcome for the fuel poor. To the extent that EPS increases the capital cost of plant, increases maintenance or operational demands, or results in more fuel being burnt, it will contribute to increased costs. It could also lead to a further decoupling of energy prices from the raw fuel cost, since the cost of the fuel—whether coal or gas—will be a smaller percentage of the overall power station operating costs.

September 2010

Memorandum submitted by UKCCSC and UKERC

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 (CO₂) emitting sources of power generation (ie 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.²³ 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 CO₂ in the atmosphere, it would be sensible 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 CO₂ 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 CO₂ than gas plants, so if for example 85% of CO₂ is captured by a coal plant you may then emit around 150g CO₂/kWh where as if 85% is captured with gas you may emit down to 70g CO₂/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.

²³ For example, as outlined in analysis undertaken by and for the Committee on Climate Change. See www.theccc.org.uk for further details.

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 CO₂ 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.²⁴ 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 (eg capture plant, pipeline, CO₂ 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 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 1,100 lbs CO₂/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.

²⁴ 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.

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.²⁵ 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, 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.

²⁵ <http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx>

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.

September 2010

Memorandum submitted by RWE npower

SUMMARY

1. RWE npower, part of the RWE Group, owns and operates one of the largest and most diverse portfolios of power generating plant in the UK with over 9,000 megawatts (MW) of large gas, coal and oil-fired power stations and cogeneration plant. Our retail arm, npower, is one of the UK's leading suppliers of electricity and gas with around seven million customers.

2. We are pleased to respond to the select committee's inquiry into emission performance standards. Investment in new low carbon generation will be essential for the UK to meet its greenhouse gas emissions targets of an 80% reduction in emissions by 2050. However it is important that a clear strategy is developed to ensure that new investment is delivered in a cost-effective way that does not adversely impact on either security of energy supply or UK competitiveness.

3. We are concerned that proposals for introduction of an EPS on new coal-fired power stations, whilst not necessarily setting more stringent emissions limits than existing coal policy, could set an unacceptable precedent for either new gas fired generation capacity or existing coal-fired power stations. Raising the possibility of an EPS for gas plant beyond 2020 will lead to investor uncertainty and is likely to lead to security of supply concerns in the 2020–30 period as old nuclear and remaining coal plant are closed.

4. Whilst we recognise that CCS is likely to play an important role in low carbon generation in the future, the priority must be in ensuring that the technology is adequately demonstrated and that investors have the certainty needed to make decisions around the high level of capital investment that will be needed to achieve a low carbon energy supply. Prematurely setting an EPS on either coal or gas plant will not contribute towards this certainty.

RESPONSE TO SPECIFIC QUESTIONS

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?

5. The key factors that should be taken into account in deciding either the need for an EPS or the level that an EPS should be set at are as follows;

- Will an EPS be effective in delivering investment in low carbon electricity generation capacity?
- What are the likely impacts of introduction of an EPS on investor confidence in the UK? In particular are there any consequences for electricity security of supply?
- What impact will there be on electricity prices and consumers from introduction of an EPS?
- What level of emissions is achievable from commercially available technology? What are the practical implications for a demonstration plant?

6. The stated aim of the EPS as set out in the Coalition programme for Government is to prevent coal-fired power stations being built unless they are equipped with sufficient carbon capture and storage to meet the emissions performance standard. However, the coal strategy set by the previous Government already requires any new coal-fired power station to demonstrate CCS on at least 300 MW net capacity with the expectation that CCS would be retrofitted to its full capacity by 2025. Given this strategy introduction of an EPS is considered to be unnecessary and premature.

7. We are concerned that an EPS, whilst acting as a moratorium on construction of coal fired power stations, will do nothing to incentivise demonstration and development of CCS technology. Development of CCS demonstration must be part of a wider strategy for delivering a low carbon energy system which requires a comprehensive strategy to ensure that the necessary investment is forthcoming.

8. The EUETS remains the key mechanism which will deliver emissions reductions in the electricity sector in the UK. Additional policies may be necessary to incentivise investment in specific low carbon forms of electricity generation. However an EPS, whilst it would prevent investment in unabated coal, would not provide any incentive for investment in other low carbon electricity generation capacity.

9. Whilst doing nothing to encourage generators to invest in new low-carbon generation an EPS could have potential impacts on investors' confidence in investing in new infrastructure in the UK. As a mechanism it would penalise investment in technologies with high levels of CO₂ whilst failing to create appropriate incentives or an effective framework to deliver the necessary investment in low carbon technologies. Rather than focussing on an EPS Government should consider what is needed to make it attractive for investors to invest in low carbon technology.

10. Regulatory changes that could potentially impact on the return of an investment will impact on investors' decisions on investment in new power plant capacity in the UK. The potential for the introduction of future emissions standards for either coal or gas fired power stations will have an impact on investors decisions on whether to invest in the UK and which power plants to invest in. This could have significant implications for security of electricity supply in the UK and consequently electricity prices for consumers.

11. Suggestions that the level of an EPS could also change over time or that an EPS could be introduced for gas fired power stations built after 2020 increases exposure to political risk, which can only have significant negative impact on investor confidence.

12. It needs to be recognised that whilst carbon capture and storage technology is a potential for future low carbon generation of electricity the full chain has not yet been demonstrated and is not likely to be commercially available for a number of years. It is far from clear that warranties on performance standards vendors will be able to offer and how these might impact on the cost of CCS.

13. Setting an EPS for a coal fired power station with demonstration plant fitted to 300MW is also likely to be difficult where the operating pattern of the unit with CCS fitted is difficult to predict at this stage. The fact that the CCS is at the demonstration stage would mean that it is very difficult to set a meaningful EPS until it is clear that the unit with CCS fitted is fully operational and meeting expected CO₂ removal efficiencies. It is therefore difficult to see what can be achieved by setting an EPS prior to CCS being judged commercially available.

14. An EPS may have a role to play in setting future standards for fossil fired power generation but this should only be introduced once the technological performance and costs of CCS on both coal and gas-fired plant have been adequately assessed.

15. Once CCS is commercially available we would expect it to be evaluated through the EU Commission BREF process (Reference Document on Best Available Techniques) whereby technical experts evaluate the performance of combustion technologies and advise on what standards are achievable and should be applied through the environmental permitting process. In considering appropriate standards a number of factors would need to be taken into account including appropriate compliance periods, age of plant, whether to include or exclude start-up and shut-down, scope for derogations and exclusions etc.

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

16. The EUETS sets the overall level of emissions that will be achieved in the traded sector out to 2020. Introduction of an EPS will therefore not result in any further reductions in CO₂ emissions from the traded sector.

17. If investment in the UK resulted in greater reductions of CO₂ than would have occurred if an EPS had not been introduced, these would clearly have to be paid for by increased energy costs for UK consumers. In addition the overall emissions reductions required across the EU would be easier to achieve as a consequence of higher UK investment and the overall cost of carbon across the EU would reduce. Competitors elsewhere in Europe would therefore benefit from lower costs of carbon and consequently energy. In effect UK customers would be subsidising customers elsewhere in Europe.

18. The threat of any introduction of an EPS or mandatory retrofitting of CCS on gas plant would act as a strong deterrent for investment in new plant at a time when a significant amount of existing coal and nuclear capacity will be closing. This could then result in the perverse consequence of higher UK CO₂ emissions if existing coal fired power stations remain open for longer.

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?

19. An EPS will not drive forward the development of CCS technology. If investors perceive that it is too risky to invest in new coal plant with demonstration on one unit because it is not clear that a future EPS level would be achievable, it could in fact act as a delay in driving forward the technology. Many pan-European companies such as RWE have a number of options for investment across Europe. Uncertainty around introduction of an EPS in the UK could result in investment decisions favouring other European countries rather than the UK.

20. Rather than focus on an EPS to drive development Government should aim to ensure that investment in low carbon technologies is attractive to investors. Once the technology has been demonstrated effectively on the first round of projects through funding via the CCS levy and European funding the next stage of investment should be driven by the same criteria as investment decisions in other low carbon technologies.

21. To ensure that low carbon investment is achieved in the most economically efficient way then it is important that there is a level playing field for making choices between alternative low carbon investments.

22. Unabated fossil fired power generation may still have a role (albeit a much smaller role) in the electricity generation mix and in the transition to a low carbon electricity system. In particular unabated gas generation may be a necessary back up for intermittent renewables.

23. In addition to recommending consideration of an EPS for new gas fired power stations from 2020 onwards the CCC has recommended that serious consideration should be given to funding at least one gas demonstration project. However the relatively low CO₂ intensity of the emissions from a CCGT would result in a very high cost per tonne of CO₂ abated compared with other technologies. We do not believe that CCS on gas fired plant will be a competitive or cost effective means of reducing CO₂ emissions in the UK for a significant period of time. The focus should be on demonstrating the technology on coal-fired power stations which remains the global priority. Given this context it is not clear what benefits there would be from demonstration on gas fired plant. In addition it is likely to lead to significantly higher demonstration programme costs for the consumer.

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

24. Introduction of an EPS will not stimulate investment in low carbon technologies and, if introduced for gas plant in addition to coal, could deter investment in high efficiency CCGT plant. If introduction of an EPS leads to delay in investment in new capacity then clearly energy security could be impacted. Delayed investment will tend to maintain older higher emissions plant on the system for longer, making it harder to achieve UK climate change goals.

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

25. If an EPS is introduced in a way that does not constrain investment decisions beyond the current policy on new coal fired generation then it is unlikely that an EPS would result in any impact on domestic energy prices.

26. However if the manner of introduction of an EPS leads to delays in investment in new capacity (particularly new gas fired generation) and Government fails to come forward with an effective framework for encouraging investment in low carbon technologies this could result in a shortage in capacity and domestic energy prices are likely to rise.

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

27. As far as we are aware no other European countries are currently considering introduction of an EPS. However, we understand that a legislative proposal for the introduction of an EPS from 2020 was discussed in the Dutch Parliament earlier this year, but has not progressed since the Parliament re-formed following elections.

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

28. Introduction of an EPS would send out the message that the UK Govt does not consider that the EUETS will be sufficient as a mechanism to meet Kyoto and successor targets.

29. This is likely to lead to lack of confidence in whether global mechanisms will contribute to reductions in greenhouse gas emissions and potentially make it harder to reach agreement on these mechanisms.

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

30. Emission performance standards can be part of the mechanisms to address climate change but it is difficult to see how emissions trading and EPS can be used alongside each other. The aim of an emissions trading scheme is to deliver emissions reductions in the most economically efficient manner. Imposition of an additional standard will reduce the economic efficiency of the scheme.

31. Suggestions of a mandatory EPS would be unacceptable to countries with significant domestic fossil fuel reserves, until such time as CCS is proven to be technically and commercially viable at scale.

September 2010

Memorandum submitted by EURELECTRIC

EURELECTRIC is the sector association representing the common interests of the Electricity Industry at pan-European level, plus its affiliates and associates on several other continents. The European Electricity Industry recognizes the responsibility of the power sector as a major emitter of GHG and is taking actions. That is why 61 electricity companies' CEOs—representing well over 70% of total EU power generation—signed in March 2009 a Declaration whereby our sector clearly committed itself to carbon-neutrality by 2050. As a requisite, the declaration also draws attention to the need for a properly-functioning electricity market in Europe, the desirability of an international carbon emissions market and the role of all technologies, including nuclear, renewables and CCS, to efficiently evolve to a low carbon electricity system.

EURELECTRIC had already expressed its concerns with attempts made to introduce an EPS for CO₂ at European level or to allow Member States to introduce such a standard. We would like to use the opportunity of this inquiry to submit our arguments on the implications of the introduction of a national Emissions Performance Standards for CO₂.

THE INTRODUCTION OF AN EU-WIDE EPS FOR CO₂ WOULD CAUSE NO ADDITIONAL REDUCTION IN EMISSIONS

EURELECTRIC regards the EU-ETS as the key policy instrument to reduce CO₂ emissions in Europe. Properly constructed and with continued political support, the EU-ETS will provide a reliable carbon price, which will act as a signal for market participants, including power generators, to direct their investment towards less carbon-intensive production in an economically efficient manner. As a result, CCS and other low-carbon technologies will over time become competitive. It is important that EU-ETS remains technology-neutral. The European electricity industry will be subject to full auctioning of CO₂ emission allowances from 2013. The power sector will therefore pay the market price for all its CO₂ emissions and this cost will be taken into account in any plant investment and operation decision.

However, EU ETS can only operate efficiently if market players can freely choose between various abatement options. In EURELECTRIC's view, there is therefore no role for mandating or banning any particular technology under the EU-ETS, and such approaches can only undermine the carbon market and reduce its economic efficiency. Moreover, there is no environmental justification for introducing regulation in this area, as CO₂ emissions from the ETS sectors are in any case capped.

BANNING OR MAKING MANDATORY ANY PARTICULAR TECHNOLOGY BY SETTING AN EPS FOR CO₂ WOULD BE COUNTER-PRODUCTIVE

As a consequence of the introduction of an EPS for CO₂, advances in CO₂ capture technologies would be derailed. EPS would immediately make CCS mandatory for coal-fired power stations. It must be noted that in its impact assessment of the proposal for a CCS Directive, the Commission had found that a hasty and mandatory CCS would cost €6 billion more than when the technology is more mature. An EPS would limit technological and cost-efficient options to reduce CO₂ emissions and would thereby increase marginal costs of CO₂ reduction. In addition, energy supply would become more dependent on imported gas. Since electricity generation at CCGT plants with CO₂ capture would be more expensive and less efficient, unabated gas plants would be built instead of coal-fired plants ready for CCS—depending on the threshold. If coal is driven artificially out of the market by an EPS, the efficiency of the carbon market would be reduced impacting short-and medium-term investments in low carbon technologies. This would have a negative impact on security of supply and cause higher price volatility. It is impossible to consider the introduction of an EPS for CO₂ before the potential and costs of CCS have been properly assessed, both for coal and gas.

THE INTRODUCTION OF A DOMESTIC EPS FOR CO₂ WOULD CAUSE NO ADDITIONAL GLOBAL REDUCTION IN EMISSIONS

A domestic EPS for CO₂ would increase the domestic cost of electricity production (and price to customers). It would reduce the overall demand for CO₂ allowances from the EU ETS and, as a consequence, reduce the price of allowances in the EU market. In parallel, electricity costs (and prices to customers) in other EU Member States would be reduced. It would lead *de facto* to a transfer of revenues from the sponsoring Member State to all others.

ARTICLE 193 TFEU AND INTRODUCTION OF NATIONAL EPS FOR CO₂

EURELECTRIC would also like to challenge the legal interpretations claiming that member States should be allowed to introduce CO₂ EPS based on article 193 TFEU (ex-article 176 TEC). A national EPS for CO₂ would not constitute “*more stringent protective measures*” according to 193 TFEU (ex-article 176 TEC). Indeed, more stringent measures are measures which go in the same direction as the EU measure but achieve outcomes beyond those envisaged at EU level. The objective is to further enhance the level of environmental protection achieved at EU level. The implementation of national emissions performance standards in addition to the ETS would not lead to a stricter environmental approach but would indicate the choice of an altogether different approach. Member States would be choosing other measures and not “*more stringent protective*” ones.

EU ETS HAS DELIVERED ON THE OBJECTIVES

EURELECTRIC would like to repeat its support for the EU ETS. It provides long-term transparency and stability as well as near-term clarity, which is essential for investors in the European electricity industry. It delivers agreed carbon reductions at least cost by setting a market carbon price and it has succeeded to date in this aim.

September 2010

Memorandum submitted by Statoil

RESPONSE TO THE PARLIAMENTARY INQUIRY ON EMISSIONS PERFORMANCE STANDARDS

Statoil welcomes the opportunity to comment on the Parliamentary Inquiry on Emissions Performance Standards. The UK energy market is important for Statoil in a number of ways. Statoil is the largest importer of natural gas to the UK and an investor in offshore renewable projects in the UK.

Statoil is also considering, based on our CO₂ storage experience from the oil and gas business, to develop a new business as a storage provider for CO₂ from 3rd parties. Statoil is also a partner in the CO₂ Technology Centre Mongstad (TCM) in Norway, and have entered into an agreement to construct a full-scale carbon capture facility at the Mongstad Refinery.

Statoil acknowledges that emission of greenhouse gases is a major challenge, and we believe that coordinated and powerful effort by governments, businesses and individuals is required to combat climate change. Statoil believes that wide deployment of CCS in the longer term perspective is one necessary measure to reduce greenhouse gas emissions from power production.

Statoil remains to be convinced that the EPS is the best method for enabling CCS and other low carbon generation technology to develop. Mandating standards before technology is ready could have detrimental effects on the energy mix of the UK and may not lead to the most efficient outcome.

NECESSARY MEASURES TO FACILITATE CCS AND REDUCE CO₂

Statoil sees market based cap-and-trade systems such as the EU Emissions Trading Scheme (EU ETS) as the main instrument for cost efficient reduction of GHG emissions. The EU ETS provides a predictable framework for industry in the long term, rewarding the most carbon efficient solutions. However, Statoil fully recognises the EU ETS does not currently provide sufficient investment incentive in low carbon generation, and that public funding are required to speed up development and implementation of CCS in the short term. The main long term objective of CCS is to become a competitive tool for reducing GHG emissions, ie that the cost of CCS meets the carbon price. To do this a reliable market focused regime must be maintained and relied upon to provide investor confidence.

To achieve wide deployment of CCS in the longer term perspective an appropriate regulatory and financial framework is required in the shorter term. Such mechanisms will primarily involve public funding, as CCS technology is currently at an early demonstration phase and not yet commercially viable. Statoil supports the present EU and UK policy on CCS—the single most important issue at present is to get the planned CCS demonstrations built as quickly as possible.

The CO₂ Technology Centre Mongstad, which is scheduled to start up in 2012, is an example of fruitful public private partnership, which we believe will be of great importance for wide deployment of CCS. The public private partnership consists of Statoil, Shell, Sasol and Gassnova SF (owned by the Norwegian Government). The goal of the test centre is to further develop and test various technologies relating to carbon capture from exhaust gases from the combined heat and power station, and from emission sources at the refinery. The test centre is scheduled to start up in 2011.

ENERGY SECURITY

Introducing a demanding EPS on all emission from power production would in practical terms make CCS mandatory when investing in new power plants in the UK. Statoil is concerned that commercialisation of CCS technology will be negatively affected by EPS, as industry could be exposed to the full cost and risk of CCS before the technology is commercially available. It is reasonable to expect EPS to have large detrimental effects on investments in new power production, as few investors will be able to take on projects faced with the risks of employing technologies that are not technological and commercially mature. This could hamper the longer term viability of CCS as an efficient tool in emission reductions.

Such impacts on the energy systems in the UK could undermine the investment in gas fired power plants to provide flexible electricity generation to manage intermittent renewable load. The flexibility and ability to respond quickly to demand peaks is one major characteristic of gas-fired power plants. This characteristic is of major importance in electricity markets with a large share of renewable production, such as wind power. The increase in investment costs of CCS are likely to limit the construction of gas-fired power plants. If they were built these costs would require baseload operation which would not fit the supply pattern required with high levels of renewable energy. This would have negative impact on the security of supply in the UK electricity market with a growing share of renewable production and reduced ability to meet peak demand.

NATURAL GAS AND RENEWABLE ENERGY PRODUCTION

Another important measure to reduce carbon intensity of the power sector is the use of natural gas, which could reduce CO₂ emissions by 70% compared to old coal-fired power plants. Natural gas is a very cost competitive fuel, which is available now and will provide secure supply of energy in the long term. Statoil believes that the combination of natural gas, which could reduce CO₂ emissions by 70% compared to old coal-fired power plants, and wind power which is emissions free, could quickly deliver large reductions of emissions from power production. However, implementation of EPS would jeopardise future investment decisions both in power generation and consequently further upstream. Gas producers require long term signals that gas demand will continue into the future in order to invest in maintaining supply levels to the UK. In addition new gas fired power station are required to provide the additional capacity that will be called upon to generate when renewable energy cannot.

STATOIL'S RECOMMENDATIONS

Regulatory stability is crucial to achieve the investments needed to reduce UK carbon emissions both for fossil power producers and renewable energy developers. Statoil appreciates the current Government policy regarding the public funding of up to four demonstration projects. Wider energy policies such as EPS must consider the impacts such legislation would have on the stability of the energy mix within the UK and the supply security issues this will have for the future and we remain unconvinced that this represents the best way to deliver a sustainable reduction in CO₂ or deliver CCS technology to the market. Statoil appreciates the opportunity to communicate our opinion in this regard and we remain available for any further discussions on this matter.

September 2010

Memorandum submitted by EDF Energy

SUMMARY POINTS

- We agree with the Government that an Emissions Performance Standard (EPS) will not on its own achieve decarbonisation. Nevertheless, we believe that EPS will ultimately have a role to play, alongside electricity market reform.
- The primary objective of the proposed EPS would be to prevent new coal-fired power stations from being built unless they are equipped with sufficient carbon capture and storage (CCS) facilities. However, the proposal for an EPS raises the question of its potential extension in two respects, firstly to encompass other new fossil fired power stations and secondly to encompass existing fossil fuelled power stations.
- Applying an EPS to new coal plant alone implies the acceptability of new unabated gas plant. We believe that further investment in Combined Cycle Gas Turbine (CCGT) plant, beyond the minimum that is required to bridge the gap to transition to low carbon technologies, will reduce the medium term potential for decarbonising the electricity sector and increase the risk that the long term emissions reduction targets will not be met, as the carbon emissions from these new assets will be “locked in”. As well as increasing the country’s exposure to gas price risk, there would be little immediate contingency if CCS were delayed or demonstrated to be too expensive.
- We believe that the arguments are finely balanced in respect of the adoption at this stage of the proposal by the Climate Change Committee (CCC) that no new gas-fired power stations, except perhaps for peaking purposes, should be constructed after 2020 unless equipped with CCS. While the direction indicated by this proposal is undoubtedly correct, there is a risk that this approach

may create perverse incentives leading to an unnecessary “dash for gas” ahead of the 2020 deadline. Nevertheless, we agree with the CCC that there would be merit in including a gas-fired plant in the four CCS demonstration plants to which the Government is committed.

- CCS is still at an early stage of development, and, on the Government’s current best estimate, it is only likely to become technically and economically viable for new plant after 2020 at the earliest. The technical and economic challenges of retrofitting CCS to existing plant will be even greater than for new plant. Until CCS has been proven technically and economically or the UK has made sufficient progress in constructing new low carbon generation capacity, we believe that it will be difficult to specify the detail of any EPS measures to restrict the operation of existing fossil fuelled plant and ultimately to force their closure. Such measures would need to be carefully calibrated in order to deliver emissions reductions in a cost-effective manner without jeopardising security of supply by forcing the premature closure of existing plants.
- Therefore, while we believe that it is useful for Government to signal the intention to phase out fossil fuelled generation, other than potentially for peaking purposes, on a timescale consistent with the CCC’s recommendations that electricity generation should be largely decarbonised by 2030, we believe that it is too early to specify the detailed rules for implementation of an EPS for this purpose. At this stage, the immediate priorities for Government should be the implementation of a carbon price floor to strengthen the incentive for investment in all low carbon technologies, and the reform of the electricity market to ensure the right capacity mix is built for economic delivery of decarbonisation and security of supply.

INTRODUCTION

1. EDF Energy is one of the UK’s largest energy companies with activities throughout the energy chain. Our interests include nuclear, renewables, coal and gas-fired electricity generation, combined heat and power, electricity networks and energy supply to end users. We have over five million electricity and gas customer accounts in the UK, including both residential and business users.

2. EDF Energy believes that, as well as concerted efforts to improve energy efficiency, large scale investment in electricity infrastructure is urgently required to replace existing plants and meet the UK’s climate change targets. It is important that the transition to a low carbon economy is progressed efficiently to ensure that the competitiveness of UK energy supplies is maintained while also ensuring the stability and affordability of energy prices. It is essential that the right decisions are made now to secure investment in large-scale low-carbon electricity generation and to promote the transition to a low carbon economy. There will need to be a diverse energy mix, including nuclear, renewables and CCS technologies that can be applied to fossil fired generation plant subject to their successful demonstration.

3. We must recognise the scale of the challenge that this represents for the electricity sector and the importance of the need to take action now. The current markets have served us well up until now, but these need to be modified to deliver the UK’s current energy policy objectives. We welcome the planned consultation by DECC on market reform in the autumn, as well as the work that is being taken forward by HM Treasury to underpin the carbon price this year to ensure that we get a robust signal on the future carbon price. Together these elements should provide sufficient clarity to continue with our plans to invest in low carbon electricity generation.

RESPONSE TO SPECIFIC QUESTIONS

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

4. EDF Energy believes that energy policy must address the three general overarching issues of security of supply, decarbonisation of the economy, and affordability. Without a holistic approach to the problem that considers how the proposed policy interacts with existing frameworks of decarbonisation measures, we believe that a mandatory and inflexible mechanism to limit carbon emissions, like an EPS, may run the risk of unintended consequences, with considerable potential for delay in vital low-carbon infrastructure. For example, if the EPS is set too high then this may simply encourage the development of unabated gas-fired plant instead of low carbon. California has an EPS limit of 1,100lbs CO₂/MWh (~ 500kgCO₂/MWh), which is often used as a point of reference for proposed levels around the world, and, while this prevents the construction of unabated coal-fired plant, it still allows for the construction of modern CCGT plant, which have direct emissions of around 350kgCO₂/MWh. Favouring one fossil fuel over another will not deliver the level of decarbonisation required to meet the UK’s climate change objectives, and it will also pose a significant risk to the country’s security of supply due to a lack of diversity. We believe that further investment in CCGTs, beyond the minimum that is required to bridge the gap to transition to low carbon technologies, will not be the right answer for the UK, because it will increase the risk that the long term reduction targets will not be met as it will lock in the higher carbon emissions from these new assets. As well as increasing the country’s exposure to gas price risk, there would be little immediate contingency if CCS were delayed or demonstrated to be too expensive.

5. While an EPS can be used to curtail emissions from fossil fuel plant, it will do little to create a tangible incentive for investment in new low carbon generation. It should be seen therefore as only part of the solution. Furthermore, the CO₂ emissions from fossil fuel plant are dictated by the carbon intensity of the input fuel and the efficiency of the plant: both of these parameters are fixed in the design and construction of the plant. The options therefore for changing the carbon footprint of fossil generation are relatively limited.

6. CCS does provide a potential option for keeping coal and gas in the generation mix by capturing and storing CO₂ emissions. However, CCS is still in an early stage of development and, at the Government's current best estimate, is only likely to become economically and technically viable after 2020. Setting an EPS before the CCS is first implemented at scale could be premature, since it could risk the enforced closure of fossil plant, which could jeopardise security of supply in advance of other measures to bring forward investment in other low carbon technologies.

7. Therefore, the introduction of an EPS must be considered in the context of the successful development and demonstration of CCS. Without CCS being demonstrated, it could be premature to recommend the level at which the EPS should be set. If a retrofit programme to install CCS were mandated at a later stage, then the expectation would be that the level of the EPS would decline over time, matching the timescales for completing a CCS retrofit for existing fossil plant.

8. We therefore believe that once CCS has been proved viable or the UK has made sufficient progress in constructing new low carbon generation capacity, there would then be merit in an EPS as either a form of a regulatory "backstop" to ensure emissions from operational fossil plant are abated, or as part of the longer-term solution in removing residual emissions.

9. At the same time, we do not believe that EPS can be the primary driver that promotes the UK's transition to a low-carbon economy. We believe that this can only be achieved through a wider package of electricity market reform that produces both a strong carbon price and a credible revenue stream for low carbon generation from the market that is protected from the distortive impacts of excessive subsidies for various technologies.

10. If the objective of the EPS is simply to force a moratorium on new unabated fossil fired plants, this can also be achieved in a more flexible manner through the National Policy Statements (NPSs). The draft Overarching National Policy Statement for Energy (EN-1) currently states that all applications for new combustion plant should demonstrate that the plant is "Carbon Capture Ready" (CCR) before the consent may be given. We recommend that once CCS is demonstrated to be viable, then this could be announced in the Annual Energy Statement. The wording in the relevant NPSs could then simply be amended to reflect the requirement of new combustion plants to have CCS. We believe that such an approach will introduce an effective form of regulation that is no longer based on arbitrary targets but is more process-orientated in both nature and scope.

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

11. An example can be taken from Germany's experience with its aggressive centrepiece Renewable Energy Sources Act (EEG), which came into force in advance of the establishment of the EU ETS in 2005. A recent study by a German think tank²⁶ cites academic analysis that finds that "that while the CO₂ emissions in Germany's electricity sector are reduced substantially, the emissions are hardly altered at the European scale by Germany's EEG. This is due to the fact that Germany's electricity production from renewable technologies mitigates the need for emission reductions in other countries that participate in the ETS regime, thereby significantly lowering CO₂ certificate prices by 15% relative to the situation without EEG" (p21). Due to this substitution effect, it concludes that "since the establishment of the ETS in 2005", the EEG's net climate effect has been equal to zero and that the EEG "attains no additional emission reductions beyond those achieved by ETS alone" (p6).

12. This experience would suggest that specific targeted policies can achieve specific outcomes even though they could in practice undermine broader policy frameworks. However in the case of the EU ETS it isn't clear if these specific interventions are simply serving to disguise the shortcomings of the EU ETS or if it is genuinely being undermined. We have already alluded to the need for market reform and the need to underpin the carbon price because we believe that while the EU ETS has been useful in establishing a market price for carbon, it is failing to provide a credible long term market signal to bring forward investment in the low carbon generation that is required to deliver the UK's emissions reduction targets.

13. It is therefore possible that the introduction of an EPS could help sharpen the incentive to reduce CO₂ emissions. However we must recognise that while the introduction of an EPS would deter the construction of new unabated fossil plant it is not an instrument that will create a tangible value or additional revenue to incentivise low carbon generation. We therefore believe a greater emphasis should be placed on strengthening the carbon price by taking action to set a floor in the EU ETS price paid by UK generators by using a top√/up tax that can work along side the EU ETS and believe that this will ultimately be more effective.

²⁶ Economic impacts from the promotion of renewable energies: The German experience, Rheinisch-Westfälisches Institut für Wirtschaftsforschung, October 2009

14. Accelerating the deployment of low carbon technologies and/or the successful demonstration of CCS could in turn provide policy makers in the EU greater reason and confidence to set more stringent targets for the EU ETS.

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

15. For the reasons outlined above, we believe that an EPS alone will not be a catalyst for CCS innovation, and that it must only be considered as part of a robust and holistic long-term policy framework. The economic and technical viability of CCS should determine an EPS, and not the other way round. We should also note the unintended consequences that could arise from introducing a single EPS as in California where setting an EPS simply led to investment in gas-fired generation.

16. We agree with the recommendation of the Committee on Climate Change (CCC) to fund at least one gas CCS demonstration project as part of the demonstration programme committed to by the Government. We believe that this would support the UK's objective of securing the decarbonisation of the power sector. One of the primary benefits described by the CCC of having gas with CCS on the system is the better economics of the plant when running at lower load factors, which will be an important consideration if significant intermittent wind capacity comes on to the system. We therefore believe that an explicit objective of any gas with CCS demonstration project should be to prove that this type of plant is technically capable of operating flexibly in this way and is able to contribute to system balancing. However, any subsidy to gas with CCS should be limited to the demonstration programme and, after this, the pace of implementation of CCS across all fossil generation should be driven by the carbon price and the electricity market—just as it should be for the implementation of all forms of low-carbon technology.

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

17. While an EPS will curtail emissions if CCS is available, it could lead to generation shortages brought on by the early closure of fossil fired plant if CCS is uneconomic, and without there being immediate adequate provision of a suitable alternative. This is why we believe that the focus of energy policy and the introduction of an EPS should be to provide a robust and holistic long-term framework to develop and deliver low-carbon technologies.

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

18. At this stage, without having sight of the level of the EPS (which is linked to CCS, the costs of which are unknown) or its scope, it is difficult to speculate on what the effect on domestic energy prices will be.

19. We believe that the Government should be focussing on the facilitative actions that lead to a successful CCS demonstration programme. Otherwise, there is a real risk that the impact on annual domestic electricity bills will end up higher than the Government's current forecast of £8 and £15 in 2015 and 2020 respectively,²⁷ and that consumers will end paying more for no extra tangible benefit.

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

20. We are currently not aware of any other European countries actively considering an EPS as a national policy measure. While in theory the standards could be harmonised (presumably along the lines of the EU Industrial Emissions Directive), agreeing a common standard across the EU would be difficult given the very wide range of carbon intensities that currently prevail across all of the Member States and the differences that exist in individual Member States' energy policies.

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

21. It is unlikely that any action by the UK to introduce an EPS will have sufficient time ahead of the Cancun meeting to establish evidence that justifies its introduction.

Can greater use of Emissions Performance Standards internationally help promote agreement on global efforts to address climate change?

22. It may, but we believe it would be of limited value. As outlined above, an EPS would only apply to fossil fuel plant and so would not capture the full scope of decarbonisation efforts. It would also do nothing to proactively make other forms of low-carbon technology, like new nuclear build, attractive to developers.

September 2010

²⁷ Estimated impacts of energy and climate change policies on energy prices and bills, DECC, July 2010

Memorandum submitted by E.ON UK**SUMMARY**

In the EU, the EU Emissions Trading Scheme (EU ETS) has been adopted to ensure that emissions across the EU from the sectors covered do not exceed a level consistent with the EU's overall climate change targets.

Concerns about the effectiveness of the EU ETS could be addressed by moving to a tighter EU emissions cap for the third trading period which begins in 2013, and extending the period from 2020 to 2030 or later. This would significantly sharpen price signals and ensure these were maintained over the longer timescales needed for new investments.

Emissions Performance Standards (EPSs) have drawbacks of their own. Any reductions in CO₂ emissions achieved through the implementation of an EPS in the UK additional to those that would have been achieved through the EU ETS would be entirely offset by higher emissions elsewhere in the EU within the overall EU ETS cap, so there will be no net reduction in EU emissions.

An EPS can also create new risks which can substantially increase the discount rates applied to new investments, and ultimately determine whether an investment proceeds or not. The fundamental problem is whether companies will be confident that the market or the energy policy framework will fund the required investment to achieve the EPS.

These risks need to be addressed if an EPS is to play a role. There is no point having an EPS which energy companies are unable to meet because they are not confident of their ability to recover the costs involved. This issue has already been recognised in the US.

An EPS will not drive the development of carbon capture and storage (CCS) technology at all unless investors believe they will recover the costs associated with the investment needed. The key issue then is less the EPS but more whether there will be sufficient incentives to support the required investment to deliver CCS.

The main risk for security of supply arises from the effect of implementing an EPS without establishing first whether the necessary investment is capable of being funded by the market or by Government policies. This means that consideration of EPSs and electricity market reform need to be considered together.

We agree that Government should also consider the case for demonstrating CCS on gas-fired plant, although in our view the priority is to demonstrate CCS on coal as new coal plant is already required to fit CCS and this has much wider international relevance.

OVERVIEW

1. EPSs have been adopted in California and a number of other states in the western US to ensure that CO₂ emissions from new baseload power stations or imports from outside the state are below a given level, typically 1100lbCO₂/kWh (499kgCO₂/kWh). The EPS does not apply to new capacity operating at load factors below 60%, so allows the construction of higher carbon plant which might be needed to maintain security of supply during periods of high demand. The level of the EPS prevents the construction of new coal plants, while still permitting the construction of gas-fired CCGTs and appears intended to shift the fossil fuel mix over time to a lower carbon content as new plant is built. However, while the measure is designed to incentivise developers to come forward with low carbon generation, it does not appear to have been focused primarily at incentivising development of CCS. There are also no state proposals to set an EPS which requires CCS on new gas plant.

2. In the EU, the EU ETS has been adopted to ensure that emissions across the EU from the sectors covered do not exceed a level consistent with the EU's overall climate change targets. This approach is consistent with a single European market, and leaves the market to identify the most economic options for achieving the reduction targets, taking account of other factors such as security of supply and affordability for consumers. This approach has merit from a climate change perspective given the need to achieve climate change, security of supply and affordability goals together.

3. Broadly speaking, support for an EPS in the UK has reflected a lack of confidence by NGOs initially, and subsequently by the Climate Change Committee, in the ability of the EU ETS to provide sufficient incentives to support the delivery of new low carbon generation and to ensure that CO₂ emissions from the UK power sector are sufficiently restricted to meet the UK's national targets, which go beyond those set at EU level. This is understandable, given the limited economic incentives so far provided by the EU ETS, but these concerns could be addressed by moving to a tighter EU emissions cap for the third trading period which begins in 2013, and extending the period from 2020 to 2030 or later. This would significantly sharpen price signals and ensure these were maintained over the longer timescales needed for new investments.

4. EPSs also bring their own set of problems. First, at the EU level, any reductions in CO₂ emissions achieved through the implementation of an EPS in the UK additional to those that would have been achieved through the EU ETS would be entirely offset by higher emissions elsewhere in the EU within the overall cap. This will raise the overall cost to the EU of achieving the target as the emission reductions achieved in the UK could probably have been achieved at lower cost elsewhere. In other words

implementation of an EPS in the UK will not give rise to lower net CO₂ emissions globally, although proponents may argue that there are indirect effects from the UK taking a position which prohibits the construction of unabated coal plants.

5. Second, from the perspective of an investor in new generating capacity, an EPS can create new risks which can substantially increase the discount rates applied to new investments, and ultimately determine whether an investment proceeds or not. The fundamental problem is whether companies will be confident that the market or the energy policy framework will fund the required investment to achieve the EPS and equally, if it is later tightened further, whether it will be able to fund that. To the extent that this depends on the development of a technology such as CCS, which is yet to be demonstrated at commercial scale and which has an uncertain cost, the risks associated with any investment will be substantially higher.

6. This problem becomes more severe if an EPS is set at a level which requires CCS on gas as well as coal as energy companies would not have the option to invest in unabated gas-fired CCGTs.

7. These risks need to be addressed if an EPS is to play a role. There is no point having an EPS which energy companies are unable to meet because they are not confident of their ability to recover the costs involved. While companies would continue to be able to invest in renewable or nuclear capacity, it will deter investment in the more flexible new coal and CCS capacity or new gas-fired plant which will be required to maintain security of energy supply from 2017 onwards.

8. This factor was recognised in the US in the work done by the US Climate Action Partnership (USCAP). USCAP comprised leading industrial brands, including utilities, and environmental organisations. It came together before the US election to seek to devise a route-map to a US legislative programme on climate change. They collectively devised a blueprint covering a range of issues, in which coal was a major consideration. The parties agreed a package comprising of three points of a triangle:

- Cap and trade;
- An EPS for new coal-fired plant; and
- Enhanced financing package seeing CCS through from demonstration to deployment.

9. Importantly, USCAP made the different parts of the triangle conditional on one another – thereby ensuring the package was not unpicked. Therefore, when they suggested an EPS of 1100lbCO₂/MWh for all plant permitted after 2015 and 800lbCO₂/MWh for those permitted after 2020, these EPS steps were conditional on the government adopting the USCAP financing proposals. If the finance was not in place for some reason, the EPS would be delayed until it was.

10. The following paragraphs respond to the specific questions raised by the Committee.

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?

11. Consideration needs to be given to a wide range of factors. What is the basic policy intent—is it simply to prevent construction of unabated coal plant or is it also to incentivise lower carbon technologies including CCS? If the latter, is the technology commercially available to deliver the EPS and, if not, what are the prospects of it becoming available and by when? What is the right timescale for introduction to allow companies to factor the requirement into investment decisions? The form it takes—is it in gCO₂/kWh or, say, a limit on annual operating hours—also needs to be addressed as does the period of operation over which it is applied. For example, is the EPS applied continuously or averaged over a longer period to provide some flexibility? In our view, the cost of compliance needs to be understood before setting an EPS (and this will not be known for some years until we have successfully demonstrated CCS technology), as well as whether the electricity market and the policy framework within which it operates will incentivise the required investments. This may not be clear until the process of electricity market reform is complete *and* the costs of compliance are known.

12. Whether an EPS should be tightened over time depends on the policy goal. If a decision is taken to introduce an EPS, it could either be set at a fixed level to prevent construction of higher carbon plant with the EU ETS driving investment below that level. Alternatively, if the EPS is adopted as the main driver, it could be tightened over time as and when CCS technology becomes available and as CCS costs reduces, subject to the market and the policy framework incentivising the necessary investment. However, energy companies would want to be clear what future requirements will apply to proposed new plants before they take an investment decision. The EPS should not be changed for new plants after the investment has been committed, unless the investor can fully recover the related costs.

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

13. We have already pointed out that any reduction in emissions achieved in the UK would be offset by higher emissions elsewhere in the EU within the overall EU ETS cap. From a purely national perspective, it is difficult to say what benefit, if any, the UK would secure in terms of lower emissions from implementing an EPS compared to the EU ETS, not least because this depends on what assumptions are made about future carbon prices and the level of the EPS. If the EPS is set at a level which requires CCS on coal but not on gas, this would only lead to lower emissions if the EU ETS carbon price and relative coal and gas prices otherwise incentivised unabated coal plant. Of course it is possible to set an EPS which prevents construction

of any unabated coal or gas plant. While this would avoid the emissions from the unabated plant which would otherwise have been built, the emission savings from an EPS need to be considered against the impact on power prices and security of supply.

14. Overall these outcomes could be achieved more efficiently by tightening the EU ETS cap which would give rise to a higher carbon price in which case the effect would be EU wide and the cost of delivering lower emissions would be spread more evenly across Member States. It could also be achieved by introducing more effective policies to incentivise construction of nuclear plants or CCS which would achieve the desired goal of accelerating investment in low carbon plant, accelerating the closure of existing plant and disincentivising investment in new unabated coal plant without imposing an EPS. This should be the goal of the Government's electricity market reform process.

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?

15. An EPS will not drive the development of CCS technology at all unless investors believe they will recover the costs associated with the investment needed. The key issue then is less the EPS but more whether there will be sufficient incentives to support the required investment to deliver CCS.

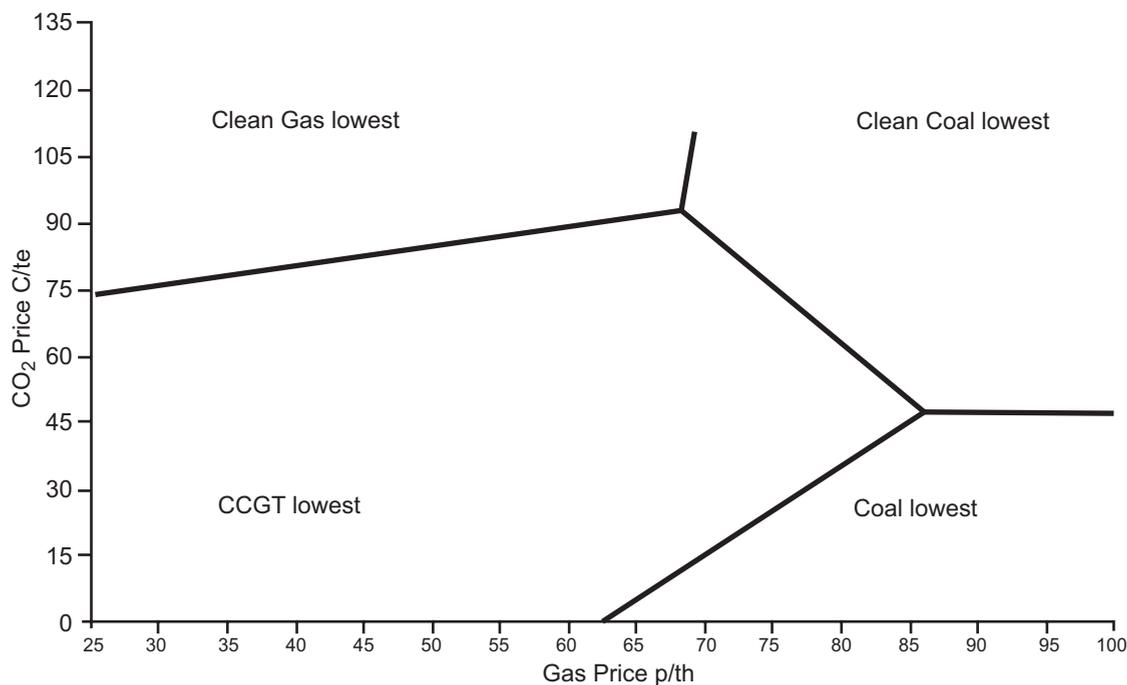
16. The recommendation by the Climate Change Committee (CCC) that the Government should seriously consider including CCS gas demonstration reflects the view that gas-fired plant may make up a significant proportion of new capacity operating in the 2020s, that some of this will need to be retrofitted with CCS to achieve its recommended goal of largely decarbonising the power sector by 2030, and that new gas-fired plant with CCS may be a more economic option than coal with CCS particularly for plant operating flexibly at relatively low load factors. We agree that the Government should consider this issue in more detail and should consult fully before reaching a decision.

17. The issue on gas CCS is perhaps more one of timing than whether CCS should be demonstrated on gas in principle. For coal, there is a requirement already that any new coal plant has a CCS demonstration project and an expectation that new coal plant would be retrofitted with CCS by 2025. In addition, from an international perspective, the priority is to fit CCS to new coal plant, which is still accounting for the majority of new build in developing countries such as China, rather than gas. All these arguments suggest that gas CCS demonstration should proceed later than for coal with the common engineering lessons from coal CCS demonstration then applied to gas.

18. For gas, the CCC is not arguing that new gas plant should have to be fitted with CCS until 2020. It is also not arguing that retrofit should be mandated on gas plants commissioned before that date, which would risk chilling any proposed investment between now and then. This raises the question of whether it is actually sensible to demonstrate gas CCS *now*, when no CCS would be operating on gas plant until 2020 at the earliest.

19. The volume of new gas plant that will in fact be built from 2020 and the need for gas CCS will depend in part on relative coal, gas and carbon prices at the time which are of course highly uncertain but may become somewhat clearer by the mid 2010s. How much new nuclear and renewable plant is operational in the 2020s will also be an important factor in determining the future role of gas plant on the UK system and whether CCS on gas plant will be required to achieve the CCC's target of largely decarbonising the power sector by 2030.

20. The CCC view that a new gas-fired plant with CCS may have lower levelised costs than a new coal plant with CCS needs to be assessed more fully. This view is based on the Mott Macdonald report published by DECC on 1 June 2010 but is particularly dependent on assumptions about the relative price of gas and coal for power generation in the future. Relative capital costs are also a significant factor and in our view the report may underestimate the capital cost of a gas-fired plant with CCS. The following "phase diagram" gives our very rough estimate of what plant is the cheapest to build against varying gas and CO₂ prices assuming a constant price of coal.



21. There would also need to be a discussion about whether we should be supporting pre or post combustion on gas, or indeed oxy-fuel combustion. Oxy-fuel combustion currently appears likely to be the best option for gas in the long-term but it is the least advanced technology. These issues need to be fully debated before a decision is reached by DECC on whether supporting gas CCS now through the CCS levy is value for money for the consumer.

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

22. The main risk for security of supply arises from the effect of implementing an EPS without establishing first whether the necessary investment is capable of being funded by the market or by Government policies. This would lead to power plant investments, whether on coal or gas, depending on the level of EPS, being deferred until this has been resolved. This also applies to CCS demonstration projects on new plants as investors will want to know how CCS retrofit requirements subsequent to the demonstration will be funded. This means that consideration of EPSs and electricity market reform need to be considered together. Without this an EPS would disincentivise investment in new fossil (gas or coal) plant and could lead to an increased dependence on nuclear and intermittent renewables generation which are less able to operate flexibly to meet variable electricity demand which could significantly reduce energy security.

23. We have already pointed out that an EPS is a fundamentally different approach from emissions trading. We are concerned that the increasing focus on an EPS approach will lead to undermining of the EU ETS which is the principal policy mechanism for tackling CO₂ emissions and that EU efforts to reduce emissions will be undermined.

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

24. This depends entirely on what assumptions are made about the extent of investment required to deliver an EPS, the level of the EPS set, what plant it is applied to, the extent to which the investment is incentivised by the carbon price or additional incentives such as the CCS levy, and the level of electricity prices had an EPS not been introduced. If the EPS is set at a level which requires more CCS than under current policy, then the effect will be to raise power prices and prices to the domestic consumer.

25. Assuming no policy interventions to fund CCS, investors would in principle only invest in fossil plant with CCS if they believed wholesale power market prices allowed them to recover the cost of the relevant investment. On this basis, and as a very rough estimate, power prices would need to rise by at least 25% to deliver this outcome for first of a kind CCS plant, although this would fall as CCS costs declined. As power prices account for about half of retail prices to domestic consumers, this would lead to an increase in domestic prices of at least 12%. However, wholesale prices would only rise to this level if fossil and CCS plant were the lowest cost new capacity available. In practice new nuclear is likely to be significantly cheaper so market prices would not rise to this level. This means that additional support would be needed to fund fossil plant with CCS. The estimated maximum impact on domestic bills of the Government's CCS demonstration programme is around 2–3% but this only covers the cost of around four projects of around 300–500MW each.

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

26. Not that we are aware of, although the issue has been discussed in the European Parliament. The EU's principal policy measure for reducing CO₂ emissions is through the EU ETS. The Industrial Emissions Directive in fact prohibits Member States from imposing plant specific CO₂ limits under the IPPC regime as the EU ETS is intended to be the main driver. Given the lack of wider interest by Member State governments and the Commission's view that the EU ETS is the priority, we see no need to harmonise EPS standards.

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

Can greater use of Emissions Performance Standards internationally help promote agreement on global efforts to address climate change?

27. While the commitment not to permit the operation of unabated coal plant could have a modest impact, it could also be seen as a demonstration of a lack of confidence in the EU ETS and emissions trading. The EU and the UK have hitherto aimed to extend the use of emissions trading from the EU to encompass other countries. The EPS is a fundamentally different approach. The international community would perhaps be more impressed by seeing CCS demonstration proceeding on a commercial scale than statements of policy intent.

September 2010

Memorandum submitted by EEF

SUMMARY

An Emissions Performance Standard for coal-fired power stations would deliver no environmental benefit could undermine energy security, reduce the competitiveness of electricity prices and slow deployment of carbon capture and storage

INTRODUCTION

1. EEF is the representative voice of manufacturing, engineering and technology-based businesses with a membership of 6,000 companies employing around 800,000 people. A large part of our representational work focuses on the issues that make a difference to the productivity and competitiveness of UK manufacturing, including regulation, investment, innovation, skills and tax issues.

2. This memorandum is a submission to the Environmental Audit Committee's inquiry into the pros and cons of Emissions Performance Standards (EPS) for coal-fired power stations.

ENVIRONMENTAL BENEFITS

3. Total carbon dioxide emissions from UK power generation are already capped and regulated under the European Union Emissions Trading System (EU ETS). Therefore introducing power station level limits through an EPS would deliver no additional carbon savings or environmental benefits.

4. The environmental logic for an EPS only exists in jurisdictions, such as California where it has been pioneered, where no industry level cap exists.

RISKS AND UNINTENDED CONSEQUENCES

5. Whilst delivering no environment benefits, a poorly implemented EPS could have a number of negative and unintended consequences.

6. Firstly, by removing the option of investment in coal-fired power stations an EPS could undermine energy security. Without the option of coal, utilities are likely to turn even more than they already are to investment in gas-fired power stations for flexible base-load plant (which will be increasingly necessary in a world with more intermittent generation). This will only serve to exacerbate the already considerable risks associated with rising dependence on imported natural gas.

7. Secondly, by removing the option of investment in coal-fired power stations an EPS runs the risk of unnecessarily increasing electricity prices. Utilities will have less flexibility to develop balanced portfolios of plant with which to deliver secure and low carbon energy supplies for their customers.

8. The government, through the renewables target, is already making a major intervention in the market to specify where utilities should source a significant portion of their electricity. Prohibiting coal-fired without CCS plant will remove the option of using one of the most widely available, flexible and cost-effective power generation fuels. This would limit even further their investment options and as result could increase the cost of both decarbonising the UK economy and providing secure supplies of electricity.

9. Finally, by removing the option of investment in coal-fired power stations an EPS runs the risk of delaying deployment of CCS in the UK. If CCS develops into a commercially viable abatement option, it is likely to be deployed first on modern coal-fired power stations (the additional cost CCS will impose on power generation means that it is unlikely to be viable to deploy on older and less efficient coal plant). So without state of the art coal plant the UK will be unlikely to be in a position to quickly roll out and take advantage of CCS.

CONCLUSION

10. The logic for introducing an EPS for power generation in the UK is difficult to fathom—it will deliver no environmental benefit but could have a number negative unintended consequences. Furthermore, policies that deliver no environmental benefit but undermine energy security and price competitiveness could have the unfortunate consequence of undermining support for action on climate change.

11. Limits on emissions whilst essential, are more effective when they are applied at the portfolio level where they give power generators flexibility over how to provide customers with a reliable supply of low carbon energy.

September 2010

Memorandum submitted by Ofgem

ABOUT OFGEM

1.1 Ofgem welcomes the opportunity to provide evidence to your inquiry on Emission Performance Standards (EPS). We are the Office of the Gas and Electricity Markets. Protecting consumers is our first priority. We do this by promoting competition, wherever appropriate, and regulating the monopoly companies which run the gas and electricity networks. The interests of gas and electricity consumers are their interests taken as a whole, including their interests in the reduction of greenhouse gas emissions and in the security of the supply of gas and electricity to them.

EXECUTIVE SUMMARY

1.2 The evidence we have gathered suggests that there are many ways of designing an EPS in order to achieve different objectives, but that any EPS has to be designed very carefully in order to:

- complement existing and future policies in reducing CO₂;
- manage any effects upon EU wide CO₂ emissions and the carbon price;
- limit its effect on the level and volatility of domestic energy prices;
- encourage the development of carbon capture and storage (CCS) technology;
- minimise the costs associated with reducing CO₂; and
- manage its impact on security of energy supply and investment, especially with regard to flexible capacity.

Designing an EPS which addresses all of the above will be difficult and it is inevitable that there will need to be some trade-offs throughout the policy development process.

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?

1.3 Before discussing the factors to be considered in setting the level of an EPS, it is important to clarify what is meant by an EPS. In essence an EPS is a limit on the amount of CO₂ that can be emitted during the generation of electrical energy. Within this basic definition, an EPS can take a variety of different forms according to what the EPS is attempting to achieve and what the existing policy and market framework is like.

1.4 Firstly, there are options for the timescale over which the emissions are measured. An EPS could be designed such that the amount of CO₂ per unit of electrical energy generated is restricted on a half-hourly basis, which is the approach currently being used in California.²⁸ Alternatively, it could be applied on an annual basis (an emissions “bubble”), which was adopted in the UK to reduce other gas (SO₂ and NO_x) emissions from large power plants during the 1990s.²⁹

1.5 Secondly, there are options for how an EPS is targeted across the power sector. One possibility is to apply the EPS to every plant (or even generating unit), which would effectively prohibit the construction (or constrain the running hours) of particular types of power generation that emit relatively large amounts of

²⁸ California Public Utilities Commission 2010, Greenhouse Gas EPS (set at 500g/kWh), http://www.cpuc.ca.gov/PUC/energy/Climate+Change/070411_gheph.htm

²⁹ Crown Copyright 1991, The Large Combustion Plant (Control of Emissions) (Scotland) Regulations 1991, Statutory Instrument 1991 No. 562 (S.47)

CO₂ for each unit of electrical energy they generate. A further possibility is to apply an EPS across a company's fleet or across the whole of the UK's power fleet. This would allow high emitters to operate for limited periods, provided that the average emissions over the year are below the EPS level.

1.6 Thirdly, an EPS can also be applied to either new or existing plant (or both), which could have implications that are discussed later on.

1.7 Finally, these limits can be static or change over time. While the CO₂ limit in California is fixed at 500 kilos of CO₂ per megawatt hour, the SO₂ and NO_x limits under the European Large Combustion Plant Directive (LCPD) became tighter throughout the 1990s.

1.8 Each of these designs imply very different flexibilities for both Government and energy companies, with a range of associated benefits and costs. Therefore, before setting any EPS design or level, it is important that clear objectives are considered. Possible objectives include:

- The limiting of CO₂ emissions from new, existing or all plant.
- Preventing the construction of certain types of generation plant (eg specific technologies such as unabated coal).
- Encouraging the development of low carbon technologies, such as CCS.
- Encouraging more carbon efficient plants within existing technologies—eg designing an EPS to make all gas plants meet a certain EPS for gas plants.

Once the objectives are set, it is then possible to consider the other factors to be considered when setting the EPS. These include:

- The effectiveness of the EPS for achieving emissions reductions—there could be unintended consequences as a result of generators' decisions and through interactions with other policies.
- The need for new flexible plant on the system and security of supply issues—see sections 1.22 to 1.26 for further information.
- The existing policy framework for emissions reduction and the interaction of the EPS with these policies—see sections 1.9 to 1.14 for further information.
- The future policy framework, such as a carbon price floor.
- The availability of technology to operate within the EPS—the EPS has to take account of what is technically possible or should be designed to drive technology development.
- The costs associated with meeting the EPS—see sections 1.27 to 1.36 for further information.
- The effect of the EPS on investment decisions.

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

1.9 Before discussing the extra benefits of an EPS beyond EU ETS it is important to highlight the overlap between the two policies. As the EU ETS is primarily designed to reduce the quantity of CO₂ emissions over time, any sort of EPS that does this too will clearly overlap with it. For an EPS to reduce CO₂ emissions in the UK by more, it will have to set limits on generators that are stricter or more specific than those implied by the EU ETS.

1.10 However, a UK based EPS will not necessarily reduce total emissions across the EU unless further steps are taken. Because total EU power sector emissions are capped at the EU wide level, and the EU ETS allows trading of carbon across member states, any emissions reductions undertaken in the UK could still be emitted elsewhere in Europe.

1.11 This “waterbed” effect could, however, be mitigated if suitable quantities of EU Allowances (the currency of EU ETS representing the right to emit) are removed from the system. The Government could “retire” or “purchase” EU Allowances but this process is complex to get right. It should also be noted that the auctioning of EU Allowances brings in substantial Government revenues which would be forgone. Further, the legality of the UK government effectively reducing the quantity of EUAs available within an EU-wide agreed cap and trading scheme would have to be explored.

1.12 There is also the question of how widely an EPS could be applied. For example, as noted above, a UK applied EPS could reduce UK emissions, but would have little wider impact on EU emissions. For an EPS to have a significant impact on EU emissions, it would also have to be implemented by a number of European countries either independently or co-ordinated together. However, this would imply that two schemes are in place with similar purposes and possibly working against one another in certain areas.

1.13 The overall impact of an EPS upon EU Allowance availability and the CO₂ price is unclear since this depends on the interaction between lower demand—generators wanting fewer EUAs because they cannot emit as much carbon—and reduced supply—Governments retiring EUAs to prevent the waterbed effect. However, it is possible that an EPS could reduce the price of CO₂, which would act as a disincentive for investment in low carbon technology.

1.14 However, if an EPS helps to force a technological breakthrough in CCS or other emissions performance innovations in generating plant then this could encourage cheaper ways of decarbonising the power sector than those that would otherwise have emerged as a result of the EU ETS. This could mean that the cost of using these technologies is reduced in future relative to what they would have been had an EPS not been introduced and could also mean that the EU ETS cap could be further tightened to take advantage of this technological development in order to reduce emissions further.

1.15 In addition, an EPS could ensure that there is an insurance policy against the construction of higher carbon plant that could occur if the EU ETS were to be weakened in the future. We understand that there is some stakeholder concern that once higher carbon plant have been built, their developers may have some “bargaining power” with which to later broker a way to run for more hours with future Governments.

1.16 Lastly, an EPS that affects existing coal plants might also encourage further switching to biomass, which has started to occur due to the subsidies offered by the RO. For example, the Drax and Tilbury power plants have both moved from pure coal-firing to biomass co-firing, with plans to increase the amount of biomass that they use as their fuel source.³⁰ This should reduce emissions in the short-term, with the provisos about the EU ETS cap that were noted earlier, but as the use of biomass increases so does the importance of sustainable sourcing and life cycle emissions.

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?

1.17 There is no simple answer to this question as different types of EPS have varying impacts on the development of CCS.

1.18 If an EPS means that power generators using fossil fuels cannot operate without CCS, this may provide an incentive for them to invest in this technology.

1.19 However, at present, CCS technology is unproven at a large scale both technically and economically. Correspondingly, a developer may choose to make an alternative investment decision to meet the EPS, rather than necessarily explore CCS. For example, if an EPS rules out unabated coal plants, a developer may choose to invest in a gas plant (assuming that would meet the EPS) rather than a coal plant with CCS.

1.20 There is an additional risk that some EPS types may actually deter investment in CCS. For example, a developer may not invest in a new plant with CCS fitted if it believes that it will be left with a stranded asset in the eventuality that CCS does not work and the station cannot meet the required EPS.

1.21 All in all, most EPS variations are unlikely to provide a sufficient incentive by themselves to push a developer towards CCS.

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

1.22 Once again, there is no simple answer to this question as different types of EPS have varying impacts on energy security and climate change.

1.23 In the energy market there is always a requirement for flexible plants to be able to be switched on quickly when energy demand is high, or when output from other forms of generation is lower (eg when renewable output is low or when base-load plants fail). Flexible capacity is likely to become of greater importance as increasing amounts of variable renewable generation, such as wind power, comes onto the power system. Currently fossil plants provide a lot of this flexibility.

1.24 If an EPS ensures that fossil plants are to be restricted in some way then flexibility will be needed to be provided from somewhere else. This could be provided by increased use of sustainable biomass and through innovations in electricity storage and demand side response, as well as extra interconnection. However, these possibilities face a number of current challenges. Correspondingly, any EPS will need to carefully consider what impact it would have upon peaking and balancing plant during the time before these alternative options can be developed and deployed.

1.25 For example, if an EPS prevented the construction of any new coal-fired plants, then alternative generation (eg new gas plants) would need to be built in their place. We have analysed in the “Discovery analysis tool” the most extreme case, ie the impact of building neither any of the coal-fired plants that we had projected would be built between now and 2024–25, nor any alternative plants. Although this is a crude analysis as it is likely that the market would invest in alternative generation (eg new gas plants), the tool showed a potential shortfall in generation capacity. If this shortfall is filled primarily by gas plant, then the UK will lose some diversity in its generation capacity, which could pose a risk to security of supply if there are gas supply blockages.

1.26 Further, it is possible that if an EPS is focused on banning new fossil plants from being built, it might encourage existing fossil plants that are less efficient and “dirtier” to run harder and longer than would have been otherwise been the case. Under some circumstances this could perversely lead to increased carbon emissions (although this effect would be limited by the EU ETS cap). This incentive would be created if an EPS drives higher prices for electricity (mentioned below) and a lower carbon price.

³⁰ Drax 2010, “Drax highlights vital role for biomass”, 30 June.

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

1.27 Once again, there is no simple answer to this question as different types of EPS have varying impacts on both the level and volatility of the price of energy.

1.28 However, an effective EPS will affect the level and volatility of domestic energy prices. This is because any effective EPS will restrict the choices available to generators, which is likely to lead to higher costs that will ultimately be passed onto energy consumers in the form of higher prices.

1.29 The most obvious source of an increase in costs is generators having to use lower carbon forms of generation to provide the energy needed in the UK. Existing lower carbon energy (at current carbon prices) is generally more expensive than using coal or gas, and the fitting of CCS to fossil fuel power stations would also clearly increase the cost of generating the electrical energy.

1.30 In addition, generators under any sort of running hours restrictions will only want to use their running hours at the point where they can make the maximum possible returns. This means that the generators will want to sell their energy at peak times when the electricity price is highest eg winter demand spikes. Correspondingly, generators will not want to use their hours at times of lower demand, when prices are generally cheaper. If their generation was required at those times of lower demand, then they would demand a higher price to generate, in order to factor in the opportunity cost of them not being able to use their hours when they can take advantage of higher prices. The result would be that the price at those times of lower demand would increase, thereby increasing the costs to consumers.

1.31 When restricted plant is able to demand a higher price for its electricity, unrestricted plant can also increase its price in the knowledge that it will still be purchased. Therefore the price making behaviour of restricted plant to maximise their profits also presents opportunities for unrestricted plant to become more profitable. Unrestricted plant includes low carbon and renewable generators, and increases in these generators' profitability could extend their planned operational life, or increase the incentive to invest in these technologies.

1.32 We would like to draw the Committee's attention to an interesting example of how plant running restrictions can affect the prices that these plant charge for the electricity that they produce. We would like to stress that the example is only dealing with the price of the energy produced by the specific restricted plant mentioned below and that we are not drawing any firm conclusions on the more complicated effect of these plants' behaviour on other plants' pricing behaviour. While overall electricity prices did increase during this period, there were other contributory factors affecting the wholesale market price at that time.

1.33 The example here is the effect of the Large Combustion Plant Directive on plant pricing behaviour. The LCPD introduced measures to control the emission of nitrogen oxides (NO_x), sulphur dioxide (SO₂) and particulates (dust) from combustion plants. These plants must meet Emissions Limit Values (ELVs) for the three pollutants.

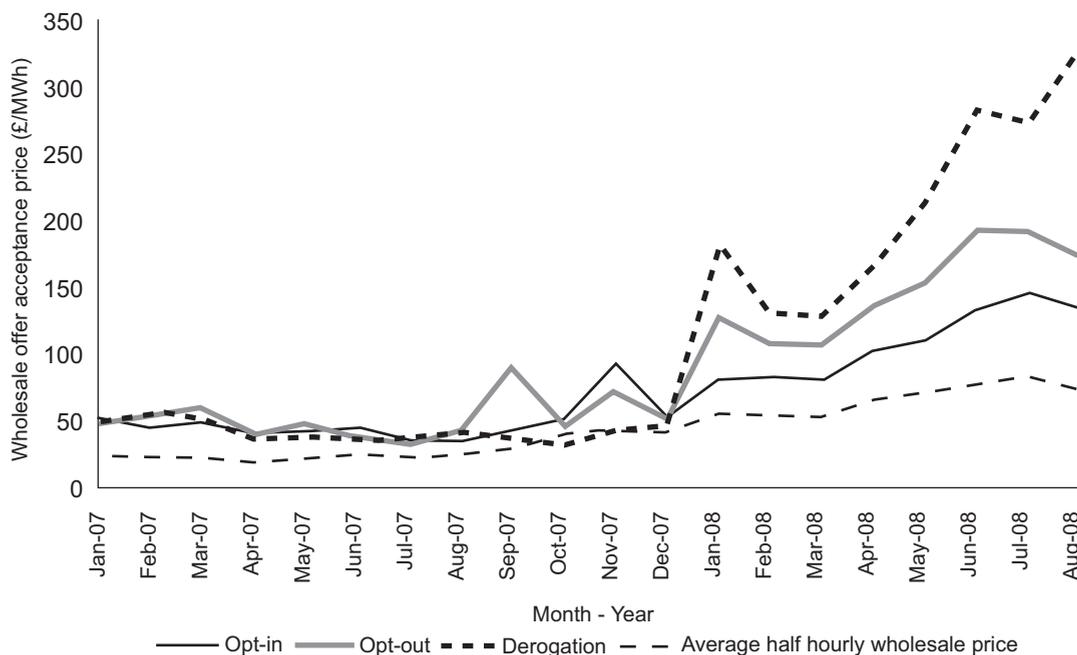
Large combustion plant had the option to either:

- Opt-in: comply with LCPD's ELVs, with existing plants being able to use a national cap and trade system that reduces the amount of their emissions over time; and
- Opt-out: existing plant could agree by 30 June 2004 not to run the plant for more than 20,000 operational hours between January 2008 and December 2015.

1.34 Existing plant which would not run for more than 2000 hours a year until the end of 2015, and/or 1500 hours a year from 2016, could apply for derogation from the LCPD. These were subjected to a fixed ELV for SO₂.

1.35 From the graph below it can be seen that the more restricted plants (opt-out and derogation) became more expensive than the plants who fully complied with the LCPD's emissions limits. This is mostly visible from December 2007 onwards, where the differences between the prices asked for by plants which have opted for the different LCPD compliance options diverges. This is because they put a premium on their energy, factoring in the opportunity cost mentioned in 1.30.

Prices for coal-fired generation, 2007–08, £/Mwh



CONCLUSION

An EPS is a policy intervention with good intentions but many potential repercussions. It is not just a case of introducing a simple intervention to ban higher carbon forms of electricity generation.

The policy intent of any EPS needs to be clear, then the EPS can be appropriately designed to meet its intent.

Whatever EPS is chosen, it must be well designed in order to ensure that it actually results in carbon emissions reductions, while preventing security of supply threats or increases in the price of energy.

I hope that this evidence is of use to you and I am happy to provide additional evidence if required.

September 2010

Memorandum submitted by Centrica

1. Centrica plc (Centrica) was formed in February 1997 when the former British Gas plc was demerged to form BG Group plc and Centrica. We are the UK's largest energy supplier, with around 16 million customer contacts in the domestic sector and around one million in the non-domestic sector.

2. We also own upstream gas production and power generation assets to support our supply businesses:

- We own eight gas-fired power stations including Britain's newest power station in Langage, near Devon.
- We are a leading developer of offshore wind and were recently awarded exclusive rights to develop the Irish Sea zone which provides us with the potential to develop up to an additional 4.2 gigawatts of renewable electricity, representing around £9 billion of investment.
- Centrica has already built and refinanced the Lynn and Inner Dowsing wind farms on the east coast, and expects to commence construction at the 270 megawatt (MW) Lincs offshore wind farm development later this year. Docking Shoal and Race Bank, Centrica's two other Round Two wind farm proposals, which are awaiting consent, could add a further 1.1GW—enough to power 760,000 homes.
- Centrica also plans to play a role in the UK's new nuclear renaissance. We own 20% of British Energy, through our Joint Venture with EDF Energy. Through this we are undertaking the pre-development activities for a planned nuclear new build programme, with the intention of constructing, and operating and decommissioning four European Pressurised Reactors.

3. We welcome the opportunity to respond to the DECC Select Committee Inquiry into Emissions Performance Standards.

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?

4. We believe the introduction of an EPS is an unnecessary policy instrument that risks causing unintended consequences and putting up energy bills for consumers. If the intention is to prohibit unabated coal, we believe Government policy prohibits this anyway, through its existing position and that the Secretary of State will not sanction new coal plants unless they demonstrate CCS technology. This has the impact of a de facto EPS. In addition, planning policy means the Government and other stakeholders can restrict the development of new coal. Therefore an EPS is, we believe, unnecessary.

5. If the intention is to support clean coal technology, we believe this is best done by supporting that technology through the existing policy framework including a competition and CCS incentive to support new plant. This will identify the barriers to CCS development, uncover the costs of this emerging technology, and share R&D and development learnings with the broader sector.

6. If the intention is to support low carbon generation investment more generally, this is best done through the Energy Market Review. This is considering the appropriate market arrangements and incentives for encouraging investment to deliver decarbonisation and security of supply. Investors will look at the long term investment case, predominantly considering expected returns within that investment climate. Specific banning of technologies may limit options for investors, but will not consequently make specific alternative options more attractive. Without proper support for near zero-carbon generation technologies, investors are as likely to be attracted to gas-fired generation.

7. If the intention is to reduce carbon dioxide emissions from the power sector, the sector is already covered by the EU ETS, and EPS would provide no additional benefit whatsoever.

8. Instead, the unintended consequence of an EPS is likely to increase the costs of new generation investments as investors place additional regulatory risk costs to them. This is because the EPS would represent an additional “unknown”.

9. Should an EPS be introduced, its level should not be altered over time. Keeping open the option to change the level would lead to significant investment risk for new and existing plants.

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

10. An EPS would bring no additional benefits over and above the EU ETS. This is because the emissions from the power sector are capped, so any additional efforts in Member States to reduce their emissions simply means that other Member States can increase theirs. We suggest that the EU ETS should remain the primary CO₂ reduction tool within the EU. As such it remains unclear at this stage whether an EPS would be required and if it is deemed necessary. In addition to capping existing emissions, the priority should be to support investment in low carbon technologies in order to decarbonise the power sector. This can be achieved through establishing a framework that brings forward low-carbon generation and R&D support for emerging technologies such as wave and CCS.

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?

11. Restricting certain fuel sources is not a credible policy mechanism for encouraging investment in other technologies. The challenges facing untested, unproven CCS are linked to policy, regulatory, cost, technology development and operational challenges; simply banning higher-carbon feedstocks would not direct investment towards addressing those challenges.

12. Instead investment would either seize up, leading to a security of supply situation, or be directed in other, more proven technologies that are cost effective, for example gas. The focus should be on developing and trialling the technology before any mandate for it—direct or indirect—is introduced. We believe in any case that if CCS can be made to work on a commercial scale, and assuming the fiscal and regulatory framework is supportive, investors will naturally use CCS technology without mandate.

13. We see no reason why demonstration gas projects should not also be eligible for the CCS demonstration competition. In doing so however, the Government should not have any high expectation that gas projects will come forward given the high costs and unknown technology issues.

14. Similarly, the Government should not provide additional regulatory intervention specifically to encourage gas CCS; the global priority should be to develop coal CCS. Unabated coal-fired power generation is a major contributor to climate change, and developing this technology will be crucial to reducing emissions in China, India and other countries. In many circumstances, unabated gas-fired generation will be a key transition fuel, so developing coal CCS must be the priority.

15. New gas generation capacity is needed now to ensure sufficient flexible, relatively low carbon capacity as heavily polluting coal, oil and inefficient gas plants close. An Energy Performance Standard (EPS) ruling out certain technologies is a blunt tool and much care needs to be taken in consideration and introduction of it. An EPS which sets level equivalent to that of, say high efficiency CCGT, would rule out many investments, including possible peaking plant which may be beneficial to UK. It might also have implications for CHP and other plants where simple fuel efficiency is not the only factor considered when optimising dispatch.

16. Given the challenge in the massive scale of developments needed to get renewables and nuclear up to high levels of penetration by 2020, and the fact that the only flexible, large scale, balancing options proven to date is thermal plant, such a ruling could lead to serious risks of capacity shortfall and/or extreme pricing. The need for flexibility will increase as greater intermittent renewables is built. Demand side and energy storage options have potential to offer flexibility, but are at very early stages of development and it is unclear how much or in what timescale they can contribute.

17. We therefore believe it is too early for any move which rules out new gas build without CCS, even applicable post 2020.

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

18. Yes. The introduction of an EPS risks creating additional investor uncertainty. This is because although the impact may be restricted to certain plants eg coal, investors would be concerned that the Government could arbitrarily change the rules and impact on other investments. This investor uncertainty would raise the overall cost of projects, and therefore costs to consumers, and would potentially inhibit the development of new power generation including gas. Gas power plants are cheap, relatively straightforward to build, and can play a key role in the transition to a low carbon economy. This is because they can fill any energy gap created by the closure of coal power stations before sufficient renewables, nuclear and CCS can be built. In addition, because they are flexible, they can be used to back up intermittent wind generation and balance the system, maintaining security of supply.

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

19. An EPS would most likely increase domestic energy prices. This is because the investor uncertainty associated with an additional policy intervention would raise the overall cost of projects, and therefore costs to consumers, and would potentially inhibit the development of new power generation including gas. Investor uncertainty would revolve around how the policy lever would be used. There would be a concern that Government could overstretch the EPS in order to meet stakeholder demands, and then find circumstances in which it needs to relax the regulation. For example, in the context of extreme price spikes, it may be necessary to bring on existing coal or oil fired generation, albeit for a very brief interval. This would require politicians relaxing the EPS. All these uncertainties add risks to projects and therefore costs.

Could unilateral action by the UK to introduce an EPS contribute towards global climate negotiations in Cancun in November 2010? Can greater use of Emissions Performances Standards internationally help promote agreement on global efforts to address climate change?

20. We do not believe an EPS would have any impact in the international climate negotiations. Meaningful and credible actions are far more meaningful than additional policy objectives.

21. The UK Government has long-championed its CCS demonstration project within the international sphere as an indicator of its commitment to the technology. However, other countries will only take heed when we have a full scale plant operating, actively capturing and storing CO₂ that they will take notice and turn to the UK for expertise. The impact of a UK specific EPS will be at best, marginal, and at worst, meaningless to the international negotiations.

September 2010

Memorandum submitted by Drax Power Limited

SUMMARY

1. Drax supports the EU Emissions Trading System (EU ETS) as the key policy instrument for reducing emissions of carbon dioxide from the electricity generation sector and the main energy intensive industries both in the UK and across the EU. The implications of introducing an Emissions Performance Standard (EPS) in the UK need to be considered within this context, for example, whether it would amount to double jeopardy for UK players.

2. The need for the urgent development of Government policy to better address Carbon Capture and Storage (CCS) is clear. Drax recognises it as one of the critical technologies which needs to be implemented in order to address the challenges of climate change whilst maintaining a diverse energy mix and the consequential security of supply benefits. However, the principal early objective for the UK CCS programme should be to develop an appropriate regulatory and financial support framework which will provide confidence to investors and developers through the demonstration and follow-on phases.

3. An EPS might be a realistic tool for the regulation of plant built under a future regime of full CCS deployment, but not before. If Government is concerned about the potential for new coal plant operating without CCS, there are sufficient well-established mechanisms already available to prevent this happening.

INTRODUCTION

4. Drax Power Limited is the operating subsidiary of Drax Group plc, and the owner and operator of Drax Power Station in North Yorkshire. Drax Power Station is the largest, cleanest and most efficient coal-fired power station in the UK. At current output levels its coal and alternative fuel burn approaches some 10 million tonnes per annum, and its six 660MW units supply some 7% of the UK's electricity needs.

EMISSIONS PERFORMANCE STANDARD

5. Drax supports the EU ETS and the principle of a price for carbon as the most appropriate way to incentivise the uptake of low carbon technologies. Drax is concerned that the introduction of an EPS may introduce further regulation with the same aim, effectively introducing double jeopardy. For that reason, the introduction of an EPS needs to be considered within the context of a market already regulated in terms of carbon emissions.

6. Drax believes that the highest priority for Government is to set out a (demonstrator and post demonstrator) framework in the very near future in order to detail the expectations and requirements for future CCS plant. This would need to cover both the regulatory regime and the financial support mechanisms.

7. Any such framework would have to be capable of evolving into a platform for the large-scale deployment of CCS in the UK, including transport and storage. We believe that a target of 20–30GW of CCS deployment by 2030 should be adopted by Government. This target was suggested by the Climate Change Committee (CCC) which has considered scenarios in which up to 20–30GW of coal plant could be operating with CCS by 2030. We note that the UK is currently experiencing a new “dash for gas” which will result in a high level of “locked-in” fossil CO₂ emissions together with a high future dependence on imported gas; a situation which will only deteriorate unless coal CCS can be brought on line quickly.

8. The key issue for a potential investor, such as Drax, is the removal of investment uncertainty combined with the introduction of policies and regulations which provide realistic objectives and incentives. In order to achieve a substantial amount of UK CCS plant, a potential investor will need to be very clear about the risks and other implications of investing in an integrated project comprising generating/capture plant, transport pipelines and long term storage.

9. At this stage in the development of the technology, therefore, setting an EPS on the capture element without specifying the remainder of the regulatory “package” would be premature. In particular, it would be inappropriate to second-guess the detailed regulation of a future integrated capture/transport/storage system whose likely costs, market structure and technological performance are imperfectly known and where the different components may develop at different rates. The whole point of demonstrator plant is to establish the limits of the technology, and hence setting up regulatory regimes in advance which penalise failure will be counterproductive.

10. An EPS might be a realistic tool for the regulation of plant built under a regime of full CCS deployment, when it could be a part of the “best available techniques” (BAT) requirement, but not before. If Government is concerned about the potential for new coal plant operating without CCS, there are sufficient mechanisms already available to prevent this happening. The mechanism for retrofitting existing plant already exists in the consenting/permitting process and the requirement to justify the use of BAT, the definition of which will incorporate an analysis of whether CCS is technically proven and whether it can compete in the market place. All plant, in particular those which are currently being built as capture ready (ie coal and gas), would then be expected to retrofit to BAT standards over a defined period of time.

CONCLUSION

11. The impact of an EPS in the UK needs to be considered in the context of a wider EU market already regulated in terms of carbon emissions. As far as providing a further incentive to invest in CCS, the unilateral imposition of an EPS on an embryonic industry may perhaps signal intentions by Government, but unless it is accompanied by a clear package of market, financial and regulatory requirements it will be an empty gesture which may turn out to be counter-productive.

September 2010

Memorandum submitted by Shell
EXECUTIVE SUMMARY

- Shell believes the most efficient policy approach for reducing emissions remains the use of market-based instruments, in particular cap-and-trade. A successful EU-ETS is in the interest of the UK, and as such we advocate for balanced recalibration of Phase III of the EU-ETS and an allowance reserve price in Phase IV and beyond to ensure a robust CO₂ price is delivered by this system.

- An EPS combined with the EU ETS would be ineffective at driving overall incremental emissions reductions and with the above changes to the EU ETS would also be redundant. If the Government is still committed to the implementation of an EPS for the power sector, we recommend that the EPS has three key features:
 - (1) it approximates the emission reductions that would occur under the EU ETS with a robust CO₂ price (ie that are least cost);
 - (2) it treats all existing and potential new facilities in the same way; and
 - (3) it should not prescribe premature application of specific and particularly new and undemonstrated technologies.

INTRODUCTION

1. Shell welcomes the opportunity to submit comments to the Energy and Climate Change Committee's Inquiry on Emissions Performance Standards. We understand that the introduction of an emissions performance standard (EPS) for the power sector is a commitment of the Coalition Government to meet the UK's emissions reduction targets. Our submission mainly responds largely to questions 1–3 posed by the Committee.

ETS AND EPS

2. Shell believes that the most efficient policy approach for reducing emissions remains the use of market-based instruments, in particular cap-and-trade systems for those sectors where emissions reductions are likely to be driven by a robust CO₂ price (eg large stationary emission sources like power plants). Mandates and standards are typically used in those sectors where emissions are not very responsive to this price signal (eg transport), and may be required to drive significant—but not least-cost—emissions reductions (eg through use of biofuels and vehicle efficiency standards).

3. We support the EU Emissions Trading Scheme (EU ETS) because a robust CO₂ price will drive the most immediate and the greatest cumulative emissions reductions. In models of the UK electricity market, this would be achieved mainly through the replacement of coal with gas power generation in the short term and the deployment of CCS, along with investment in renewables and nuclear, in the medium and long term.

4. However, Shell recognizes that Phase III of the EU ETS is at risk of not delivering a robust CO₂ price because of the severe recession and the anticipated permanent step-down in the level of EU output and emissions relative to the pre-recession expectations on which the emissions cap for Phase III was set.

5. The experience of the EU ETS during the recession also raises the important issue of how best to design cap-and-trade systems in the face of inevitable uncertainties from both the macro-economy and the process of technological change. Rather than engaging in the *ad hoc* recalibration of the cap in response to unexpected shocks, as is being proposed for Phase III of the EU ETS, it would be more credible to introduce an allowance reserve price in advance of any such shock. This feature would signal to investors that future unexpected shortfalls in emissions would be used in part to step up emission reductions and at the same time reduce uncertainty in long-run investments associated with the CO₂ price. This would help to close the gap between the long-run objective of limiting global warming to 2°C and the need to reduce the uncertainty that businesses face in making long-run investment decisions.

6. An EPS applied to the UK power sector, which is already covered by the EU ETS, would be largely ineffective at driving overall incremental emissions reductions. If the EPS leads to emission reductions in the UK power sector beyond those driven by the EU ETS CO₂ price, it would reduce demand for carbon credits and depress their price. This in turn will reduce the incentive for further emission reductions in those sectors to which the cap applies but that are not covered by the EPS. In other words, the UK power sector would be shouldering a disproportionately higher burden than other sectors or countries that need to comply with the EU ETS. Alternatively, if the EPS does not drive emissions reductions in the UK power sector beyond what would have happened anyway at the prevailing CO₂ price, then the EPS becomes a redundant policy instrument. At most, an EPS could approximate the equivalent of a CO₂ price floor for the UK power sector, driving behaviour only if the CO₂ price were to fall sufficiently.

APPLICATION OF AN EPS: KEY PRINCIPLES

7. Should an EPS nevertheless be considered, to be effective it should have three key features:
 - the standard should bring about emission reduction choices similar to the least-cost reductions induced by a robust CO₂ price under a cap-and-trade system;
 - it should treat all existing plants in the same way and not discriminate between new plants and existing ones, in order to maintain the incentive for investment in new capacity; and
 - it should not prescribe the application of specific technologies. This risks forcing premature mass deployment of promising technologies in the development phase, such as CCS or renewables. The technologies need to be tested both technically and economically in the demonstration phase before moving to deployment at scale.

DESIGN OF AN EPS: KEY LEVERS

8. **Portfolio approach:** An EPS can be applied to a power plant using any fuel. If the aim is largely to decarbonise the power sector by 2030, it would be reasonable to apply the EPS to all fossil-fuelled power generation—which is responsible for the vast majority of emissions in the sector. Greater compliance flexibility and a more diverse generation mix can be achieved through application of an EPS at a company portfolio level, in which the emissions from an operator’s total generation capacity are averaged so as to provide increased compliance flexibility and a robust generation mix. This portfolio approach can be extended to include renewables and nuclear power generation as well as a credit trading system whereby operators with emissions below the limit could sell emissions credits to those wishing to emit more than the set limit. These two additions would provide further flexibility to balance out higher emission plants should they be required to maintain security of electricity supply.

9. **Timing and scope:** A key design option critical to reducing emissions is how early the EPS comes into effect and whether it is applied to existing as well as new power plants. Modelling shows that to be effective an EPS should start early and be applied to both existing and new power plants. Such a design will also expedite emissions reductions in the UK because there is such a large share of generation capacity due for decommissioning or refurbishment to meet other emissions regulations.

10. **Size:** The size of power plants regulated by an EPS must also be set. This limit should be set to reduce emissions from their greatest sources yet allowing for security in local generation capacity as well as limited administrative burden. A size limit of 300MW capacity could meet such a requirement to balance interests in the UK.

11. **Intensity values:** The most common metric used to set an EPS in the power sector is a maximum allowable emissions rate expressed as grams of CO₂/MWh. In setting this intensity value, the current state of available technology and mitigation options must be taken into account. In other words, the EPS limit must be achievable. Regulators who have introduced an EPS on fossil-fuelled power generation have, therefore, chosen to set the target emissions rate for fossil-fuelled power plants at a level equivalent to a modern combined cycle gas turbine plant. Such a rate would prevent unabated coal-fired power stations being built and ensure the phase out of existing ones. Intimately linked to the target rate is the trajectory to achieve it. Due to construction lead times (also increased through elevated demand) and the imperative of maintaining security of electricity supply, the EPS should be phased in over time. The UK could set intermediate target intensities to correspond to the emissions trajectory of the overall UK emissions reduction target.

12. **Other metrics:** Two other potential metrics can be considered for an EPS: a percentage reduction in emissions per plant, per annum; and a mandate to use best available technology (BAT). A percentage reduction in emissions should be avoided. This will tend to be unfair due to the variation in the portfolios of operators, because it penalises early movers who have already responded to calls from government to reduce emissions. In the case of the BAT approach, prescribing specific technology increases the cost of compliance to the sector as other less costly mitigation options that may be available to certain plants cannot be pursued. (Indeed it is specifically because it avoids this drawback that the Emissions Trading System approach is preferable.) Another pitfall of prescribing BAT is similar to the risk identified in paragraph 8 above ie that it could force demonstration stage technologies such as CCS before they are fully tested technically and commercially.

CONCLUSION

13. Shell believes the most efficient policy approach for reducing emissions remains the use of market-based instruments, in particular cap-and-trade. A successful EU-ETS is in the interest of the UK, and as such we advocate for balanced recalibration of Phase III of the EU-ETS and an allowance reserve price in Phase IV and beyond to drive emission reductions in the power sector.

14. If the government should nevertheless decide to pursue an EPS, then its design will be critical to avoid unintended outcomes and achieve desired objectives. As such, we would welcome the opportunity to engage on the design of an eventual EPS.

September 2010

Memorandum submitted by ScottishPower

INTRODUCTION

1. ScottishPower is one of the “big 6” UK energy utilities. We provide electricity transmission and distribution services to more than three million customers and supply over 5.2 million electricity and gas services to homes and businesses across Great Britain. We operate some 6GW of power stations as well as gas storage facilities and energy management activities.

2. We are at the forefront of research into and investment in Carbon Capture and Storage (CCS) and we are among the final two applicants in the Government's Competition for funding to demonstrate CCS. Our proposal is based on retro-fitting a 300 MW post combustion CCS plant to our existing power station at Longannet.

3. We are part of Iberdrola, one of the world's leading utilities. The group also has major interests in UK renewable energy and is working with GDF Suez and Scottish & Southern Energy on a proposed new nuclear power station adjacent to the existing nuclear complex at Sellafield.

SUMMARY

4. An Emissions Performance Standard (EPS) for generation could play a role as part of the suite of energy policies designed to reduce emissions, but it will be important that its impacts are fully understood and that it is carefully structured and timed to deliver the intended objectives. A poorly designed EPS could have the potential to create unintended consequences or impacts on security of supply.

5. As far as new plants are concerned, the function of the EPS is already being undertaken by the previous Government's policy on new coal consents. We believe that an EPS applicable to new plant could potentially provide a clearer and more transparent approach than planning restrictions. However, it must be recognised that restrictions on new plants, of whatever sort, are less likely to foster CCS development than they are to divert investment into other types of generation.

6. If the effect of the EPS is essentially to maintain in a more transparent framework the previous Government's *de facto* moratorium on new coal, we would judge there to be few negative effects in the short term since we do not consider new coal generation to be economic at the current time.

7. We think that extending an EPS to existing plant could have significant adverse effects on security of supply as it would be likely to force the closure of the great majority of the remaining coal generation fleet, which remains a very important element of supply security in GB.

8. The principal direct effect of restrictions on coal generation in the UK would be to reduce the price of carbon in the EU ETS, rather than to achieve any net reduction in emissions. A net change in emissions would only occur if the EU ETS cap was set at a lower level as a result of the restrictions or if the EPS acted as a spur to wider carbon reduction activities outside the EU traded sector. The combination of lower EU ETS prices plus more expensive substitute generation could have negative impacts on UK competitiveness and investment.

9. Finally, if an EPS is applied prematurely to gas plant, effectively requiring CCS, it could again risk security of supply if the technology is unproven or not competitive.

10. We would therefore ask that the Committee encourages Government to consider the following:

- If an EPS is applied, it should only be applied to new coal fired electricity generation in the first stage.
- Any extension to new gas-fired power stations should only be considered as and when where the commercial and technological case is proven. Furthermore, it would be essential that a ready infrastructure for transportation, storage and supply chain for implementing gas CCS is in place. This is not expected until at least 2025 on current estimates.
- Government must be clear on the connection between policies designed to oversee point source CO₂ emissions within the power sector. There is a risk that the policy may not be aligned between the EPS, the Emissions Trading Scheme (ETS) and any future carbon price floor mechanisms and that multiple instruments may work against each other or against UK competitiveness.

RESPONSE TO INQUIRY QUESTIONS

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

11. In designing an EPS, Government needs to consider the impact on security of supply and the potential impact on consumer prices. Different EPS designs and levels can have various effects upon generation investment strategies taken by market participants and these, in turn, will impact the overall plant margin for the UK as a whole. Investment costs and plant margin levels will also have a potential impact on market prices.

12. For new plant, setting the precise level of an EPS must also consider practical factors. For example, in some circumstances the implementation of a tight EPS would rely upon the availability of proven techniques for CCS and the availability of functioning transportation and storage infrastructure for CO₂. At this time CCS is not mature and is some way from being regarded as a Best Available Technique reference standard. It is unlikely to become so until such times as it has been successfully demonstrated and made cost

effective. Demonstration should therefore remain the priority, but also with the realistic expectation that developments and refinements in CCS will hopefully be produced, providing the opportunity to reflect that knowledge and experience in the setting of more appropriate EPS levels over time.

13. For existing plant, we are not persuaded that EPS standards should be applicable because of the potential impacts on security of supply.

What benefits would an EPS bring beyond the emission reductions already set to take place under the ETS?

14. It does not appear to us that an EPS will directly contribute to any overall reduction in emissions, as any such reductions are likely to be offset by increases elsewhere within the traded sector cap. Indeed, any changes in the pattern of generation arising from an EPS are more likely to lead to a reduction in the price of carbon than a reduction in emissions. An EPS will only reduce emissions overall if:

- (a) The level of the EU ETS cap is set lower as a result (and the displaced coal is not burnt elsewhere in the world); or
- (b) The EPS acts as a spur for other carbon reductions outside the EU ETS traded sector.

15. It is also unclear how the EPS will work with the ETS and the forthcoming carbon price floor, where there is the potential for over complication of the policy landscape resulting in multiple regulation of CO₂ emissions.

16. In principle, we believe that delivering climate change policy objectives, at least cost, would be best achieved via by a properly functioning, robust EU Emissions Trading Scheme and that a real alternative to any EPS would be to look to secure a long-term ETS framework that is appropriately aligned to the lifespan of low carbon technologies, to provide investor confidence. Such an ETS would ensure that unabated coal would be restricted both by the cap on emissions and the corresponding price signal, as well as channel the market towards the most efficient carbon reduction options whilst remaining technology neutral.

17. However, an EPS may be attractive as a legally binding measure that would contribute to the accelerated decarbonisation of the UK power sector and provide a degree of certainty to the energy sector and investors over the regulatory requirements for clean thermal generation. It will be important that the costs of obtaining these benefits are well understood as there may not be any direct carbon savings to balance them.

18. Careful consideration must be given to the need to minimise any distortion or unintended consequences from an EPS. Any EPS must be properly aligned with other emission reduction measures and initiatives. It will also be vital for the future role of the ETS to be clarified in the context of the implementation of an EPS so that investors could understand the new regulatory landscape more clearly. Among the issues that could be considered in any design work would be how to deal with plant operating at low load factors and whether a more flexible portfolio approach to EPS might work more efficiently.

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?

19. An EPS is unlikely to be effective in driving forward the development of CCS because the impact is more likely to be to cause investors to switch to other generation options or indeed to other investment options outside the UK generation sector. If the Government were to set an EPS such that all fossil generation required CCS, then the result could be highly negative for security of supply given the current maturity of the technology and related infrastructure. We think that it would not be prudent to set a fixed date for restrictions that may not prove practicable, or cost effective, to comply with.

20. We believe that the demonstration of CCS on gas-fired generation is a sensible and logical step, particularly allowing for the current policy requirement that new gas-fired stations have to be Carbon Capture Ready (CCR) and the ultimate need to decarbonise the power sector that must inevitably include such generation.

21. However, including gas-fired generation within the wider UK Demonstration programme for CCS should not be to the detriment of the current Competition or dilute the commitment to it. The most pressing priority remains the need to have successful initial demonstration on which further policy based around CCS as a proven technology can then be built.

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

22. The future role for coal—and other fossil fuel generation—in the energy mix must also be taken into account as well as wider electricity market structure and reform. We hold firmly to the view that coal and gas have a vital role in the overall energy strategy, contributing to security of supply and fuel mix diversity while economically supporting and complementing intermittent renewables by providing system flexibility.

23. In this context, if not properly structured or configured, or if implemented prematurely, an EPS could deter investment in new gas generation and would most likely take coal off the investment agenda altogether. This has the potential to impact energy security. A poorly timed EPS may also adversely impact investment in carbon abatement technology at an important time. If standards are set too tightly and too soon, an EPS

has the potential to prohibit investment in technology classes rather than encourage continuous technology improvement. This could set back rather than accelerate the long term development of a CCS industry in the UK that can serve future EU energy needs.

What is the likely impact on domestic energy prices?

24. The price impacts of an EPS will depend on its design and whether it causes generators to change behaviour. If its impact is principally to prevent the construction of new unabated coal plants, this will have no material impact on prices in the short term as we judge such construction to be uneconomic at present in the UK. At the other extreme, if it forced CCS to be fitted to all new generation, the costs would be very large and difficult to quantify.

25. All the revenue needed to operate the power industry and remunerate its investments must ultimately come from consumers or possibly taxpayers. On the assumption that Government money is not available, the costs arising from any EPS policy will therefore inevitably end up in consumer bills.

Are any other European countries considering an EPS? If so, should the standards be harmonised?

29. At present we are unaware of any other European countries where the consideration of an EPS is as advanced as it is in the UK. However this does raise the concerns that we have expressed elsewhere that the absence of wider EU initiatives or common provisions may lead to investment being diverted elsewhere. Such harmonisation may eventually be achieved if and when CCS is recognised as Best Available Technology (BAT) although that designation may be some way off.

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

30. The forthcoming Cancun negotiations are likely to focus on areas of policy such as securing deals for the provision of finance, agreement on the architecture of future deals, the formation of individual country commitments and encouraging the commitment to remove fossil fuel subsidies. Against this background, a decision by the UK to implement an EPS seems to us to be unlikely to be material.

Can greater use of Emissions Performance Standards internationally help promote agreement on global efforts to address climate change?

31. The use of EPS internationally could be beneficial, once CCS development and demonstration has moved further ahead, as part of sectoral agreements to tackle the wider global issue on a more concerted basis. It would also help in the creation of energy benchmarks between developed and developing countries.

September 2010

Memorandum submitted by the Sussex Energy Group³¹

ABOUT THE SUSSEX ENERGY GROUP

1. The Sussex Energy Group undertakes academically rigorous, inter-disciplinary research that engages with policy-makers and practitioners. The aim of our research is to identify ways of achieving the transition to sustainable, low carbon energy systems whilst addressing other important policy objectives such as energy security. We are a group of 15 social scientists, working from a multidisciplinary perspective. We are funded from a diverse range of sources, primarily UK Research Councils, Government Departments, the European Commission. Through the Group, the University of Sussex is a core partner of the Tyndall Centre for Climate Change Research. The Group is also part of the UK Energy Research Centre.

2. We welcome this inquiry into Emissions Performance Standards. This is a potentially important policy instrument that could, if implemented carefully, make a significant contribution to the low carbon transition required in the UK. In our response to the Committee's questions, we have drawn on both our broad expertise in UK energy policy, and on our research on policy approaches to the development and deployment of carbon capture and storage (CCS) technologies. With respect to the latter, the Sussex Energy Group is leading a project funded by the UK Energy Research Centre. The project is analysing the multiple uncertainties of CCS technologies to help inform policy responses.

3. Before turning to the Committee's specific questions, it is important to place the possible implementation of an EPS into context. The overall aim of UK policy is to reduce greenhouse gas emissions by 80% by 2050. As part of this, the Committee on Climate Change has argued that the power sector should be largely decarbonised by 2030.³² This particular milestone has not yet been formally endorsed by the

³¹ This response was written by Dr. Jim Watson, Director and Dr. Florian Kern, Research Fellow, Sussex Energy Group, SPRU, University of Sussex; <http://www.sussex.ac.uk/sussexenergygroup>.

³² Committee on Climate Change (2010) Meeting carbon budgets: Ensuring a low-carbon recovery. Second Progress Report. London: CCC. June.

government, but reflects the widespread view that reducing emissions from the power sector will be achievable more quickly than doing so in other parts of the UK's energy system and economy. An EPS can potentially provide an incentive to help achieve this aim.

4. However, it is unlikely that an EPS alone will shift investment away from unabated coal and gas fired power plants in favour of plants with CCS technologies. It is widely acknowledged that investment in CCS technologies will only happen if complementary policies are also implemented. Of particular importance are financial incentives and an appropriate legal framework to handle long term liabilities associated with carbon storage. Legislation is already in place as a result of the Energy Act 2010 so that a financial incentive can be implemented.

5. If it is implemented, an EPS will need to be designed so that it integrates successfully with other existing policy instruments such as the EU emissions trading scheme and the climate change levy. Furthermore, it is likely to be implemented alongside related policy reforms that are part of the Coalition government's programme. An EPS may have significant overlaps and interactions with the intended carbon price floor and the envisaged reform of the electricity market. These interactions will need to be analysed carefully. In the absence of further details of the precise form of the EPS or details of these other reforms, it is not possible to analyse these interactions in any detail. Previous climate policy research shows that such interactions can be complex³³—and can lead to conflicting or overlapping incentives if not thought through. For this reason, it makes sense to evaluate an EPS and other related policy reforms as an overall “policy package” to check for coherence and to avoid excessive complexity.

SPECIFIC RESPONSES TO THE COMMITTEE'S QUESTIONS

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?

6. The level of the EPS should be informed by the Committee and Climate Change's recommendation that the power sector should be largely decarbonised by 2030. It should therefore be designed to help ensure that the carbon intensity of electricity generated in the UK falls from the current level of 496g CO₂ per kWh³⁴ to less than 100g CO₂ per kWh by 2030. This will not only help to underpin investment in CCS technologies, but will provide a general incentive for investment in other low carbon technologies.

7. Changing the level of the EPS over time makes sense in principle, not least to take into account the current uncertainties associated with CCS technologies—and the fact that these technologies are just entering the full scale demonstration phase. An initial level that prevents new, unabated coal plant from operating is clearly needed—perhaps of around 300g CO₂ per kWh. It is more debatable whether the initial level should also prevent new, unabated gas-fired plant – or whether such plant should only be covered at a later date (eg 2020) to allow investors more flexibility. Gas-fired plants emit less than half the CO₂ per unit of electricity generated than coal-fired plants.

8. Furthermore, whilst it is appropriate that the EPS initially applies to new plants, it will be important to also apply the standard to existing plants at a later date. This should be between 2020 and 2025 so that investment in (and operation of) fossil fuel plants will be in line with the Committee on Climate Change's recommendations. This will provide time for the CCS demonstration programme to scale up CCS technologies and to demonstrate that they can operate with high levels of carbon capture.

9. Whilst we see a strong rationale for changing the overall rate of the EPS over time, we think that the number of “milestones” should be minimised and signalled clearly in advance to provide certainty to investors. In addition, the same EPS rate should be applied to all power generation technologies. Implementing too many intermediate adjustments and different rates for different technologies would risk micro-managing the power sector, and constraining the flexibility of investors to make efficient decisions.

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

10. In theory, the EU emissions trading scheme and other complementary policies covering the non-traded sectors should ensure that the UK and EU climate targets are met. Furthermore, targets for the traded sectors should (again, in theory) be met at the lowest overall cost. As a result, the EPS will be unlikely to lead to additional emissions reductions over and above those that would have happened anyway. All other things being equal, this is because increased emissions abatement in the UK would be offset by less abatement elsewhere in the trading scheme.

11. However, economics are not the only consideration. Climate change policy and politics mean that the kinds of actions that are taken to meet such targets matter. It is important that no unabated coal-fired power plants are built in the UK, and that in the medium term the same should apply to gas-fired plants. An EPS will help to ensure this, and to send a signal nationally and internationally that the UK is serious about its commitment to the low carbon transition. Having said this, the impacts of an EPS should be taken into account when the European Commission sets the allocation of emissions permits in future phases of the EU ETS.

³³ Sorrell, S. (2003), “Who owns the carbon? Interactions between the EU Emissions Trading Scheme and the UK Renewables Obligation and Energy Efficiency Commitment”, Energy and Environment, 14(5), 677–703.

³⁴ Committee on Climate Change, op. cit.

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?

12. As noted earlier, an EPS alone is not likely to be effective in driving the development of CCS technologies in the UK. Because of the high costs of CCS technologies, and the high risks to investors financing the first full scale demonstration plants, financial incentives are required to complement an EPS. So far, the price of carbon within the EU ETS has been too low and too volatile to provide such a financial incentive for CCS and other low carbon technologies.

13. Therefore, other measures are required to complement an EPS and the EU ETS, particularly for low carbon technologies entering the demonstration stage such as CCS.³⁵ We therefore support the provision in the Energy Act 2010 for a new electricity supply levy to help fund the four CCS demonstrations planned for the UK. Given the need to phase out unabated gas-fired generation well before 2030, it will be important to include at least one gas-fired power plant in the programme of four UK demonstrations. Gas currently plays a key role in the UK's energy and electricity systems, and is likely to do so for the foreseeable future.

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

14. It is unlikely that an EPS will pose any risks to UK energy security unless it is implemented in a draconian manner in too short a timescale. For this reason, we have suggested earlier in this submission that an EPS should apply first to new plants, followed by extension to existing plants after several years. Furthermore, setting the initial level of an EPS so that new, unabated gas-fired plants can operate for the next few years without fitting CCS would add further flexibility and resilience to the UK electricity system.

15. Applying an EPS to all plants from either 2020 or 2025 will provide enough time for decisions to be made about retrofitting or closure of older fossil fuel plants. For those existing plants that will only be used for peaking duty, there may be a case for an "opt out" based on reduced running hours. Such an "opt out" would be similar to that in the Large Combustion Plant Directive which places limits on the operation of plants that do not have equipment fitted to control sulphur dioxide emissions.

16. There is a possibility of risks to the UK's long-term climate change agenda from implementing an EPS if this is done without careful thought. It is conceivable (though unlikely) that a hastily implemented EPS which leads to unintended consequences could lead to a backlash against policies to reduce power sector emissions. Perhaps a more important risk is that mentioned earlier—that an overly complex EPS policy would constrain the choices of power developers too much, and discourage investment.

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

17. Energy prices are likely to remain high irrespective of whether an EPS is implemented. This is not only because of the underlying costs of fossil fuels which provide the vast majority of our energy. It is also because of the costs of investing in low carbon technologies including CCS, renewables and nuclear power. The support policies to enable such investment (ie the renewables obligation and the new levy for CCS plants) will increase electricity bills—as will the carbon price floor that has been proposed, primarily to make private investment in new nuclear power plants more likely.

18. Having said this, an EPS will (in theory at least) lead to emissions reductions in the UK at a higher overall cost than a generic economic incentive such as that in the EU ETS. This is because it will effectively force UK power plants to reduce their emissions even if the costs of doing so are higher than the costs of abatement at other plants elsewhere in the EU ETS. In practice, it will be hard to disentangle the extent to which cost increases will stem from an EPS *per se*. As noted earlier, this is because an EPS will be part of a complex array of policy instruments, and is likely to be implemented alongside other measures such as a carbon floor price and energy market reform.

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

19. A key challenge for the negotiations at Cancun is to rebuild trust after the disappointing and chaotic experience at Copenhagen in 2009. Measures to show that low carbon transitions are possible and practical in particular countries are badly needed to help re-build that trust. Whilst an EPS will clearly have no impact on UK emissions before Cancun, its planned implementation will send a positive signal of leadership. It would demonstrate the intention that the UK will not permit the construction of new, unabated fossil plants. It would also strengthen the credibility of the UK's continuing calls for the EU to go further in its medium term emissions reduction target for 2020.

September 2010

³⁵ Watson, J. (2008). *Setting Priorities in Energy Innovation Policy: Lessons for the UK*. ETIP Discussion Paper. Cambridge, MA, Belfer Center for Science and International Affairs, Kennedy School of Government, Harvard University.

Memorandum submitted by Dr Rachel Western

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Her academic background is in the science and policy issues associated with nuclear waste management; and she has worked for the nuclear waste agency (Nirex), and also for Friends of the Earth (HQ).

SUMMARY

This paper focuses on the imperative requirement of avoiding radionuclide creation in the programme to avoid carbon emissions.

Radionuclides are created when uranium is used to produce nuclear energy. These radionuclides present a threat to "DNA"—the blue-print for life.

However, predicting the degree of harm that would be caused by the creation of such radionuclides is extremely problematic.

The majority of text is contained in the Appendix, which provides the evidence base for the contention that the prediction of harm due to radionuclides is extremely problematic.

In addition to the discussion of radionuclide harm, brief reference is also made to the KPMG report that concluded that Subsidies would be required if nuclear power stations were to be built. This conclusion must be compared to Government policy? which states that nuclear power stations should not be built if they require subsidy.

RESPONSE TO QUESTIONS

(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?*

(A) The level should not be set such that the creation of radionuclides is required.

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

(A) Extreme care should be taken to avoid dis-benefits

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

(A) If it was decided to meet Carbon Targets through the introduction of nuclear power, this would be likely to create a false sense of security

Professor Andrew Blowers of the Open University, and former member of the UK government's Committee on Radioactive Waste Management (CoRWM) has commented:

"[Nuclear power] would provide the illusion of a solution to the problems of global warming and energy security which required no fundamental changes in production or consumption. It is this business-as-usual aspect of nuclear that is its most insidious characteristic. — The danger is that by focusing on nuclear we refrain from recognizing the scale of the challenge we face and shirk our responsibility for dealing with it".³⁶

(5) *What is the likely impact of an EPS on domestic energy prices?*

(A) In August 2010 it was reported that:

"all the intellectual spare capacity in the government is focused on the deficit and the budget cuts, and there is very little capacity left to look at other political priorities"³⁷

It was reported that this was having a particularly severe impact on DECC (the Department of Energy and Climate Change).

³⁶ Source: Professor Andrew Blowers of the Open University, and former member of the government's Committee on Radioactive Waste Management (CoRWM). See *Nuclear or Not? Does Nuclear Power Have a Place in a Sustainable Energy Future?* David Elliott (editor) [Palgrave, 2007] Preface (page xviii).

³⁷ Business Green 17th Aug 2010
<http://www.businessgreen.com/business-green/comment/2268303/coalition-honeymoon-ends-energy>

In July 2010, the Telegraph reported that: “KPMG says nuclear power ‘won’t happen’”³⁸ The article concerned a study by KPMG for RWE npower that states that new reactors will not be built if the Government maintains its commitment not to provide taxpayer support for new reactors. The study says it is still uneconomic for utility companies to invest the billions of pounds required in new reactors under the current financial framework.³⁹

It may be seen that if it were decided to meet Carbon Targets through the introduction of nuclear power, this could have very severe impacts on energy prices.

APPENDIX

THE PROBLEMATIC NATURE OF PREDICTING HARM DUE TO RADIONUCLIDES

In September 2001, at the start of the: “*Managing Radioactive Waste Safely*” (MRWS) programme the Environment Minister, Michael Meacher stated:⁴⁰

“The legacy of a wrong decision could be catastrophic.”

TECHNICAL TERMS

There are about 90 different chemical elements (for example Hydrogen element “No 1” to Uranium element “No 92”)

Lumps of these elements may be broken down and broken down and broken down until an object about 10^{-8} centimetres big is reached that cannot be broken down any further in the same way. Breaking this object down any more would produce fragments that no longer shared the properties of the element.

The name for the smallest object that still retains the properties of the chemical element is an “atom”.

The number of the chemical element (see above) refers to the number of positive lumps (or “protons”) at the centre (or “nucleus”) of the atom.

The centre of the atom also contains neutral particles (or “neutrons”).

The centre (“nucleus”) of an atom may be unstable—due to the “wrong” balance of positive and neutral particles.

Such unstable centres (or “nuclei”) are known as

“RADIONUCLIDES”

In the process of becoming stable radionuclides release particles and/or energy. The particles and energy released are able to damage DNA (deoxyribonucleic acid.)

DNA is the “blue-print” for life. If it is damaged, cancer (either fatal or non-fatal); or alternatively birth defects may result.

The process of becoming stable through the release of particles and energy is known as “decay”.

The term “*half-life*” refers to the time that it takes for 50% of the original quantity of a given radionuclide to break down.

What is a “Sievert” ?

The harm caused by exposure to radionuclides is described in terms of:

the energy (per unit weight) of the exposure

It can be thought of in terms of the overall “*punch*” associated with the radionuclide bombardment.

one joule⁴¹ of “harm” to one kilogram is called one “Sievert”

NUCLEAR REACTORS AND THE CREATION OF RADIONUCLIDES

In a nuclear reactor uranium is pounded by small particles called “*neutrons*” and as a result a vast number of “*radionuclides*” are formed.

When uranium (chemical element “92”) is exposed to neutrons in a reactor there are three different processes that result in the creation of radionuclides.

³⁸ Sunday Telegraph—18th July 2010

<http://www.telegraph.co.uk/finance/newsbysector/energy/7896510/KPMG-says-nuclear-power-wont-happen.html>

³⁹ See also—Platts 19th July 2010

<http://www.platts.com/RSSFeedDetailedNews.aspx?xmlpath=RSSFeed/HeadlineNews/Nuclear/8917891.xml>

KPMG Press Release (19th July 2010) <http://rd.kpmg.co.uk/mediareleases/22235.htm>

World Nuclear News (19th July 2010)

http://www.world-nuclear-news.org/NP-Nuclear_investment_vital_to_meet_UK_emission_targets-1907104.html

⁴⁰ “*Government looks for Public Consensus on Managing Radioactive Waste*”—DEFRA Press Release—12th September 2001, 132/01

⁴¹ A joule is a unit of energy

These are:

the uranium^{42,43} may:

- absorb a neutron and turn into a heavier element such as neptunium (element “93”) or plutonium (element “94”). These very heavy elements are known as “*actinides*”.
- split into two separate atoms. The products of this split form two smaller atoms from the larger uranium. These smaller atoms are known as “*fission products*”.⁴⁴ They are particularly radioactive.

In addition, the reactor materials themselves:

- may take up neutrons. The radionuclides formed by this process are known as “*activation products*”.⁴⁵

It may therefore be seen that nuclear waste production is an intrinsic part of the usage of nuclear fuel to produce electricity.

Radionuclides and Damage to DNA

The reason that radionuclides are harmful is that they are unstable and as they breakdown (or “decay”) towards a form that is stable they release particles and energy that can cause severe damage to “DNA” (deoxyribonucleic acid). DNA is the genetic “blueprint” for life and a particular concern associated with DNA damage is that it can result in cancer.

For example, the National Radiological Protection Board (NRPB) (now part of the Health Protection Agency, the “HPA”) has stated:

*“a single radiation track (the lowest dose and dose rate possible) traversing the nucleus of an appropriate target cell has a finite probability, albeit very low, of generating the specific damage to DNA that results in a tumour initiating mutation.”*⁴⁶

Exposure to radiation can be harmful from outside the body⁴⁷ or from inside.⁴⁸

PROBLEMS IN PREDICTING HARM DUE TO RADIONUCLIDES

There are a number of reasons why it is difficult to predict the harm that would arise due to the radionuclides that would be created by “new-build” reactors. There is of course the obvious reason that many of the radionuclides will be dangerous for hundreds of thousands of years into the future; and so clearly making predictions on the necessary timescales would be extremely problematic.

However, another reason—which does not appear to have registered sufficiently strongly with either the nuclear industry or the regulatory community—is that although it is the radionuclide which causes the harm, this radionuclide is carried held within a chemical compound—whose behaviour is determined by the surrounding chemical environment. These chemical effects can result in extraordinary degrees of variation in the predicted contamination levels.

Prediction of Degree of Harm

The February 2009 Environment Agency (EA) “Criteria for RadWaste Disposal” document⁴⁹ sets out⁵⁰ the Environment Agency’s view—in quantitative terms—of the risks associated with radionuclide exposure.

The Environment Agency start from a baseline⁵¹ of a:

“one in a million” risk

(per year—to the person at greatest risk)

⁴² See for example “*Radionuclide content for a range of irradiated fuels*”—Contractors Report to Nirex Contractor: EEUK, Contract Number: TE2769/74 Doc No: Pcdocs395337v5 Reference Number: 17503/74/1 Rev. 2 3rd Sept 2002

Section 5.5 PWR, high burnup U fuel (pp 89–100)

⁴³ The plutonium—once created in the reactor—may also absorb neutron (s).or break up into two other atoms

⁴⁴ The initial fission products comprise the chemical elements zinc (element number 30) to dysprosium (element 66)

⁴⁵ Two particular activation products of concern are “carbon-14” and tritium (a radioactive form of hydrogen.)

⁴⁶ “*Risk of Radiation-Induced Cancer at Low Doses and Low Dose Rates for Radiation Protection Purposes*”

NRPB (1995) (National Radiological Protection Board)

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http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1195733754925?p=1219908766891

⁴⁷ For example if there are radionuclides in the atmosphere.

⁴⁸ For example if radionuclidea have been taken in by breathing, eating or drinking—or even in a cut.

⁴⁹ “*Geological Disposal Facilities on Land for Solid Radioactive Wastes. Guidance on Requirements for Authorisation*” (Feb ‘09) <http://publications.environment-agency.gov.uk/pdf/GEHO0209BPJM-e-e.pdf> [Ref 111 in DECC doc]

⁵⁰ page 46 (para 6.3.10)

⁵¹ page 47 (paragraph 6.3.1)

of developing either:⁵²

- non-fatal cancer,
- fatal cancer, or
- inherited defect

and state that this level of risk would arise from an exposure of:

20 micro Sieverts per year^{53,54}

(micro = one millionth)

Risk levels depend on the chance of something happening.

If the chance of being exposed to the radionuclides was less than one, then:

the “one in a million” baseline would be matched with an exposure level that was higher than 20 micro Sieverts.⁵⁵

NUCLEAR REACTORS AND CHILDHOOD CANCER

In late 2007 the German “KiKK” study:

(KiKK stand for *Kinderkrebs in der Umgebung von KernKraftwerken*—“Childhood Cancer in the Vicinity of Nuclear Power Plants”)

reported a 1.6-fold increase in all cancers and a 2.2-fold increase in leukemias among children living within 5 kilometres of all German nuclear power stations.

See:

Ian Fairlie

“Childhood cancers near German nuclear power stations: the ongoing debate”

Published in “*Medicine, Conflict and Survival*” 1 July 2009 (on-line)

[<http://www.informaworld.com/smpp/title~content=t713673482>]

This article indicates that the issue of just how dangerous exposure to radionuclides is still a matter of some controversy.

It is a matter of much concern and upset that the particular illness that was found near the German nuclear power stations was leukaemia and solid cancer in children under five years old.⁵⁶

WASTE FUEL CAN BE LETHAL WITHIN A MINUTE

Source:

Allan Hedin

“Spent nuclear fuel—how dangerous is it? A report from the project ‘Description of risk’”

SKB Report—Technical Report TR-97-13 (March 1997)

On page 21 of this report at para 3.5.2: the following two figures are provided:

- (1) the lethal dose is given as 5,000 “milli-Sieverts”;⁵⁷
- (2) a dose rate of one million “milli-Sieverts” per hour is quoted
(one year after one tonne of waste fuel has been taken out of a reactor—when standing at one metre distance from the waste fuel rod)

From these two figures it is then calculated⁵⁸ that:

To stand one metre from:

- one tonne of waste fuel,
- one year after its removal from the reactor
- would kill you in twenty seconds.

On page 23 of the NDA “Disposability” report for Westinghouse “AP1000”⁵⁹ type fuel,⁶⁰ a weight of approximately 600 kilograms per “AP1000” fuel assembly is quoted. (see Table B4)

⁵² page 47 (para 6.3.15)

⁵³ Environment Agency Disposal Guidance (Feb ‘09) page 47—para 6.3.17

⁵⁴ (NB—“micro”—means one millionth)

⁵⁵ also para 6.3.17—page 47

⁵⁶ page 198

⁵⁷ milli = one thousandth—for definition of “Sievert” see “Technical” section at the start of this document)

⁵⁸ (by reference to Figures 3–8a and b (See pp 22–23)

⁵⁹ “AP”—Advanced Passive

⁶⁰ “*Geological Disposal Generic Design Assessment: Summary of Disposability Assessment for Wastes and Spent Fuel arising from Operation of the Westinghouse AP1000*”

NDA (Oct ‘09)

<http://www.nda.gov.uk/documents/upload/TN-17548-Generic-Design-Assessment-Summary-of-DA-for-Wastes-and-SF-arising-from-Operation-of-APPWR-October-2009.pdf>

The figure quoted for the weight of an “EPR”⁶¹ fuel assembly is also roughly 600 kilograms.⁶² (See page 29—Table B9).

Therefore:

- One fuel assembly of either “AP1000” or “EPR” type fuel weighs roughly half a tonne.
- This means that standing next to one of either of these fuel assemblies could kill you in about a minute.⁶³

PROBLEMATIC NATURE OF HARM PREDICTION

Although extensive measures are taken to avoid people coming directly into contact with waste fuel rods (and so being killed more or less immediately) the fact is that nuclear power stations do routinely release radionuclides into the air and the sea—and it is known that these can cause cancer.

Putting numbers to the cancer rates is an area of much controversy.

There is also the fact a significant proportion of the radionuclides created will be dangerous up to one million years into the future. Such timescales are beyond our imagination.

In addition to this there is the fact that nuclear power is the Siamese Twin of nuclear weapons. The same metals (plutonium and uranium-235) are used, and also many of the same techniques. If we continue on into the 21st Century with yet more nuclear reactors, there is a danger that they will be used against us.

Timescale

An obvious reason why it is difficult to calculate the levels of harm that would arise due to the synthesis of radionuclides in the proposed reactors is that many of the radionuclides will be dangerous for hundreds of thousands of years into the future. Clearly making predictions over these timescales would be extremely problematic.

Chemical Effects

It is the radionuclide that causes the harm. However, generally speaking⁶⁴ radionuclides do not “travel solo” but exist in combination with other chemical elements to form chemical compounds.

The behaviour of these chemical compounds depends on:

- the chemical elements included;
- how they are joined together;
- the temperature;
- the amount of electrically charged (“ionic”) particles near-by;
- whether the surroundings are watery or oily—or solid or gas;
- whether the surroundings are simple or complicated (ie. is the compound just one amongst a “smorgasbord” of others—or is the chemical system quite simple); and
- the surrounding pressure.

These chemical effects can result in extraordinary degrees of variation in predicted radionuclide behaviour.

(This phenomenon is discussed further below.)

RADIONUCLIDES INSIDE THE BODY

The “*Committee Examining Radiation Risks of Internal Emitters*” (CERRIE) was an independent Committee established by the Government in 2001, following concerns about the dangers to health associated with radionuclides once they were inside the body.

In October 2004, the Committee produced a final report and a Press Release.⁶⁵

⁶¹ “EPR”—European Pressurised Reactor

⁶² “Geological Disposal Generic Design Assessment: Summary of Disposability Assessment for Wastes and Spent Fuel arising from Operation of the UK EPR”
NDA Technical Note no. 11261814
NDA—October 2009

<http://www.nda.gov.uk/documents/upload/TN-17548-Generic-Design-Assessment-Summary-of-Disposability-Assessment-for-Wastes-and-Spent-Fuel-arising-from-Operation-of-the-EPWR.pdf>

⁶³ assuming that the waste fuel had been removed from the reactor one year earlier and that you were standing one metre away.

⁶⁴ The exception would be radio nuclides that are part of the inert (or “noble”) gas series. One such example is “radon”.

⁶⁵ See <http://www.cerrie.org>

In the Press Release,⁶⁶ the Chairman of the Committee, Professor Dudley Goodhead (OBE)⁶⁷ said:

“The main finding of the Committee’s Report is that we have to be particularly careful in judging the risks of radioactive sources inside the body. The uncertainties in these internal radiation risks can be large”

URANIUM MINING

Even the process of mining the uranium is dangerous. Michael Barnes QC who was the Inspector for the Hinkley (C) Inquiry at the end of the eighties concluded:

“I recommend that if future proposals are put forward for further nuclear facilities which would involve the importing of uranium the applicants should use their best endeavours to present information to any future inquiry on conditions for workers and the public in the countries concerned who might be affected by the mining and processing of uranium for the project.”

David Lowry—of “Nuclear Waste Advisory Associates” (NWAA) has written a paper on Uranium mining looking at the issues of risk and despoliation—and also at the issue of “environmental racism”. The paper can be found on the NWAA web-site.⁶⁸

Further information can be also be found on the “WISE” web-site on uranium issues:

<http://www.wise-uranium.org/index.html>

RADWASTE BURIAL AND RESULTANT HARM

The Government propose that a future programme of RadWaste Burial would serve to keep the synthesised radionuclides from nuclear power out of harms way for timescales far into the future.

Such an approach has been advocated by the nuclear industry for many years. For example in November 1978 (just over thirty years ago) Dr L E J Roberts, Director of the Atomic Energy Research Establishment at Harwell in Oxfordshire gave a lecture to the British Nuclear Energy Society (BNES) on the issue of long term management of the most intensely radioactive wastes “high level wastes”—(or “HLW”).

In April 1979 this talk was made available as a brochure.⁶⁹ On page 19 (Fig 4) a cutaway drawing of the “conceptual” design of an underground RadWaste burial facility is shown.

The present-day idea for RadWaste Burial is more or less the same now as it was in the Seventies.

During the intervening period work has been undertaken in order to establish the degree to which leaks from such a Burial facility would be contaminated. In the 1990s, the work that had been carried out to date on this issue was scrutinised at a Planning Inquiry in Cumbria—where it was planned to initiate excavation works for a RadWaste Burial facility.

This Inquiry was an extremely rigorous process, involving as it did “Proofs of Evidence”, supporting references, witnesses and cross-examination. The Inquiry lasted for 66 days (from Sept ‘95 to Feb ‘96) and was presided over by a Planning Inspector, who had the assistance of a Technical Assessor.

The Inspectors report was delivered in March 1997.

Overall, the Inspector concluded that the Nuclear Industry should not be given the go-ahead to begin their planned programme:

“in [their] current state of inadequate knowledge”^{70,71}

The Government accepted the Inspectors conclusions, and the planned Excavation programme did not go ahead. In the subsequent period very little additional research work was done.

In October 2009, the European Union—Joint Research Centre released the following Reference Report:

“Geological Disposal of Radioactive Waste: Moving Towards Implementation”⁷²

⁶⁶ Press Release, 20th Oct 2004

http://www.cerrie.org/pdfs/cerrie_press_release_final.doc

⁶⁷ Professor Dudley Goodhead OBE

Director, Medical Research Council Radiation and Genome Stability Unit

(** Professor Goodhead served as Director of the MRC Unit until his retirement on 30 September 2003. **)

⁶⁸ “Uranium Exploitation and Environmental racism: why environmental despoliation and the ignorance of radiological risks of uranium mining cannot be justified by nuclear fuel production” Response to consultation on “Justification Application New nuclear power stations Submitted by the Nuclear Industry Association” (June 2008) by Dr David Lowry [Environmental policy and research consultant]<http://www.nuclearwasteadvisory.co.uk/uploads/5794Uranium%20exploitation%20and%20environmental%20racism,%20submission%20to%20nuclear%20justification%20consultation,%202025-3-09.doc>

⁶⁹ “Radioactive Waste—policy and perspectives” L E J Roberts, Published by the United Kingdom Atomic Energy Authority (UKAEA) April 1979

⁷⁰ McDonald (1997) p277 para 8.56

⁷¹ A very useful source of Background Information on the “Nirex RCF” decision can be found in an article written by Tom Wilkie in Prospect Magazine (May 1997) http://www.prospect-magazine.co.uk/article_details.php?id=5050

⁷² Authors—W.E. Falck and K.-F. Nilsson

http://ec.europa.eu/dgs/jrc/downloads/jrc_reference_report_2009_10_geol_disposal.pdf

Chapter Two of this Report (pp 10–21)—entitled: “*The Technical Concept of Geological Disposal*” identifies nearly forty outstanding research areas.

In November (2009) Francis Livens, Professor of Radiochemistry at the University of Manchester and a Member of the “Committee on Radioactive Waste Management” (CoRWM)⁷³ said:

“In recent years we have recognised where we do not have relevant expertise,

[concerning radioactive waste management]

and that is a first step towards dealing with these pressing problems.

We are starting at a very low base along what will be a long and complex journey.”

EXTREME LEVELS OF HARM

Malicious Exposure

Nuclear Reactors are intrinsically linked with nuclear weapons. Al Gore commented in March 2009:

*“For the eight years that I spent in the White House every nuclear weapons proliferation problem we dealt with was connected to a reactor programme. People have said for years that there are now completely different [nuclear] technologies. OK, but if you have a team of scientists that can build a reactor, and you’re a dictator, you can make them work at night to build a nuclear weapon. That’s what’s happened in North Korea and Iran. And in Libya before they gave it up.”*⁷⁴

On 24 March, Jacqui Smith at the Home Office warned of the risk of terrorists using nuclear weapons.⁷⁵ and the Home Office referred to a strategy of “prevent, pursue, protect and prepare”.⁷⁶

Nuclear power stations create plutonium⁷⁷ thus the fact that the Government is actively seeking the synthesis additional plutonium when the Home Office have raised nuclear concerns is incongruous.

On 17 March 2009 Gordon Brown gave a speech on nuclear proliferation,⁷⁸ in which he spoke of “capping the production of weapons useable fissile material”. However, there is no question of the fact that the plutonium from nuclear power stations could be used to make nuclear weapons.⁷⁹

RELEASE DUE TO TERRORISM

Bombs can also be made out of Uranium-235, and a “dirty bomb” (that disperses radionuclides—but isn’t made out of a nuclear explosive) could be made out of something that simply contained radionuclides. Euratom (the nuclear part of the European Union) has a research programme^{80,81} which is currently looking at:

“Malevolent uses of radiation or radioactive material”⁸² The web-site states:

“With new security challenges facing society, there is a need to develop robust and practical approaches in response to the malevolent use of radiation or radioactive materials, in particular to minimise the impact of nuclear and radiological terrorism.”

⁷³ a Committee that advises Government.

⁷⁴ “Gore on Lovelock, nuclear power and climate change sceptics”

Tuesday 16th March 2009

Guardian

<http://www.guardian.co.uk/environment/blog/2009/mar/16/climate-change-al-gore>

⁷⁵ “Home Office warns of Nuclear Terror Threat” UK Parliament 24th Mar 2009

<http://news.parliament.uk/2009/03/nuclear-proliferation-lords-debate/>

⁷⁶ Telegraph 24th Mar 2009

<http://www.telegraph.co.uk/news/newsttopics/politics/defence/5042708/Government-warns-of-nuclear-terror-threat.html>

⁷⁷ The book “Plutonium—Blessing or Curse” by Herman V. Henderickx (Pub: “The Copper Beech” Brussels—Denver 1999) refers to the production of about ten kilograms of plutonium per 1,000 kilograms of waste fuel (assuming that the fuel rod has been in the reactor for three to four years)—[see page 45.]

⁷⁸ Speech on nuclear energy and proliferation, Tuesday 17 March 2009 Transcript of a speech given by the Prime Minister, <http://www.number10.gov.uk/Page18631>

⁷⁹ “Managing Plutonium in Britain: Current Options”—Oxford Research Group “Current Decisions Report” Number 21 (September 1998) pp 9–11 “Will Mixed-Oxide (MOX) Fuel Make it Easier to Acquire Nuclear Weapons?” Frank Barnaby

⁸⁰ part of “FP7”—or the 7th Framework Programme

⁸¹ See Council of the European Union Press Release —18th December 2006

“Council approves EU research programme for 2007–13”

[http://www.consilium.europa.eu/cms3_applications/applications/newsroom/](http://www.consilium.europa.eu/cms3_applications/applications/newsroom/loadDocument.ASP?cmsID=221&LANG=en&directory=en/misc/&fileName=92236.pdf)

[loadDocument.ASP?cmsID=221&LANG=en&directory=en/misc/&fileName=92236.pdf](http://www.consilium.europa.eu/cms3_applications/applications/newsroom/loadDocument.ASP?cmsID=221&LANG=en&directory=en/misc/&fileName=92236.pdf)

⁸² http://cordis.europa.eu/fp7/euratom-fission/malevolent_en.html

Last Updated—16th December 2008

In October 2009 a nuclear scientist working on the Large Hadron atom collider in Switzerland was arrested as it was suspected that he was helping al-Qaeda. He had worked in the UK at the Rutherford, Appleton laboratory in Didcot, Oxfordshire.⁸³

SERIOUS REACTOR ACCIDENTS

The first serious reactor accident in the world took place in the UK, when one of the Windscale⁸⁴ “Piles”⁸⁵ caught fire.⁸⁶ There was also a very serious accident in Chernobyl in the Ukraine in 1986.

In March 1978, an accident happened in a PWR at Three Mile Island, Pennsylvania 240 kilometres from New York. This accident is of particular concern as the “PWR” reactor type is of the type proposed by EdF.

Memorandum submitted by International Power plc

(I) ABOUT INTERNATIONAL POWER

IPR welcomes the opportunity to contribute to the Energy and Climate Change Committee’s call for evidence on an Emissions Performance Standard (EPS) for CO₂.

International Power plc (IPR) is a global independent power generation company with interests in over 32,000 MW of generation capacity in 21 countries. This includes approximately 5000 MW of plant in the UK market where, in partnership with Mitsui & Co., it owns and operates the coal fired station at Rugeley, Deeside Power CCGT, Saltend Cogeneration Plant in Hull, First Hydro Pumped Storage Stations at Dinorwig and Ffestiniog in North Wales, and Indian Queens peaking plant in Cornwall; the company also has a share in Derwent Cogeneration plant. These assets represent a 7% market share, making IPR one of the country’s largest independent power producers.

IPR is one of the world’s top 10 owners and operators of wind farms with an installed capacity of over 1100 MW, much of which is in Europe. The company is keen to develop its renewable portfolio further and is hoping to develop a range of projects in the UK as part of this strategy.

(II) SUMMARY KEY POINTS

- IPR supports the widely acknowledged need to reduce carbon dioxide (CO₂) emissions as part of the response to climate change and that substantial decarbonisation of UK electricity generation by 2030 is an important part of this response.
- IPR does not support the introduction of an EPS for either new or existing generation plant. IPR believes that the European Union Emissions Trading Scheme (EUETS) is the primary regulatory mechanism by which to bring about reduction of industrial CO₂ emissions.
- IPR believes that the EUETS should be allowed to continue to operate without undue distortion in order to best meet objectives (eg through adjustments to the overall cap to achieve the required overall reduction). Prescribing technology specific restrictions will limit flexibility in achieving overall reductions targets and impact on the efficiency of the scheme. It would also undermine the EUETS, indicating a lack of confidence in the ability of the EUETS to function as intended.
- IPR believes that the introduction of an EPS may also have a damaging effect upon investment decisions needed now to ensure a smooth transition to a low carbon economy. Carbon Capture and Storage (CCS) should become the relevant Best Available Technique (BAT) for abatement of CO₂ emissions from new plants, when it is commercially available. Until then IPR welcomes Government’s support for demonstration CCS projects.
- To provide a diverse energy mix, coal with CCS will be an energy source not only in the UK but throughout the world for the foreseeable future. Therefore investment in coal needs to be encouraged as is the case with the demonstration CCS plants. An EPS will not serve to encourage this investment or the similar investment required to develop CCS for gas fired plant.

⁸³ Telegraph 11th Oct 2009
<http://www.telegraph.co.uk/news/worldnews/europe/france/6292797/Terror-suspect-worked-at-British-nuclear-lab.html>
 Sunday Express 11th Oct 2009
<http://www.express.co.uk/posts/view/133318/Nuclear-suspect-s-link-to-British-lab>
 —Mail on Sunday 11th Oct 2009
<http://www.dailymail.co.uk/news/article-1219569/Revealed-Al-Qaeda-suspect-worked-UK-laboratory.html?ITO=1490>
 Mirror 10th Oct 2009
<http://www.mirror.co.uk/news/top-stories/2009/10/10/nuclear-scientist-working-on-large-hadron-collider-a-terrorist-115875-21736127/>
 Independent on Sunday 11th Oct 2009
<http://www.independent.co.uk/news/world/europe/nuclear-terror-suspect-is-top-physicist-1800927.html>

⁸⁴ now Sellafield

⁸⁵ In a “Pile” type reactor uranium fuel rods were bombarded with neutrons—and transitioned into “fission products” and plutonium—as is the case for a nuclear power stations; however no effort was made to use the heat to produce electricity. The purpose of the “Piles” was to produce Plutonium for nuclear weapons.

⁸⁶ For more details see the book by Lorna Arnold—“Windscale 1957—Anatomy of a Nuclear Accident”
 Pub: Macmillan (1992)

- Existing plant in the latter part of its natural life cycle has decreasing operational load factors as more modern generation replaces it. In a speech at the Economist UK Energy Summit on 24 June 2010 the Secretary of State for Energy and Climate Change said “*We need a meaningful carbon price to underpin investment decisions*”. We note the Government’s plans to introduce a carbon price floor in order to achieve “meaningful” levels. Application of an EPS in addition to such measures at best seems redundant, and at worse potentially damaging to security of supply should older fossil plant be regulated out of the market at times when reliable capacity is required.
- *If despite these arguments the Government wishes to introduce EPS, the latter should only apply to new coal plant, addressing the highest carbon intensity generation.*

(III) ON THE QUESTIONS POSED IN THE CALL FOR EVIDENCE

Q1: *What are the factors that ought to be considered in setting the level for an EPS and what would be an appropriate level for the UK? Should the level be changed over time?*

1. IPR does not consider that an EPS is a useful option to encourage reductions in CO₂ emissions and the investment needed to move to a low carbon economy and acceptable security of supply. The alternative pathway that IPR would welcome is a move by the UK to work with other EU Member States to strengthen the EUETS to make it more effective; this is particularly important given the desire to move from 20 to 30% overall carbon emission reduction target and the associated need to decarbonise the electricity sector.

2. With this in mind, existing fossil plant will be increasingly impacted by the Industrial Emissions Directive and will eventually close. However the short-term operation of this plant can help to contribute to the longer term decarbonisation process by providing necessary security of supply during the period in which CCS and low carbon generation is brought to commercial fruition thus, reducing the risk of new fossil plant being built which ultimately does not contribute to the low carbon future.

3. *If* the Government is seriously set on introducing an EPS, it should be applied only to *new* coal plant so as not to threaten security of supply. In addition Government should be clear about the detail of what an EPS is intended to achieve over and above the requirement to fit CCS. If it is to stop unabated coal generation in the event of CCS failure, then an EPS would have to be set at the appropriate level to achieve this but also avoid replacement generation at a higher carbon emission rate.

Q2: *What benefit would an EPS bring beyond the emissions reductions already set to take place under the EU ETS?*

4. IPR does not think that an EPS offers any benefits over a properly functioning EUETS. On the contrary IPR believes that an EPS would only serve to weaken and undermine the EUETS, indicating that the EUETS is not functioning as intended and that Government lacks confidence in the EUETS. An EPS would threaten security of supply and ultimately lead to higher prices for consumers.

Q3: *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?*

5. The development of CCS is not dependent on an EPS being in place; there is already interest in industry to proceed with CCS. Successful development of CCS is much more dependent on the success or otherwise of the four demonstration plants. If CCS development is successful, then an EPS is not needed; if CCS development is unsuccessful or is successful later than expected, then unabated coal will still be difficult to operate in a world of relatively high carbon prices and a declining carbon emission cap for the sector.

6. The electricity sector will need some gas in the future to provide “shape” in the market, peaking plant, and stand-by generation. With this in mind it makes sense for one of the demonstration projects to be a gas-fired technology.

7. A properly functioning EUETS will be more likely to push forward development of CCS compared to an EPS, *and* preserve an acceptable level of security of supply.

Q4: *Could the introduction of an EPS pose any risks to the UK’s long-term agendas on energy security and climate change?*

8. The introduction of an EPS on existing plant would have a severe impact on energy security. IPR considers the EUETS to be a preferable means by which to protect short term energy security and to encourage a positive short-to-mid term response to climate change. While it can be argued that an EPS would help to support the UK’s climate change agenda, IPR believes that this issue must be assessed along with associated issues and not in isolation. Therefore the best way to encourage the climate change agenda in electricity supply, to protect security of supply, to help prevent fuel poverty, and to encourage diversity of fuel supply, is to focus on the EUETS and encourage the development of CCS. These tasks go hand in hand with the need to continue the encouragement of energy efficiency and the development of non fossil sources of electricity.

Q5: *What is the likely impact of an EPS on domestic energy prices?*

9. DECC's *Updated Energy and Emissions Projections* published in June 2010 show electricity prices are set to rise between 60% and 85% between 2010 and 2025, consistently across the various scenarios presented. The contribution of coal is projected to drop dramatically over this period while gas generation continues to make a significant contribution. The imposition of EPS on fossil plant, particularly gas, would lead to higher cost generation options being adopted than would otherwise be the case, resulting in higher costs to consumers.

Q6: *Are any other European countries considering an EPS? If so, should the standards be harmonized?*

10. IPR is not aware of any other European countries considering an EPS. It is also worth noting that an EPS was considered for inclusion in the Industrial Emissions Directive but did not find sufficient support for ultimate inclusion.

11. The US State of California EPS of 500 gCO₂/kWh introduced in 2007, cited by the Conservative Party as the example for a similar possible measure in the UK before the General Election, is the only form of carbon legislation in that state—California does not have an equivalent to the EUETS or a carbon tax on fossil generation.

Q7: *Could unilateral action by the UK to introduce an EPS contribute towards global climate negotiations in Cancun in November 2010?*

12. To date, unilateral action has not proven to be effective approach and IPR does not consider this to be a prudent strategy. IPR believes that it would be more beneficial to focus on improving what is already under consideration, for example the setting of meaningful targets within an agreed framework, the role of CDM, and international collaboration in the development of abatement technologies and renewables.

Q9: *Can greater use of EPSs internationally help promote agreement on global efforts to address climate change?*

13. While they will wish to work to the end of tackling climate change, it is unlikely that the major economies will want to risk their growth prospects by the imposition of an EPS similar to that under consideration in the UK. If available, they will want to use their indigenous fossil fuel reserves for the economic benefit of their people. Therefore it would be better to focus on making CCS work and to speed up the CCS development timetable as much as possible.

14. The EUETS is now well established in the EU as an effective way to bring about reductions in CO₂ emissions—emissions trading has also provided an effective mechanism for addressing SO₂ and NO_x emissions from the power sector in the US. It is also worth noting that the EU ETS has also proved an effective vehicle for engaging developing countries in climate change mitigation by offering a “market” for Clean Development Project credits. The success of this engagement suggests strengthening the EU ETS, and encouraging ETS development in other countries is a more effective forward.

September 2010

Memorandum submitted by GE Energy

GE Energy is a leading supplier of power generation and energy delivery technologies.

The businesses that comprise GE Energy—GE Power & Water, GE Energy Services and GE Oil & Gas—provide integrated product and service solutions in all areas of the energy industry including coal, oil, natural gas and nuclear energy; renewable resources such as water, wind, solar and biogas; and other alternative fuels. In the UK, our installed technology meets 18% of UK energy needs and we also supply to 13 of the 14 transmission & distribution networks in Great Britain.

GE is a leader in the development, application and design of Integrated Gasification Combined Cycle (IGCC) power plants, which employ gasification as a key technology for pre-combustion carbon capture. Through our IGCC technology, GE is playing an active role to support IGCC demonstration projects and the development of a regulatory framework governing the transportation and storage of CO₂. In Europe, GE also has its own European Cleaner Coal “centre of excellence” in Warsaw, Poland—underscoring its commitment to IGCC and carbon capture & storage (CCS) technology.

In the UK GE Energy's installed technology includes 15GW of generation producing ~ 18% of UK energy needs. We also provide network management systems to 80% of the Distribution Network Operators in Great Britain.

GE Energy is part of General Electric, a global infrastructure, finance and media company. GE employs 20,000 people in the UK, has 25 manufacturing sites here and is the largest sponsor of London Olympics.

SUMMARY

GE Energy is pleased to provide its recommendations to the Energy and Climate Change Select Committee Inquiry into Emissions Performance Standards (EPS). The UK's energy challenges of security of supply, climate change and energy affordability require a long-term approach and a policy framework that addresses current investor uncertainty surrounding Carbon Capture Storage (CCS) investments.

The demonstration of CCS is the only way to prove CCS technologies at a commercial scale and, to this end, GE supports the Government's current aim to fund demonstration projects through a CCS levy; prohibiting the development of new coal plants without a CCS demonstration; and the requirement for all new fossil-fuelled power stations to be "Capture Ready". We also support the Committee on Climate Change's recommendation that the UK must have a largely decarbonised power sector by 2030 in order to meet its 2050 target of reducing emissions by 80%.

Whilst we recognise that policy-making is at an early stage, GE views the concept of an Emission Performance Standard (EPS) for coal plant as a viable regulatory supplement. We recognise that the EU Emissions Trading Scheme (EU ETS) should be regarded as the primary long-term mechanism for delivering cuts in emissions. Any introduction of an emissions performance standard should not imply a weakening of the importance of the EU ETS, but rather can provide an early incentive for the electricity market to switch to low-carbon technologies during a period until the cost of CCS is sufficiently low to be supported by the EU ETS price.

RESPONSE TO QUESTIONS

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?

Carbon emissions in the power sector are currently determined by a cap under the EU Emissions Trading Scheme (EU ETS). The EU ETS should remain the principal policy instrument to deliver absolute reductions in carbon emissions, however due to weak electricity market prices and uncertainty, it does not currently incentivise investment in low carbon generation. In order to address this other mechanisms will be required to drive low carbon investments.

An emissions performance standard (EPS) sets a maximum level of GHG emissions per unit of output and is designed to raise emissions performance of power plants. This is a good way of quantifying CO₂ emission levels, setting consistent goals across technologies and to deliver technological advancement in low-carbon solutions within a certain timeframe.

Should the UK Government decide to implement an Emissions Performance Standard policy, there are a variety of issues that should be considered:

- The type of facility commitment that should be subject to the EPS.
- Whether it applies to new construction and/or new investments in existing facilities.
- Determining the facility threshold, ie MW size or capacity factor.
- The timeframe for introducing a performance standard in relation to full CCS demonstrations at commercial scale.
- Derogations for certain types of plant (for example flexible peaking technology).

Before an Emissions Performance Standard can be introduced, the level and timing of an EPS policy must be carefully considered in order to take account of differences in fuels and technology options. Whilst policy-making remains at an early stage, we would recommend that the design of EPS should seek to be consistent with best available technology at the time of implementation. For example, under the current Large Combustion Plant Directive (LCPD), we would be opposed to an initial standard that goes beyond the 360g CO₂/kWh as any standard set higher risks penalizing fuel advantages provided by natural gas by unnecessarily increasing capital and operating expenditures.

We would also recommend that policymakers ensure that certain considerations are incorporated into any standard. For example, a more differentiated approach to EPS levels should take into account different technologies, plant configurations, and other requirements certain power plants have to fulfil along the merit order (ie base load, load following/peaker).

Should the level be changed over time?

Once established, an Emissions Performance Standard can be reviewed and made more stringent over the years as the technology develops. However, in the first instance, it will be important to ensure that CCS has been demonstrated at a commercial scale.

As such GE urges the UK Government to proceed to demonstrate CCS as quickly as possible, both to expedite cost-effective emission reductions and to build the UK's competitive advantage. In the UK GE is supporting the Hatfield project, a 900MW Integrated Gasification Combined Cycle Power Station, by

providing steam turbines to enable a phased approach to CCS by 2015 with up to 90% carbon capture. Projects such as Hatfield are at an advanced state of readiness and can serve to inform future energy policy including consideration of an Emissions Performance Standard.

The ultimate emission limits for fossil fuel power generation and other industries cannot be set until commercial viability of the full CCS chain has been established. It is therefore essential that industrial-scale projects begin as soon as possible in order to ensure CCS becomes the best available technology.

In the long term it is to be expected that all power plants could be able to comply with some form of emissions standard.

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

Putting a price on GHG emissions will result in investments in technologies and other actions that will reduce emissions. However, some activities that reduce emissions cost-effectively do not respond to this price signal: so-called market barriers prevent or impede the penetration of cost-effective technologies and practices that could mitigate GHG emissions.

If the Government were to develop an Emissions Performance Standard then it must be supplementary to and complement the EU ETS and should not be designed in a way that undermines the carbon segment.

We recognise that the EU ETS should be regarded as the primary long-term mechanism for delivering cuts in emissions. Any introduction of an Emissions Performance Standard should not imply a weakening of the importance of the EU ETS, but rather can provide an early incentive for the sector to switch to low-carbon technologies during the period until the cost of CCS is sufficiently low to be supported by the ETS price.

Complementary policies achieve a variety of objectives in addition to reducing GHG emissions and removing segment barriers. They can achieve reductions outside (or below) the cap, encourage investments in low-carbon technologies and lower the cost of transitioning to a low carbon economy. As such, an Emissions Performance Standard could therefore ensure that other low carbon technologies are not undermined by the operation of lower cost, non-CCS fitted carbon intensive plant.

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?

The introduction of an Emissions Performance Standard could provide vital support to the deployment of CCS and increase diversity and security of supply by ensuring the continued use of coal. However, it cannot be the main driver to achieve a UK low-carbon economy nor, as a part of that, deployment of CCS in its own right.

GE produces Integrated Gasification Combined Cycle (IGCC) technology, which employs gasification as a key technology for pre-combustion carbon capture and storage. This is technologically proven and ready for deployment but full-scale demonstration is required to integrate into an economic package.

An Emissions Performance Standard must therefore be considered as part of the wider set of policy measures needed to reform the electricity sector framework and provide sufficient certainty and flexibility to deliver projects at the lowest cost of abatement.

The most significant barriers to CCS at present are upfront cost, technology and regulatory uncertainty surrounding issues of planning, shared infrastructure and CO₂ liability. The introduction of policies without appropriate incentives to address these risks will not encourage CCS development and won't provide investors with confidence that the cost of their investment can be recovered.

As such, an EPS could become necessary for new coal stations if CCS remains technically but not economically viable beyond 2020 and in circumstances where the carbon price is insufficient to justify the investment in CCS.

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

GE recognises that careful consideration must naturally be given to how a standard might be implemented in order to avoid unintended or unwelcome consequences. An inappropriately designed UK Emissions Performance Standard (as with all badly implemented policies) could potentially increase operating costs, encourage investment in less cost-effective technologies and thereby reduce investor confidence.

However, claims that an EPS might ultimately threaten security of supply or could ultimately result in a "dash for gas" tend to be exaggerated. Security and diversity of fuel supply remain a key strategic issue that can be addressed by a variety of policy approaches and second, in the case of pre-combustion CCS for coal, existing technologies such as GE's IGCC can already achieve less than ~360g/Kwh CO₂ today AND keep coal in the energy mix.

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

Inevitably, if an Emissions Performance Standard were introduced the cost of operating CCS plant would be passed through to the consumer. However, the EU ETS complemented with a funding mechanism at an appropriate level in the initial demonstration phase can provide the necessary incentives to enhance cost recovery and thereby could save bill payers from funding new plant investment that do not meet the UK's emissions targets.

Are any other European countries considering an EPS? If so, should the standards be harmonized? Could unilateral action by the UK to introduce an EPS contribute towards global climate negotiations in Cancun in November 2010? Can greater use of Emissions Performance Standards internationally help promote agreement on global efforts to address climate change?

The UK Government has previously stated its ambition to establish the UK as a "first choice for investment in CCS" and therefore has a unique opportunity to lead the way by promoting the development of this technology.

As a result, whilst harmonisation of policies and standards across Europe remains unrealistic given the differences in industrial structures that occur from one country to another, leadership from certain member states could result in competitive advantages that accrue to their low carbon economies. Whilst there is no "silver bullet" solution, the implementation of an Emissions Performance Standard and similar policy instruments could go along way to support negotiations at the UN Climate Change Summit in Cancun by demonstrating the UK's commitment to meeting emissions targets.

CONCLUSION

- GE views the concept of an Emission Performance Standard for coal plant as a viable regulatory supplement but should only be considered as part of a suite of policies including transitional incentives for CCS, electricity market reform and infrastructure policy.
- An achievable emissions standard must be within current technology capability to begin the deployment. If introduced, the level and timing of an EPS policy must be carefully considered, to take account of differences in fuels and technology options, but could be considered in the context of establishing CCS demonstration and the need to fully decarbonise the power sector by 2030.
- Set at the right level and under the prerequisite that the transport and storage part of the CCS chain are available, an EPS can be instrumental in commercializing CCS and compatible other instruments to promote low carbon investments.
- It is widely understood that further policy interventions will be required to meet the UK's energy targets. GE notes the forthcoming DECC consultation on Electricity Market Reform, which will include consideration of an Emissions Performance Standard policy together with a variety of regulatory and financial measures. GE looks forward to responding to this consultation in due course.

September 2010

Memorandum submitted by the Combined Heat and Power Association

SUMMARY AND INTRODUCTION

1. The Combined Heat and Power Association welcomes the opportunity to respond to the Energy and Climate Change Committee's call for evidence on an emissions performance standard (EPS).

2. The Combined Heat and Power Association (CHPA) is the leading advocate of an integrated approach to delivering energy services using combined heat and power and district heating. With around 100 members active across a range of technologies and markets the CHPA is widely recognised as one of the leading industry bodies in the sustainable energy sector. The CHPA works to promote a greater awareness and understanding of CHP and district heating and to create a strong, dynamic and sustainable environment for its members and the communities, businesses and households they serve. In the UK, CHP represents about 7% of electricity generation and, therefore, an important and growing part of the UK electricity mix.

3. The CHPA remains to be persuaded of the case for an EPS in achieving the Government's carbon emissions targets but recognises that it could provide a policy backstop for emissions reduction, provided that it is correctly implemented. This response to the call for evidence sets out some key considerations that are vital should an EPS be adopted,

SUMMARY OF RESPONSE

4. The CHPA has identified the following key issues for the design and implementation of an EPS:
 - An EPS must take into account the emissions saved in the supply of useful heat from a generation station (CHP plant) to ensure that it rewards optimal resource use and emissions savings.

- An EPS should form part of a wider suite of fiscal and regulatory measures to ensure that the market delivers the Government’s energy ambitions.
- An EPS should be applied to individual plant NOT to a portfolio of plant to ensure that incentives are equivalent to all actors in the market. Furthermore, application to a portfolio will deliver little or no policy additionality.
- An EPS should not apply only to coal but also to gas.

An EPS must take into account the emissions saved in the supply of useful heat from a generation station (CHP plant) to ensure that it rewards optimal resource use and emissions savings

5. As an EPS is designed to control emissions from electricity generation stations, the emissions limit is generally based on the CO₂ per unit of electricity. A CHP plant delivers both useful heat and power in which some power may be sacrificed to generate a large amount of heat (for every one unit of power lost between three and 10 units of heat will be generated dependant on the grade of heat supplied). In any circumstance, a CHP plant which meets the EU’s qualifying conditions is more efficient than separate heat and power generation. High efficiency CHP saves at least 10% of the input fuel compared to separate generation, although in reality this figure is often significantly greater. An EPS based purely on electrical output would, therefore, penalise a CHP plant compared to a power-only plant which exhausts its heat to the atmosphere. CHP plants burning either renewable or fossil fuels represent the optimal use of the fuel thereby contributing to energy security, affordability, emissions reductions and, where renewable, renewables targets. If an EPS failed to account for the delivery of useful heat, the EPS would penalise efficiency and emissions reductions and be a disincentive for CHP development. It is vital that the heat from CHP is adequately accounted for in any EPS.

6. The best methodology for determining an EPS would be to account for overall efficiency of useful energy conversion. For a power only generating station, this is simply the mean electrical efficiency. For a CHP plant, this would be the electrical conversion efficiency PLUS the heat efficiency. The Cogeneration Directive requires high efficiency CHP to have an overall efficiency of 70%⁸⁷ (Net Calorific Value {NCV}); Accounting for overall efficiency is an effective and simple way of ensuring that an EPS does not penalise efficient plant operation.

An EPS should form part of a wider suite of fiscal and regulatory measures to ensure that the market delivers the Government’s energy ambitions

7. An EPS is one of a range of fiscal and regulatory tools available to Government for delivering the low carbon electricity grid and wider energy system. An EPS either prevents or permits the construction of a given plant—in this respect, it is effectively an extension of the consenting process. Just because a proposed development would comply with the EPS does not guarantee its construction or continuing operation.⁸⁸

8. Crucially, any development of an EPS must occur within the context of wider policy in relation to the viability of developing and operating new plant. With particular regard to CHP, current uncertainty over the climate change levy exemption for CHP and accreditation timelines under grandfathering for biomass under the RO are creating significant risks that relevant plant will not pass the second or third tests set out above.

9. With a wider debate over the energy market a capacity guarantee and reform of the CCL, any EPS needs to be developed in the context of these other policy variables to ensure that there are no unintended consequences and that support in one area is not undermined by policy decisions in another. In this context, a capacity guarantee, if poorly developed, could run directly contrary to an EPS as it could drive least cost (and higher emission plant) to be built. The CHPA is developing proposals for how a capacity guarantee could operate to ensure that it does not run contrary to an EPS and would be very willing to share these with the Committee.

An EPS should be applied to individual plant NOT to a portfolio of plant

10. An EPS could be designed to apply to the portfolio of plants operated by a company rather than individual plant. Whilst this could operate well for the major portfolio operators, it would harm independent generators as these often only have a one, or a small number, of plant. For portfolio generators, such a system could permit the development of new, high emission plant, which could be offset by other existing low carbon plant defeating the objective of an EPS. Furthermore, for companies owning only one plant,

⁸⁷ The Cogeneration Directive: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0008:EN:HTML>

⁸⁸ There are at least three major tests that must be met for a plant to be built and operate:

1. Can the plant be built—is the plant under consideration legally acceptable within the UK. This is the only test only that would be affected by an EPS. If legally acceptable, the project can proceed to the second test.
2. Project financials—does the financial modelling provide a predicted rate of return (or other measure) that is sufficient and competitive compared to other options available to the developer. This test includes returns from Government policies such as the renewables obligation and climate change levy exemption. The tests will include the regulatory risk of these policies changing or being withdrawn during the lifetime of the plant
3. Ongoing operation: If the second test is met the plant is likely to be built. Ongoing operation (and therefore contribution to emissions reductions) will be dependent on a combination of market conditions and government support. Changes in government support could cause a plant to reduce or cease operations.

compliance would have to be ensured by a form of carbon trading, directly replicating the EU emissions trading scheme which would be an unnecessary complication to an already highly complex market. In addition, independent generators, provide valuable market services such as a disproportionately high level of liquidity. Such services would be undermined by a portfolio EPS.

11. From a deregulation perspective, it is apparent that, if an EPS were implemented on a portfolio-wide EPS, the consequent effect would be the replication of an emissions trading scheme. The EPS would thus provide little or no additionality in terms of policy outcomes. On this basis an EPS could only add value on an individual plant basis.

An EPS should not apply only to coal but also to gas

12. The Committee on Climate Change has recommended that the Government provides support for CCS gas plant as well as CCS coal.⁸⁹ The CHPA believes that there is substantial value in pursuing CCS for both gas and coal. In addition, to ensure that fossil resources are used optimally, the application of CCS should be incentivised to operate in combination with CHP wherever possible. CCS reduces plant efficiency but, by combining CCS with CHP, much of the heat that would otherwise be wasted can be captured and supplied to meet new or existing heat demand, significantly improving overall plant efficiency. By supplying heat from CCS plant for industrial, commercial and domestic use, CCS plants could help to decarbonise heat supply in a very effective and efficient manner. This is particularly important in the industrial sector where options for decarbonising heat are particularly limited and challenging.

13. Given the extent of decarbonisation that will be required from the power sector in the period to 2050, the Association recognises that CCS may ultimately be required in gas-fired plant as well as coal. The extent and timing of this requirement will be highly dependent upon progress in respect of decarbonisation of the wider economy and the evolution of the generation mix.

14. For any input fuel the introduction of any EPS will need to be timed to reflect the commercial viability of CCS technologies, cost implications and impacts upon security of electricity supply. Application of too tight a standard may introduce costs or risks that may be excessive in respect to the requirement for carbon abatement. An understanding of these trade-offs and technological maturity will be critical in setting the levels of any standard, and the timing of its introduction.

15. It should also be recognised that different plant configurations may provide a degree of flexibility in setting standards, particularly in respect of gas-fired plant. Where the value of heat recovery is recognised in the assessment emissions factor, an unabated gas-fired CHP plant may be capable of meeting an emissions factor of 300g/kWh, whilst the equivalent power-only plant would not. Under appropriate conditions utilisation of CHP might therefore assist in providing safeguards over security of supply, whilst maintaining downward pressure on emissions from the wider generation fleet.

In any circumstances, incentives to operate must be maintained

16. The application of an EPS will need to be timed to reflect the development of CCS technology. If an EPS were to be introduced, therefore, it could apply to both gas—and coal—fired plant. This will have the practical effect of ensuring that all new-build plant is likely to meet minimum standards of emissions performance in operation. It is important to note, however, that the EPS is only part of the picture. Since the EPS will act as a constraint on development, the Government must ensure that the commercial incentives for construction and operation of this plant will persist over the long term.

17. In setting EPS standards, it will be important to consider the option for setting levels that vary based on input fuel. It may be appropriate to set the EPS at a different level for coal than for gas.

MAINTAINING SECURITY OF SUPPLY

18. In setting an EPS, it is vital that security of electricity supplies are not compromised. The timing of the application of the EPS is critical. Imposing an EPS before the technology is available to deliver the standard set would stall developments and may compromise security of electricity supplies. Alongside an EPS, incentives to invest in, and operate, new plant will need to be maintained in order to guarantee operation (and carbon savings) whilst, EPS-constrained plant is required to compete with existing, written-down plant. The risks associated with an EPS can be managed by providing sufficient flexibility to investors to adopt alternative approaches, including the application of low-carbon technologies that are proven and available today. Through operating a gas-fired power station as a CHP plant is a proven means of reducing carbon emissions without constraining gas-fired generation *per se*: It is possible to set an EPS at a level that provides CHP operation as a compliance option alongside CCS. Such a choice may be a valuable mechanism for ensuring security of supply whilst still reducing carbon emissions

⁸⁹ Letter from Lord Adair Turner to Rt. Hon Chris Huhne, Secretary of State for Energy and Climate Change concerning CCS 17 June 2010 <http://hmccc.s3.amazonaws.com/gas%20CCS%20letter%20-%20final.pdf>

CHPA RESPONSES TO SPECIFIC QUESTIONS ASKED BY THE COMMITTEE

19. 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?

The key factors to consider when setting an EPS are:

- The commercial availability of CCS technology.
- The cost of applying CCS to plant.
- The availability of wider compliance options.
- Crucially, the wider electricity grid emissions trajectory.
- Any potential impacts on security of energy supply.

20. The Association notes that CHP could provide an appropriate compliance option both initially and into the future as emissions levels become more constrained (ie CCS CHP as a measure for continued emissions reductions).

21. Consideration also will need to be given to application of any EPS to plant when operating flexibly to meet grid requirements, including low load and transient operation. One possibility would be for an EPS to be determined on the basis of average annual operational emissions accounting for increased emissions when operating as spinning reserve or during start up/shut down processes. A second option to account for operational flexibility would be to permit all affected plant to be allowed a maximum total number of operating hours which can be excluded from the calculation of the average emissions factor for EPS compliance.

Should the level be changed over time?

22. In theory, the level of an EPS should decline over time for new generation plant only. The EPS should be set to drive cost effective emissions reductions and maximise plant efficiency (for both heat and power generation). If adopted, the ultimate aim should be to ensure that an EPS along with other government policies, facilitate the development of CCS CHP plant which will provide the lowest possible emissions from coal, gas and bioenergy plant whilst maximising the useful energy output.

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

23. If the EUETS operates successfully under phase 3, it is unlikely that an EPS will bring additional emissions savings. It could, however, prevent new unabated coal plant from being constructed and drive more efficient use of fossil fuels. As such the EPS provides a policy backstop for emissions reduction. In so doing it is vital however, that the net effect of the wider incentive and market framework is to deliver both investment and operation of qualifying plant.

How effective is an EPS likely to be in driving forward the development of CCS technology?

24. On its own, an EPS will not drive the development of any new technology; it will merely prevent the development of generation stations with emissions over that set by the EPS. It is vital, therefore, that to promote, CCS and CCS CHP, the Government will need to ensure that the economics are attractive enough for developers to invest in these over and above other technology options. It is for this reason that an EPS should apply to gas generation as well as coal as, if applied only to new coal stations, it will simply drive new, unabated gas power plant not CCS.

Should the UK's CCS demonstration programme cover gas-fired as well as coal-fired power stations?

25. Yes, gas will continue to be an important fossil fuel in the future and a failure to include gas within the CCS demonstration programme is an unnecessary limitation. Should an EPS be applied to gas, the option to operate as gas CHP should be available as a compliance option to drive down emissions whilst preserving security of UK energy supplies.

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

26. If an EPS failed to account for heat off-take this could limit the ability of industry to decarbonise and could have the perverse effect of driving an increase in emissions in some sectors.

27. CCS will have to be made to be profitable for investment in any new thermal power plant to take place at all. Application of EPS unilaterally by the UK may discourage investment by international players if other power markets more profitable.

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

28. The decarbonisation of energy in the UK is likely to have direct and indirect impacts on consumers through the cost of energy directly and in consumer goods. The EPS in itself does not add direct costs to consumers unlike other Government support mechanisms, it simply prevents certain developments. Developers will, therefore, select options which are permitted and give the best returns on investments be that through Government support (eg feed in tariff and renewables obligation) or through natural market conditions. The fitting of CCS technology will add a significant cost to development that will be reflected in electricity prices. CCS processes use a material amount of power that reduces the overall efficiency of the power plant requiring more plants to be built. Gas CCS is at least 7% less efficient compared with unabated CCGTs. By operating as CHP, CCS plant can operate at far greater overall efficiency contributing to both emissions reductions and security of supply. As such efficiency losses (and associated costs) can be mitigated by operating CCS plant as CHP.

Are any other European countries considering an EPS? If so, should the standards be harmonised?

29. The CHPA supports harmonisation of standards across member states but this should only be done if the key issues highlighted earlier (accounting for heat, application to coal and gas) are incorporated. It may be that the varying energy markets across the EU could prevent an EPS being optimal for the UK energy market.

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

30. The CHPA does not propose to answer this question.

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

31. The CHPA does not propose to answer this question.

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