



The Royal Academy
of Engineering

Our Energy Challenge

Securing clean, affordable energy for the long term

Response by The Royal Academy of Engineering to the Department of Trade and Industry's Energy Review

April 2006

Introduction

The Royal Academy of Engineering welcomes the opportunity to contribute to the development of an updated medium and long-term energy policy for the UK. This is a subject of the utmost importance and one which the Academy has studied extensively over the past decade. It is essential that an effective strategy is put in place now to achieve the Government's goals of reducing greenhouse gas emissions while ensuring a secure, sustainable and affordable energy supply in a competitive, liberal market.

For the Government to achieve its goals it must develop a clear and consistent, long-term strategy that encompasses all aspects of energy policy. This strategy should include fiscal instruments, carbon abatement mechanisms, industry standards, regulations and financial models, all of which should work together in as simple and coherent a manner as possible. It is equally important that, once this strategy is in place, the Government ensures that all measures are acted upon and targets are met.

At present, implementation of a national energy policy is over complicated whilst being short-term and disparate. With three Government Departments, the DTI, DfT and Defra all responsible for various parts of energy policy there is very little cohesion between departmental objectives and no minister for energy sitting in the Cabinet. This results in a lack of confidence and confusion within the private sector and the general public. Overall co-ordination is required at Cabinet level to ensure coherent cross-department behaviour within Government. One solution might be the re-establishment of a Department of Energy or an Energy Agency which would be capable of overseeing all aspects of energy policy within the UK, clarifying the accountabilities for ensuring security of supply and the interfaces between various bodies under normal and abnormal conditions. It would also be advisable to set up some form of independent review, such as an Energy Commission, to ensure that the policies are being successfully implemented.

Central to the Government's energy policy should be a greater focus on Security of Supply, notably for electricity generation, through a diverse mix of primary fuels. Gas, coal, nuclear power and renewables must all play a part in order to ensure security of supply whilst continuing to reduce emissions of carbon dioxide. Over-dependence on any one fuel runs the risk of interruptions to the electricity supply, particularly now that the UK is a net importer of gas and coal; much of which will come from less politically stable regions of the world. The Government also needs to do more to ensure a liberalised market in Europe for gas and that the necessary gas and electrical infrastructures are put in place.

Dependence on oil is inevitable for transport (motor vehicles, shipping and aircraft) for the foreseeable future. To combat this, a diverse range of policies must be implemented including a wide range of sources of oil, increased vehicle efficiencies, increased use of biofuels and continued research into alternatives to petrol and diesel. More recognition needs to be given to the long term and the potential role of hydrogen in moving away from an oil based transport era.

The domestic targets set by Government regarding carbon dioxide emissions are extremely ambitious. While it is important for the Government to work with industry to achieve its goals, it is also crucial to increase awareness of the issues through public engagement and education. Energy demand continues to grow and reducing peoples' usage through more efficient appliances and greater awareness will only happen with an increased effort to inform the public.

The Government must also invest much more in Energy R&D, the levels of which have fallen since privatisation. Technology can potentially provide many innovative solutions to the problems we face but industry and academia need financial incentives to do so.

Q.1 What more could the 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?

With near global consensus amongst the scientific community that global warming is a reality and man-made emissions of carbon dioxide are a major contributing factor, it is crucial that the UK continues to strive to meet its targets to reduce these emissions. However, while it seems likely that the UK will meet the targets set by the European Union under the Kyoto Agreement, we are unlikely to meet the Government's domestic target of reducing carbon dioxide emissions to 20 percent below 1990 levels by 2010. There are a number of reasons for the shortfall: an increase in the amount of coal used in electricity generation; slower than planned introduction of renewables; demand for energy outstripping savings from energy efficiency; and a continued rise of emissions from the transport sector, to name but a few.

The Government must do a great deal more to meet its long-term targets to reduce carbon dioxide emissions. Primarily, the Government must provide a clear and consistent energy strategy, something which could be provided by a new Department of Energy. In order to achieve this strategy, the framework of mechanisms designed to control emissions must be simplified and secured for a period of 15 to 20 years. This is crucial to give private industry the confidence to make the large capital investments needed for new electricity generation and infrastructure as well as the increased expenditure in R&D required to find technical solutions to the problems we face. There is already a range of technically feasible solutions to reducing carbon emissions and there is the potential for developing many more given the necessary investment. A consistent message from the Government will provide the incentives for investments by the market in such development and the adoption of the right blend of technologies

The Government must continue to reduce carbon dioxide emissions from large scale electricity generation through a diverse mix of low-carbon fuels including nuclear power, renewable sources of energy, biofuels and clean coal technologies. However, important as the supply of electricity is, they must not neglect the demand side of the equation. Without an increase in energy efficiency in the domestic and public sectors the Government's ambitious targets will not be met. There is much that can be done in this area, such as: distributed generation; CHP; low energy buildings; demand management and energy storage, as exemplified by Woking Borough Council. All of these possible solutions will be needed along with stringent legislation to ensure their effectiveness. A high level of public engagement is also crucial to achieve the best results.

Perhaps the most serious and challenging sector to deal with is transport in which carbon dioxide emissions continue to grow. Biofuels and increasingly efficient vehicles may be of some help. Government needs to give greater attention to the long-term and to prepare for a future beyond oil in the Transport sector.

Q.2 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.

With the UK becoming a net importer of energy, security of supply has become a central issue in the energy debate. It is our opinion that the main way in which this security can be maintained is to have as diverse an energy system as possible.

In electricity generation, the 'dash for gas' has left us too dependent on gas and with supplies in the North Sea dwindling we will become overly reliant on gas supplies from mainland Europe. This situation should improve with additional gas pipelines from Scandinavia and new LNG facilities at Milford Haven. However more must be done to ensure as diverse a supply of gas as possible alongside an increase in storage capacity to protect against any interruptions in the supply.

Even with these measures it should be remembered that gas is a valuable chemical feedstock and its use should be limited whenever possible. This will require the continuation of our nuclear power industry and an increase in renewable supplies of electricity, both of which have the added value of being low-carbon supplies. It is also clear that there are still large reserves of coal in the world, including the UK, and hence coal will continue to be an important fuel in the future. This will require the development of clean coal technologies including carbon capture and storage and provide an opportunity to collaborate with other countries and to develop technologies which could lead to wealth creation for the UK.

Within the renewables sector there is room for improvement with the ROC system, which at present is being monopolised by onshore wind. It is important that other forms of renewable energy are also exploited. These include offshore wind, wave and tidal power, and biomass, all of which the UK has in abundant supply. In particular it might be time to consider building the Severn Tidal Barrier, a project that could provide a significant amount of carbon free energy from a reliable and secure source.

We would suggest that a sensible split would be at least 40% to be delivered by Nuclear power and renewable energy with the balance evenly split between gas and coal (a proportion of which would include carbon capture and storage). This would give greater certainty to ensuring Security of Supply and in meeting the carbon dioxide reduction targets. It is important, however, that a detailed evidence based review be carried out to assess the technical and economic feasibility of these proportions, a task which would be suitable for an Energy Commission.

While diversity of supply is crucial, there must also be greater synchronisation between the delivery of new or upgraded transmission networks and electricity generation so as to ensure transmission system availability when required. This is important to encourage private companies to develop new capacity, particularly renewables, in remote areas as they must be confident that the grid system will be in place to utilise the new supply. For example, there is currently a 10 year waiting list for connection of wind farms which is clearly unacceptable.

Major grid infrastructure uplift is required especially in the NW of Scotland to deliver the potential offered by Scottish off-shore wind farms. Major uplift and upgrade of the Scotland-England interconnector will also be required. At the other end of the scale it

will be necessary for the grid to cope with a much greater proportion and diverse sources of distributed generation. Government needs to give clarity in terms of those responsible and accountable for such investment and provisions.

Q.3 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?

A privately funded nuclear new build programme is both necessary and possible provided the Government sets down clear implementation policies and strategies underpinned by a consistent long-term, financial and regulatory framework.

Public engagement is also critical to alleviate peoples' fears regarding cost, safety and waste. Similarly, any new nuclear build programme should not be at the expense of developing other low-carbon generating technologies but be part of a diverse mix of primary sources of energy. All low-carbon sources will be necessary to meet the demands set by the threat of climate change.

A new nuclear build programme is necessary in the UK both to ensure carbon dioxide targets are met and to ensure security of supply through diversity. The concerns raised over cost, safety and waste are often overstated and do not outweigh the advantages nuclear power has in terms of reducing carbon dioxide emissions and increasing security of supply. There are however certain issues that must be addressed in order for the new build programme to be successful and to avoid mistakes that were made in the past.

The issue of cost is of primary concern but much progress has been made in recent years in building nuclear power plants to time and budget. Countries such as the USA, Finland and France have shown that the cost of generating electricity by existing nuclear power stations is competitive with other base load generating technologies. It should therefore be possible for the private sector to build new nuclear plants in the UK without any public subsidies. However, for this to be the case, the Government must agree a consistent financial model along with a market framework for incentivising long-term investment in low-carbon technologies. The cost of Nuclear Power Plant is dominated by the cost of capital and financing charges. Mechanisms are needed to give long term market confidence thus reducing risk and hence the financing of the capital. The planning process must also be simplified, with pre-licensing of suitable reactor designs and the scope of public enquiries limited to local issues. Nuclear technology has a unique hurdle to overcome compared with other forms of generation in that the nuclear regulator is required to undertake a 3 year process to assess and license a design. It is essential this process is started now and credit taken for work done overseas in licensing internationally available designs. In this regard, Government should look seriously at the forward planning and mobilisation of additional resources and skills within the Nuclear Installations Inspectorate.

The safety of nuclear power is often raised as a concern, both in terms of plant safety and from acts of terrorism. Experience has shown that, aside from the former Soviet Union, the safety performance of nuclear power has lived up to the very high standards expected of it. Furthermore, western nuclear reactors are now available that are simplified in design and provide enhanced protection against safety related failures. The nuclear waste generated from such stations is approximately a tenth of that from our current gas cooled reactors.

Nuclear waste management remains an important challenge, particularly in the UK where there exists a legacy problem due to our complex history of nuclear technology development compounded by a lack of a strategy for long term disposal.

Several other countries with significant nuclear power have made progress in establishing a long term strategy for managing nuclear waste in a safe and sustainable manner. This is exemplified particularly clearly (although not exclusively) by Finland with their plan for deep underground storage. As a matter of priority, once CORWM has reported, it is essential that agreement is reached in establishing a clear strategy for nuclear waste management in the UK that takes full account of international experience.

For potential investors in nuclear power plants to have confidence, Government must ensure clarity of liability going forward. Two things are required as a minimum. Firstly much more rapid progress to determine the disposition of the UK's existing and currently projected legacy wastes. Secondly, a mechanism such as a segregated fund into which generators pay throughout the operating life of the power plant, to enable the Government to have a fully funded decommissioning pot with which to fund disposition of spent fuel and reactor decommissioning wastes at end of life and for the generators to be certain at the outset of their liabilities. Here there is international experience that funds extracting of the order of 0.1-0.2p/kwh will cover the liabilities incurred.

Q.4 Are there particular considerations that should apply to carbon abatement and other low-carbon technologies?

All technologies must be treated equally with regards to carbon abatement and should be supported through a fair policy framework. As part of this, the Government should carry out definitive life-cycle carbon dioxide balances of all the main low-carbon technologies to verify their claims.

The Government must also be more positive about the UK's research capabilities and take credit for R&D carried out both in the UK by foreign companies and by UK nationals working on R&D in foreign countries.

Q.5 What further steps should be taken towards meeting the government's goals for ensuring that every home is adequately and affordably heated?

It seems inevitable that energy prices will continue to rise. This can be seen already with the majority of energy supply companies recently announcing significant price increases. The situation will worsen once the cost of carbon is taken into account, either through the EU trading mechanism or through carbon capture and storage. Thus the market is unlikely to deliver affordable energy to the poor.

While we feel that the issue of affordable energy and the fuel poor is more an issue of social policy and not within the expertise of the Academy the following issues are worth noting:

- The UK should be less insular in its approach to gathering information on energy policy. Currently the focus is on larger economies such as USA, France and Germany but ignores smaller, less obvious nations, which have innovative ideas and practices that could be of benefit in the UK.
- The poorest in society are the least able to afford to make their homes more energy efficient as this usually requires an initial capital outlay. Measures such as removing resistive heating and installing adequate insulation are expensive but would ultimately lower energy costs as well as reduce peak electricity demand which is met by the most carbon intensive type of electricity generation. It would therefore be doubly valuable if the Government could find a way to help the fuel poor make their homes energy efficient.

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