Our Energy Challenge: Securing Clean, Affordable Energy for the Long-term

DTI Energy Review Consultation Document, January 2006

A Response by Drax Power Limited

April 2006

Drax Power Limited

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 country's electricity needs.

Drax Power Station was commissioned in two phases: the first 1,980MW were commissioned in 1974 and the second 1,980MW were commissioned in 1986. As the newest of the country's existing coal-fired power stations, Drax intends to be operating at high load factors in 20 years' time, provided that the regulatory framework encourages and sustains the necessary investments in environmental abatement equipment and plant upgrades.

All six of the Power Station's units are fitted with flue gas desulphurisation (FGD) technology, which removes, on average, at least 90% of the sulphur dioxide (SO_2) from the flue gases. All units have been retrofitted with low NO_X (oxides of nitrogen) burners, and emissions of NO_X are being further reduced through retrofitting boosted over fire air (BOFA) technology. On completion of the BOFA technology retrofit, Drax Power Station will be fully compliant with the 2008 requirements of the Large Combustion Plant Directive (LCPD), but large investments will be required to ensure that the plant is compliant with the 2016 requirements.

Over the last two and a half years, Drax has developed the capability to co-fire, that is, blend and burn, renewable biomass materials with coal. For the first quarter of this year, Drax was achieving throughputs of biomass material of around 2.5% by heat, and as a consequence reducing its emissions of carbon dioxide (CO_2) at a rate of almost half a million tonnes each year. There is the scope to develop this technology still further and significantly increase biomass throughput and hence CO_2 savings. In addition, Drax has also identified technology options that could assist in improving the thermal efficiency of the plant taking it to environmental performance levels approaching those of current gas-fired plants.

EXECUTIVE SUMMARY

1. The current Energy Review comes at an important time and raises key issues that must be addressed now to secure the nation's energy needs into the future. The UK is fortunate to enjoy a diversity of fuels from which its electricity is generated. As a consequence, electricity supply is not only more secure than if there was reliance on one particular fuel, but having this mix helps to stabilise costs and deliver affordable power.

2. Coal-fired electricity generation is vital to the energy mix in terms of its contribution to security of supply. It delivers the benefits of diversity, plays a critical role in responding quickly to demand on the system and coal is abundant in a global market. This important contribution to the nation's energy security should be recognised and this could sensibly be achieved through reasonable allocations under the EU Emissions Trading Scheme (EU ETS) for Phase II (2008-2012) and beyond.

3. The challenge for coal-fired generation is environmental. The major constraint is carbon, and as the country moves towards a low carbon economy the focus must be on reducing emissions of carbon dioxide (CO_2).

4. There is considerable scope for improving the environmental performance of coal-fired plants. Co-firing biomass materials with coal has emerged as a credible renewables technology, through which significant savings in CO_2 emissions can be made. The technology also provides an important spur to developing the biomass sector and in particular the UK energy crop market, with consequent benefits for the UK farming industry.

5. Further advances in environmental performance can be made through improving the thermal efficiency of existing coal-fired generation, through turbine re-blading, technology to preheat the boiler feedwater and retrofitting advanced supercritical boilers.

6. Together all of these actions could bring the environmental performance of coal-fired power stations towards that of current gas-fired plants, and with carbon capture and storage, significantly beyond this point.

7. To achieve this potential there are barriers to overcome. There is an urgent need to review and revise the current co-firing regime and to encourage the major, long term investment needed to deliver the various thermal efficiency improvement options.

8. Drax Power is currently considering a range of different options for supporting the continued contribution of co-firing whilst being sensitive to the requirements of investors in other renewable technologies; a full response will be submitted to the DTI's co-firing review.

9. A stable and predictable long term energy policy framework is essential to provide investors with the confidence to make the significant investments that are necessary to address the environmental challenge. Critical to achieving such a framework is clarity and certainty in the EU ETS, not just for Phase II, but beyond. Equally important is that energy and environmental policies, in their widest sense, should be fully integrated and consistent, and targets and objectives clearly stated; the market should then decide and deliver efficient solutions.

INTRODUCTION

10. It is well acknowledged that action is needed now to tackle climate change. The important contribution of existing coal-fired plants to this effort must not be overlooked, and taken alongside the other benefits that coal has to offer, particularly in terms of security of supply, the case for coal is compelling and deserves prominence in this Energy Review.

11. It is recognised that the Energy Review is broad in its scope, however, this paper does not attempt to address all the aspects under review, but simply focus on two of the core objectives of energy policy, namely climate change and security of supply, and set out the key role that coal-fired generation can play in meeting both.

12. Part A of this paper starts by assessing the merits of coal-fired generation against the goals of the Government's energy policy, setting out the case for retaining coal in the future energy mix of the country, and then explores the potential for existing coal-fired plants to improve their environmental performance to levels approaching that of current gas-fired plants. Proposals are advanced on ways to encourage and deliver investment in the sector, including through the Renewables Obligation (RO) and the EU ETS, which in turn will assist in meeting the Government's environmental objectives and, equally important, will keep the lights on.

13. The specific questions raised in the consultation document are addressed in Part B of this paper.

PART A

Coal-fired Generation in the Context of the Energy Review

14. The 2003 Energy White Paper set four goals for the country's energy policy, namely:

- to put ourselves on a path to cut the UK's CO_2 emissions by some 60% by about 2050, with real progress by 2020;
- to maintain the reliability of energy supplies;
- to promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and to improve our productivity; and
- to ensure that every home is adequately and affordably heated.

15. Taking these goals in turn, the following demonstrates how coal-fired generation can deliver against each of them.

Tackling Climate Change
16. Coal-fired generation should not be written off on environmental grounds, the sector is in a position to respond effectively to the ever-stricter environmental constraints. Carbon abatement technologies exist that can significantly alter the environmental footprint of the coal-fired generation sector, taking it close to the environmental performance of current gas-fired power stations and, if carbon capture and storage becomes viable, considerably beyond this point.

Security of Supply
17. Coal-fired generation is vital to delivering security of supply. It contributes to diversity in the energy mix through providing an alternative to gas, nuclear and wind generation. The design of the units is such that other fuels, such as renewable biomass materials, refuse-derived fuel or petroleum coke, can be burned in order to provide environmental benefits and fuel security.

18. Coal is in abundant supply from wide geographic sources and a wide supplier base. There are considerable reserves of coal, with proven reserves estimated to last around 200 years. Coal can be readily stockpiled at points of production, ports of origin and receipt, and at power stations thereby minimising the risk of disruption to supplies or managing exceptional circumstances, such as severe winters.

19. Finally, coal-fired generation plays a critical role in ensuring stable generation systems through its reliability and availability in operations, and its flexibility and responsiveness in following the demand on the system.

Promoting Competitive Markets
20. As an independent generating company (in contrast to the vertically integrated companies operating in the electricity market) selling its entire output into the traded power market with no pre-determined long term offtake contracts in place, Drax Power is an important market participant. Through its activity in the competitive wholesale power market, Drax Power provides a clean indicator of price assisting in the discovery of the value of generation.

Affordability
21. Diversity of fuel types also has an important role in helping to stabilise power costs. Coal, gas and nuclear generation each use fuels that are sourced and priced in separate markets, so addressing the price risk of an over-dependence on one particular fuel source.

22. Amidst growing concerns about security of energy supply, and an increasing need to import both gas and LNG from potentially unstable parts of the world and at prices over which ultimately there is little control, it is clear that diversity in the energy mix is an economically attractive option.

Open and Competitive Markets

23. Drax Power is a proponent of competitive markets and market-based approaches. Above all, Drax Power believes that coal-fired generation should be allowed to compete on a level playing field with other generation fuel sources.

24. Drax Power advocates that the electricity market should be open and free of the risk of intervention, which would serve to increase uncertainty and disrupt the associated traded commodity markets.

25. The energy policy framework should facilitate a competitive market, it should not 'pick winners' and should not be constructed in such a way that backs a single solution. In developing the framework, energy and environmental policies should be fully integrated and consistent, and targets and objectives clearly stated; the market should then decide and deliver efficient solutions.

Security of Supply

26. A note on the impact of coal on security of supply, prepared by OXERA, is annexed to this paper. The analysis illustrates the extent to which security of supply may vary as the generation mix changes and highlights the importance of a market framework that is capable of providing strong, transparent signals of the value of security of supply enabling efficient investment decisions to be made.

27. The note concludes that a less diverse energy mix which has greater reliance on generation technologies with higher fuel input risks, such as gas or wind plants, faces a greater risk of supply interruption. Or, put another way, the analysis demonstrates that the loss of a coal plant reduces overall system security more than the loss of a gas or wind plant.

28. The important contribution of coal-fired generation to the nation's energy security should be recognised and this could sensibly be achieved through reasonable allocations under the EU ETS for Phase II (2008-2012) and beyond.

Options for Existing Coal-fired Generation Plant

29. The greatest challenge faced by existing coal-fired generation is environmental and the major constraint is carbon. Drax Power recognises that as the country moves towards a low carbon economy the focus must be on reducing emissions of CO_2 if coal-fired generation is to have a long term future in the energy mix.

30. The future for coal-fired generation is principally driven by its environmental performance against the regulations and requirements of the time. The critical emissions from coal-fired plant are CO_2, SO_2, NO_X and particulates. As far as SO_2, NO_X and particulates are concerned there is some certainty over the future, at least as far out as 2016. The LCPD defines the regime for these emissions and those installations affected have now taken the decision to either invest and comply with the legislation or opt-out and be restricted on operating hours.

31. There is, however, considerable activity within the European Commission (EC) towards developing a new National Emission Ceilings Directive to introduce stricter limits for 2020 and possibly even for 2015. It is imperative that the Government takes these developments into account when setting the energy policy framework. Given that environmental regulation is fundamental to the power sector, the Government needs to fully integrate energy and environmental policies, rather than address them separately, and be cognisant of the inter-relationships and knock-on effects.

32. Less certain, however, is the carbon framework. The EU ETS provides only a short term outlook which, once the Phase II National Allocation Plan is known, extends only to 2012. It is

clear that the Government has ambitions for a low carbon economy, but the necessary long term framework against which to deliver this is not in place.

33. Given the right policy framework, one that provides certainty and stability, and is free of the risk of intervention, there are a number of technology options that existing coal-fired plants can pursue to significantly reduce emissions of CO_2:

- In the short term, co-firing renewable biomass materials with coal.
- In the medium term, improving thermal efficiency through turbine re-blading, feedwater heating and repowering, and advanced supercritical boilers.
- In the long term, carbon capture and storage.

34. Figure 1 illustrates the cumulative effect of deploying these technologies at Drax Power Station. Significant savings in emissions of CO_2 are possible taking the environmental performance of coal-fired plants towards that of current gas-fired plants in the medium term, and with carbon capture and storage in the long term, significantly beyond.

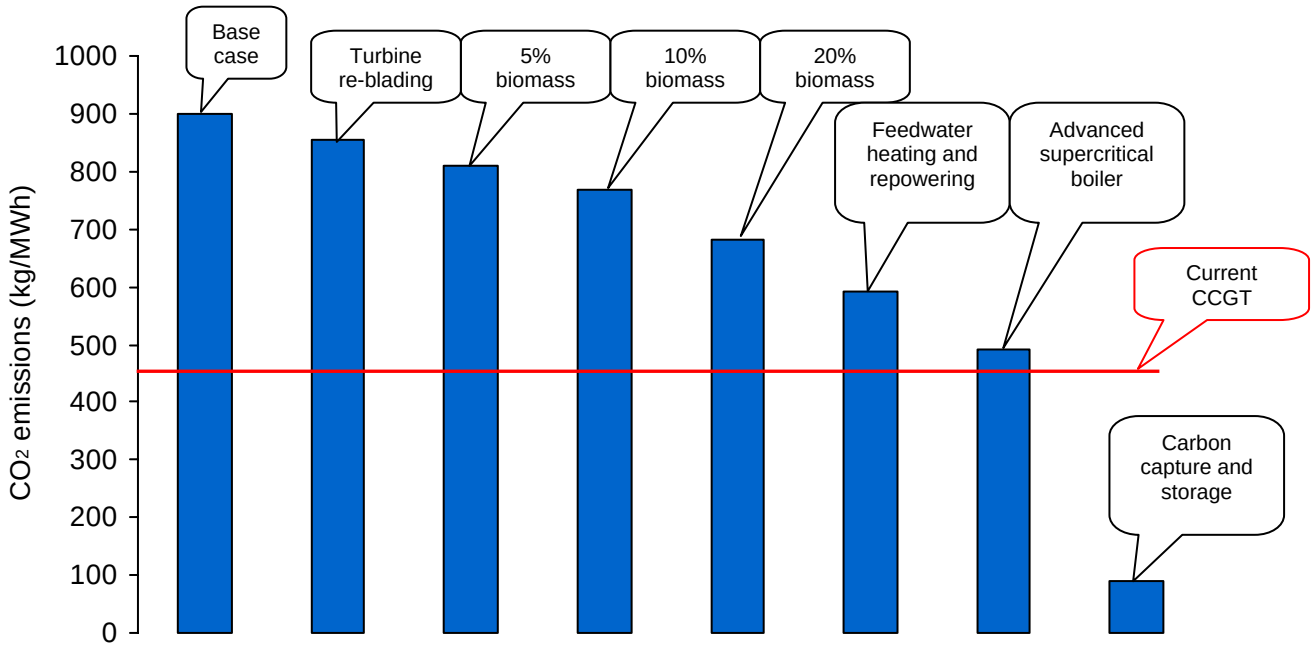

Figure 1 Potential for CO_2 savings at Drax Power Station

Co-firing

35. Through the RO, co-firing has emerged as a credible renewables technology and it is now appropriate to reconsider the role of co-firing in the context of the significant contribution it has to make in reducing emissions of CO_2.

36. The power sector has changed significantly since the RO was implemented in April 2002 and even since the Renewables Obligation (Amendment) Order 2004 which saw a partial relaxation of the original constraints placed on co-firing. For example, preparations for the LCPD mean that the only coal-fired plants that will be generating at load factors averaging more than 50% from 2008 will be the cleanest and most efficient plants. Taking this in the context of the Government's recent energy projections which put the contribution from coal at 69TWh in 2020 (average of central projections) - which again suggests load factors for these plants of above 50% (assuming no significant coal new build) - then it surely makes sense to encourage these power stations to be as clean as possible, starting with encouragement for co-firing as a proven and cost effective renewables technology.

37. Prior to 1 April 2006, that is, prior to the reduction in the cap on co-fired Renewables Obligation Certificates (ROCs) from 25% to 10%, Drax Power Station had built up the capability and was co-firing 2.5% (by heat) of renewable biomass materials with coal and as a result was reducing its CO_2 emissions at a rate of almost half a million tonnes per year. Had the momentum of this development been maintained, within two years and at a cost of around £10m, the technology could have been replicated on a further two units at the Station, doubling the percentage burn and consequent CO_2 saving. Looking beyond that, it would be technically feasible to co-fire up to 20% biomass with a CO_2 saving approaching some 4.5 million tonnes per year at Drax alone.

38. Extending this potential across the 19.6GW of FGD-fitted, opted-in coal-fired plants gives an annual CO_2 saving of 21.5 million tonnes. To put this figure into context, the EU ETS Phase I NAP allocation for the power sector was 132.2 million tonnes of CO_2, equivalent to a 42.1 million tonnes reduction against the sector's 2003 (actual) emissions. Thus, the potential saving from co-firing 20% biomass amounts to some 50% of the saving sought from the power sector in Phase I.

39. However, because of the inequitable treatment of co-firing within the current RO regime, further investment in co-firing is proving difficult to justify economically. Even factoring in the effect of the EU ETS, that is, the avoidance of the cost of carbon, the economics are marginal without some support under the RO.

40. Biomass, including energy crops, is around three times more expensive than coal, which means that without RO support a loss will be made on each tonne of biomass co-fired from 2006 onwards. However, it is important to note that the level of support required is significantly below current ROC prices.

41. Despite, under the current regime, the obligation on suppliers increasing year-on-year, the level of co-firing permitted never recovers to the levels permitted prior to 1 April 2006, so there is a real opportunity lost through the present arrangements; figure 2 illustrates this point. To compound this effect, work that has been undertaken during the last two years to encourage local farmers and landowners to grow energy crops for harvest in 2009 cannot be advanced at the desired pace.

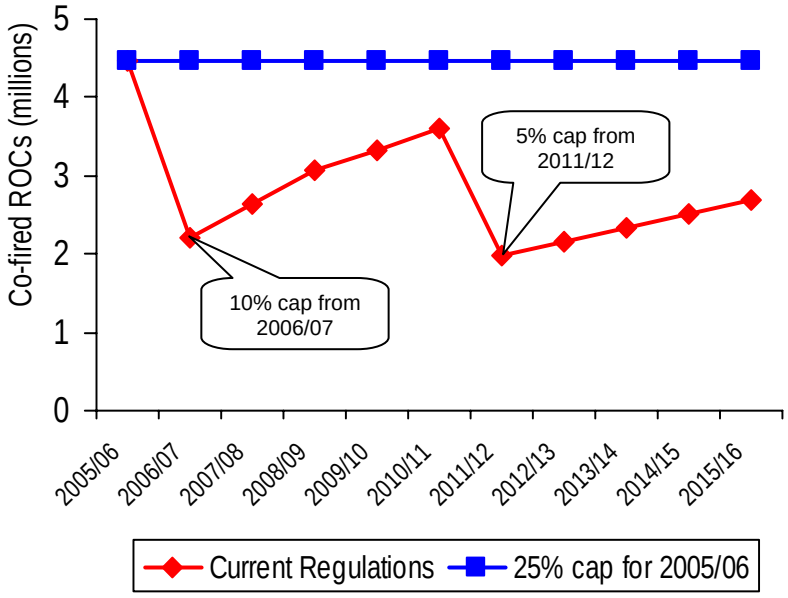

Figure 2 Impact of co-firing caps on the number of permitted co-fired ROCs

42. Co-firing provides an important spur to developing the biomass sector and in particular the UK energy crop market, with consequent benefits for the UK farming industry. There is a need

to continue to develop confidence in the technology and in handling large volumes of biomass materials in preparation for the delivery of energy crops from 2009. Constraining co-firing activities creates uncertainty over future demand which in turn discourages energy crop contracts as farmers and landowners are not receiving the assurances of demand and assistance required in the early stages of production in order to make the significant investment required to grow energy crops. The momentum established to date needs to be maintained not reduced if co-firing is to continue to make a contribution beyond 2009.

Improving Thermal Efficiency

43. Deploying carbon abatement technologies such as feedwater heating and advanced supercritical boilers at existing coal-fired power plants can deliver thermal efficiencies of 42-44% and 47-49% respectively, with upper range annual CO_2 savings of the order 3.5 million and 6 million tonnes respectively.

44. Each of these technologies is capital intensive; £75m-£125m for feedwater heating per unit and £100m-£125m per unit for advanced supercritical boilers. A station-wide programme to implement feedwater heating would take five to six years, and an advanced supercritical boiler retrofit would require a one year outage per unit.

Carbon Capture and Storage

45. Carbon Capture and Storage (CCS) has the potential to make coal-fired generation a low carbon option. CCS should not, however, be viewed as a single solution to addressing carbon emissions, rather it should be viewed as one of a number of options. Today, the single largest barrier to the uptake of CCS is the lack of understanding of the technology, particularly the transportation and storage aspect. Key to developing CCS technology in this country is a demonstration project on a meaningful scale.

Overcoming Barriers to Investment

Co-firing

46. The current co-firing regime under the RO is a distinct barrier to investing further in this technology. Co-firing can make a significant contribution to the Government's targets on CO_2 reduction and should be placed on an equal footing with other renewable generation technologies.

47. Drax Power is considering a range of different options for supporting the continued contribution of co-firing whilst being sensitive to the requirements of investors in other renewable technologies, and will be submitting a full response to the DTI's co-firing review.

Energy Policy Framework

48. The electricity industry is characterised by major, long term investment with typical payback periods of 10 to 15 years. Through such investment, and as outlined above, coal-fired generation can address the main environmental constraint of carbon. However, critical to making these investment decisions is the existence of a certain and stable long term energy policy framework. Clarity and stability in the long term framework is needed to minimise the risk of future intervention, which would simply serve to destabilise the regime, increase uncertainty and disrupt the associated traded commodity markets.

49. The focus must be long term to ensure that returns can be made on investments. At present the electricity market is typified by short term policies which are not conducive to developing long term confidence. The EU ETS is a particular example of a policy with a short term outlook. Despite the Government's CO_2 objectives being clear, the necessary long term framework to deliver against these objectives is not in place. The EU ETS should provide a clear framework for CO_2 reduction over the long term, not just for Phase II, but beyond 2012.

50. A lack of clarity on the EU ETS means that the future value of carbon is unknown, which directly impacts on the future value of power. A framework should be developed that allows the

market to price carbon and power within it. Carbon and power are key commodities for coal-fired generators, without a long term view on their value significant investment decisions cannot be taken with any degree of confidence.

51. The certainty of Phase II and recent information on the allocation methodology has allowed the market to take a view and price carbon out to 2012. However, clarity is now required for Phase III if long term investments are to be made with confidence.

52. Policies such as the EU ETS and the RO are fully supported by Drax Power and further it is believed that these policies could and should be used to encourage investment in the sector. The RO and the EU ETS should both be designed to send signals to incentivise investment.

Other Barriers

53. The Energy Review needs to be sensitive to other factors such as the transmission charging arrangements. The current arrangements attempt to incentivise generation plant to locate in the South, that is, close to the centres of large demand, through imposing significantly lower charges. For example, the 2006/07 annual transmission use of system charge for the North of Scotland is £20,519,472/GW, whereas for the South West peninsula there is a negative charge (that is, a payment) of £9,145,693/GW. The load flow model used to develop this charging regime ignores the fundamental requirements of any power station development project, namely, proximity to fuel, water, transport links and ease of planning.

54. Availability of grid connection and prohibitive transmission charges may well hinder the development of generation projects in the North despite the fundamental requirements being satisfied. Transmission charging constraints do not just apply to new build projects, but will also impact on any additional output that may result from efficiency gains made at existing power stations.

55. In the context of the Energy Review and potential outcomes it should be noted that generation based in the North is penalised because of its distance from demand centres, however, it is arguably in the North where there is greatest scope for additional and diverse generation technologies and fuels, such as, wind power, energy crops and coal.

PART B

Consultation Document Questions

56. The following addresses the questions raised in the consultation document, much of which has been addressed in full above.

Q1 What more could Government do on the demand or supply side for energy to ensure that the UK's long-term goal of reducing carbon emissions is met?

There is significant potential for reducing CO_2 emissions from existing coal-fired power stations. Carbon abatement technologies, such as co-firing biomass, turbine re-blading, feedwater heating and repowering, and retrofitting advanced supercritical boilers can significantly improve the environmental performance of coal-fired plants taking them towards the levels of current gas-fired plants, and in the long term beyond this point with carbon capture and storage.

Improved environmental performance demands major, long term investment with typical pay back periods of 10 to15 years; stability and certainty in the energy policy framework is essential to give operators and investors the confidence to take these major investment decisions.

Q2 With the UK becoming a net energy importer and with big investments to be made over the next twenty years in generating capacity and networks, what further steps, if any, should the government take to develop our market framework for delivering reliable energy supplies? In particular, we invite views on the implications of increased dependence on gas imports.

Three-quarters of the world's gas reserves lie in a strategic ellipse comprising the former Soviet states and the Middle East, regions not known for their political stability, and only 10% in OECD countries, this could easily lead to volatile pricing and delivery as recently demonstrated by the situation between Russia and Ukraine.

Having a mix of fuel types, as opposed to an increased dependence on one particular fuel, such as gas, is vital to security of supply, and it helps to stabilise costs and deliver affordable power.

Q3 The Energy White Paper left open the option of nuclear new build. Are there particular considerations that should apply to nuclear as the government re-examines the issues bearing on new build, including long-term liabilities and waste management? If so, what are these, and how should the government address them?

From the perspective of an independent market participant, this question raises a series of further questions which need to be addressed when assessing the nuclear option. For example, how will nuclear new build be incentivised? If through long term offtake contracts, how will this impact on the competitive market, in terms of its size and the number of competitors? Will it serve to foreclose competition to market participants with generation-only interests?

Q4 Are there particular considerations that should apply to carbon abatement and other low-carbon technologies?

Carbon abatement technologies have the potential to make a real difference to the environmental performance of existing coal-fired generation. The technologies are, however, capital intensive and demand pay back periods of 10 to 15 years. A stable and certain energy policy framework is necessary to provide the confidence to invest.

Co-firing has emerged as a credible renewables technology and should be placed on an equal footing with other renewables technologies. The Energy Review should aim to deliver equal treatment for all forms of generation.

Q5 What further steps should be taken towards meeting the government's goals for ensuring that every home is adequately and affordably heated?

Fuel poverty is at risk of increasing due to rising fuel prices, yet still much of the problem lies in welfare issues, such as low income and poor (energy inefficient) housing stock. From a generation perspective, the correct energy policy framework would ensure that the market delivers cost effective solutions which in turn will help to contain fuel poverty.

CONCLUSIONS

57. This paper presents the benefits of retaining coal-fired generation in the energy mix, most importantly in terms of its contribution to security of supply and its potential to make significant improvements in its environmental performance, thus helping to tackle climate change.

58. There is a belief in the competitive market and market-based approaches. Coal-fired generation should be allowed to compete on a level playing field with other generation fuel sources.

59. The important contribution of coal-fired generation to the nation's energy security should be recognised and this could sensibly be achieved through reasonable allocations under the EU ETS for Phase II and beyond.

60. The environmental challenge faced by coal-fired generators is acknowledged and solutions through the deployment of a range of technology options from co-firing in the short term, through thermal efficiency improvements in the medium term, to carbon capture and storage in the long term are discussed.

61. The barriers to overcome are identified as follows:

- The current co-firing regime under the RO needs urgent review and amendment if the full CO_2 saving potential of this technology is to be realised and a sustainable UK energy crop market developed.
- The electricity industry is typified by short term policies that are incompatible with an industry characterised by major, long term investment with typical payback periods of 10 to 15 years.
- Regulations impacting upon the electricity industry are numerous and disconnected.

62. Ways to overcome these barriers have been presented as follows:

- A range of different options for supporting the continued contribution of co-firing whilst being sensitive to the requirements of investors in other renewable technologies is currently under consideration and will be submitted to the DTI's co-firing review.
- Critical to making the necessary major investment decisions is the existence of a certain and stable long term energy policy framework. Clarity and stability in the long term framework is needed to minimise the risk of future intervention, which would simply serve to destabilise the regime, increase uncertainty and disrupt the associated traded commodity markets.
- The EU ETS should provide a clear framework for CO_2 reduction over the long term, not just for Phase II (2008-2012), but beyond 2012.
- In developing the framework, energy and environmental policies, in their widest sense, should be fully integrated and consistent, and targets and objectives clearly stated; the market should then decide and deliver efficient solutions.

63. Coal-fired generation has a vital role to play in the country's energy mix. Through this Energy Review the continuing contribution of coal-fired generation can be preserved, delivering secure supplies of electricity at competitive prices, which need not be at the expense of the environment.