



E3G

UK Energy Policy and the future of Nuclear Power

Memorandum of evidence to the
Environmental Audit Committee
Inquiry 'Keeping the lights on'

Tom Burke, CBE

October 17th 2005



© E3G 2007

This work is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 2.0 License.

You are free to:

- Copy, distribute, display, and perform the work.
- Make derivative works.

under the following conditions:

- You must attribute the work in the manner specified by the author or licensor.
- You may not use this work for commercial purposes.
- If you alter, transform, or build upon this work, you may distribute the resulting work only under a license identical to this one.
- For any reuse or distribution, you must make clear to others the license terms of this work.
- Any of these conditions can be waived if you get permission from the copyright holder.

Your fair use and other rights are in no way affected by the above.

About E3G

E3G is an independent, non-profit European organisation operating in the public interest to accelerate the global transition to sustainable development.

E3G builds cross-sectoral coalitions to achieve carefully defined outcomes, chosen for their capacity to leverage change.

E3G works closely with like-minded partners in government, politics, business, civil society, science, the media, public interest foundations and elsewhere.

More information is available at www.e3g.org

Third Generation Environmentalism Ltd (E3G)

The Science Museum

Exhibition Road

London SW7 2DD

Tel: +44 (0) 207 942 4060

Fax: +44 (0) 207 942 4062

www.e3g.org

UK Energy Policy and the Future of Nuclear Power

Contents

| | |
|-----------------------|----|
| The Case | 4 |
| The Timetable | 6 |
| The Global Background | 7 |
| The Role of Nuclear | 9 |
| Conclusions | 12 |

Memorandum of Evidence submitted by Tom Burke CBE to the Environmental Audit Committee Inquiry ‘Keeping the Lights On’

1. This evidence is submitted on my own behalf and represents my personal views on the issues under inquiry. It does not reflect the views of any of the organisations with which I am associated.
2. I am currently employed part time as an advisor on environmental matters by Rio Tinto plc. I am also a Visiting Professor at Imperial and University Colleges, London and a co-founder of E3G, Third Generation Environmentalism. I have been actively involved in the public discussion of energy and environment matters for some 35 years in a variety of roles including those of a Special Advisor to three Secretaries of State for the Environment and as Executive Director of Friends of the Earth and the Green Alliance.

3. Energy policy in the 21st Century will be dominated by the interwoven issues of energy security and climate security. As global population and economies grow, governments will face the challenge of providing secure and affordable supplies of energy in a manner which does not destabilise the climate. Abandoning either of these goals is not an option.
4. The dynamics of climate change offer only limited scope for trade-offs between them. They must be met together. Insecure access to energy supplies leads to economic, social and political instability - economic prosperity, national security and personal fulfilment would be put at risk. An unstable climate will do the same. Weak economies are ill-equipped to make the technological and institutional advances necessary to prevent and adapt to climate change. An unstable climate will divert economic, institutional and political resources from more productive uses. In both cases, the poorest among us will be the most vulnerable.
5. This memorandum will address four aspects of the energy and climate security nexus. First, the case for additional interventions by government. Second, the timeframe within which policy in both areas must be brought into alignment. Third, the global background against which decisions on these issues by the British Government will be taken. Fourth, a consideration of the role new nuclear generation might play.¹

The Case

6. Successive British Governments have pursued a policy of progressively liberalising and deregulating energy markets for more than quarter of a century. As a consequence, Britain has one of the most open markets in electricity generation and distribution in the world. Until the recent rise in global energy prices this generated a consistent downward pressure on electricity prices to the benefit of both consumers and the economy. Within the EU, Britain has argued forcefully for further liberalisation of energy markets as an essential element in maintaining competitiveness and employment as well as for securing a fair and efficient internal market.

¹ The focus of this inquiry is on electricity generation and its relationship to climate change and this evidence is addressed to that set of questions. It is however worth remembering that there is another nexus of issues around mobility where the same interaction between energy and climate security features. This has somewhat different dynamics from those associated with electricity generation but clearly there is an interaction between the sectors. The emissions from vehicles, shipping and aviation must be added to those from electricity generation and elsewhere when calculating total carbon burdens. Conversely, reductions in real or projected emissions from the transport sector reduce the pressure on the electricity sector.

7. This background of a consistent and successful long term policy sets a high hurdle to be met by any new proposal for significant intervention in the operation of electricity markets by government. The public goods that would not otherwise be delivered need to be clear and the particular pathway chosen for delivering those goods needs to represent the best value for money.
8. It would be difficult to argue against both energy security and climate security as public goods which meet the first part of this test. Neither can be guaranteed by even the most efficient operation of electricity markets. Choosing the right pathway for delivering these goods is a more difficult question and is, appropriately, the main focus of this inquiry.
9. It is vital not to constrain choices artificially in advance. The purpose of any government intervention in this area is to deliver energy security and climate security together. The full spectrum of options available for meeting this goal needs to be considered in order to establish the base case for the chosen pathway. Thus, simply asking the question whether nuclear or wind offers the cheapest way to generate electricity asks the wrong question. The purpose is not to find the cheapest way to generate electricity but to find the most cost effective way to guarantee energy and climate security for Britain.
10. This means we should be thinking of choosing between deliverable and cost effective pathways to energy and climate security not simply between technologies. Any pathway to energy and climate security will contain a mix of technologies and policy measures which will have differing economic, social and environmental impacts. There are several such pathways available, each with a differing balance of advantage and disadvantage. The base case for intervention by government should set out a range of these pathways together with the technical and economic assumptions on which they are based. Without such a broad analytic foundation it is difficult to see how the transparent comparability essential for both investor and consumer confidence can be established.
11. Discussions of public policy in this area are prone to some familiar errors which should be avoided. The first is to start with a implicit technology preference and then to argue against all the other options rather than for the ultimate goal. A second is to forget that all assessments of cost are dependent on assumptions which are themselves contestable, frequently policy dependent and which are often not completely described. A third is to

include implicit considerations from other areas of policy: social, industrial, employment or regional, for example. This is why it is important that there be both clarity and completeness in the presentation of the analytic foundations for policy. To command the greatest confidence, the Government would be well advised to separate the presentation of the range of possible pathways from its judgments and rationale for choosing one rather than another.

The Timetable

12. Climate change is not just another environmental problem. It is unique in that it will affect every single person in Britain, indeed, everyone on the planet. It will exacerbate all the other stresses the planet is experiencing. There is little likelihood that the beneficial effects will outweigh those that are harmful. The longevity of carbon dioxide in the atmosphere and the slow response of geophysical and ecological systems to increases in global average temperature mean that these effects are, for all practical purposes, irreversible. The consequences of mistaken policy choices today cannot be remedied later. In this, too, climate change is a unique challenge to humanity.
13. Our growing understanding of the science of climate change sets out a clear, if daunting, timetable within which action to maintain climate security must occur. The United Nations Convention on Climate Change has as its goal the avoidance of dangerous climate change. There is no formal agreement as to what constitutes 'dangerous' climate change. The EU has stated that the intent of its climate policy is to avoid a rise in global average temperature of more than 2.0°C². There is a growing acceptance of this threshold within the scientific and policy communities engaged with climate change³.
14. The Prime Minister convened a conference of the world's leading climate scientists in February this year under the title 'Avoiding Dangerous Climate Change'. They concluded: '*...there is greater clarity and reduced uncertainty about the impacts of climate change across a wide range of systems, sectors and societies. In many cases the risks are more serious than previously*

² 2610th Environment Council Meeting, October 14th 2004 '.....the maximum global temperature increase of 2.0°C over pre-industrial levels should be considered as an overall long-term objective to guide global efforts to reduce climate change risks....'

³ There is no robust scientific foundation for this emerging consensus. It is a 'best guess' at identifying the threshold of dangerous climate change. It is the point at which studies reported by the IPCC suggest clearly that the negative impacts of a changing climate will be widespread. Recent observations of current changes in the climate reflecting a much lower global average temperature rise suggest that even this might be unduly optimistic.

thought. They went on to further conclude that: ‘...limiting warming to 2°C above pre-industrial levels with a relatively high certainty requires the equivalent concentration of CO₂ to stay below 400ppm. Conversely, if concentrations were to rise to 550ppm CO₂ equivalent, then it is unlikely that the global mean temperature increase would stay below 2°C.’⁴

15. We have observed an increase in global mean temperature of 0.6°C above pre-industrial levels. We are already committed to another 0.6°C rise in temperature even if we were to prevent any further increase in the concentration of greenhouse gases in the atmosphere from today. This is a consequence of the extensive lags in the response of the climate system to the forcing it has already experienced. The current concentration of CO₂ alone in the atmosphere is 379ppm, up from its pre-industrial level of 280ppm. It is rising at a rate of approximately 1.8ppm per year. There is some evidence that this rate is itself increasing.
16. This establishes the timeframe within which action must be taken. We will cross the 400ppm CO₂ equivalent threshold within a decade and the 550ppm threshold some six or seven decades later⁵. This is also the time frame within which there is growing consensus that the world will pass the point of peak oil production. This has inevitably heightened concerns everywhere about energy security. Governments will invest considerable sums in coming decades to ensure energy security for their citizens. It is vital that decisions made for this purpose are convergent on those made to guarantee climate security. Correct decisions made now will secure both, incorrect decisions will be extremely difficult, if not impossible, to remedy.

The Global Background

17. Decisions about energy and climate security in Britain cannot, and should not, be taken in isolation from the global background. In a globalising world neither energy nor climate security can be guaranteed by our government alone. Britain possesses the analytic, technological, financial and political resources to play a key role in shaping the global response to this twin challenge. Our membership of the European Union gives us the potential to

⁴ It is important to note the precise phrasing here. The most commonly used data for CO₂ concentrations are the measurements at Moana Loa in Hawaii. These measure CO₂ alone. To arrive at the ‘CO₂ equivalent concentration’ referred to above the greenhouse warming potential of the other greenhouse gases released to the atmosphere must be added to the actual CO₂ concentration. This has significant implications for the timetable within which governments must act to maintain climate security.

⁵ Sooner if the rate of increase in concentrations continues to rise. This could happen as a result of sharply rising emissions or as a loss of the buffering capacity of vegetation and the ocean, or both.

leverage those resources to the scale necessary to influence global outcomes significantly.

18. Britain has led the drive for climate security by example. The EU as a whole is committed to reducing its greenhouse gas emissions by 8% below 1990 levels by the period 2008-2012. As its share of this target, Britain has undertaken to reduce its emissions by 12.5% in the same timeframe. Confidence that this commitment will be met without prejudicing either energy security or competitiveness is high. In addition, Britain has taken on a voluntary target of reducing CO₂ emissions by 20% below 1990 levels by 2010. This is a more difficult target to achieve but is nevertheless within reach of a properly focussed effort. In its 2003 Energy White Paper the Government also accepted the recommendation of the Royal Commission on Environmental Pollution that Britain should aim to reduce its CO₂ emissions by 60% by 2050.
19. These commitments provided a firm foundation for the Prime Minister's initiative in setting climate change as one of his key priorities for his Presidency of both the G8 and the EU. Britain has now firmly established itself in a leading position on climate change. These clear political signals are also providing an important long term framework for British business as it considers its investment strategy to meet the twin challenges of climate and energy security.⁶
20. The latest International Energy Agency report on the World Energy Outlook projects an increase in global CO₂ emissions of 63% above their 2002 levels by 2030. This is consistent with the emissions scenarios published by the IPCC. To meet the expanding global demand for energy the world will need to invest some \$17 trillion, about two thirds of it in the power sector. In order to meet the expected demand for electricity the WEO forecasts that just under 1400 Gigawatts (GW) of coal-fired power stations will be built⁷. China, which will build about 600 of this total, is currently constructing new coal fired power stations at the rate of one every five days. It is also planning

⁶ This political lead is particularly important for both the world and for British business. For the world it sustains the momentum as we run up to the vitally important, but unquestionably difficult, discussions on the next phase of the Kyoto process. For British business it reinforces the investment signal generated by the European Emissions Trading scheme which is, on its own, not yet sufficiently strong to drive investment. The Prime Minister has, correctly, identified the importance of technology in achieving both climate and energy security. Without investment, technology will not be available. Without the kind of longer term framework provided by the present series of political commitments, investment will be deferred.

⁷ This is in addition to some 2000 gas fired power stations.

to construct 30 nuclear power stations, even so this will only produce 6% of China's electricity.

21. Coal-fired power stations built today have a planned lifetime of 50 years. If all the currently planned coal-fired power stations are constructed using conventional pulverised coal technology, then the addition of carbon to the atmosphere over their lifetime will come to 145 Gigatonnes. That is approximately the amount added to the atmosphere since the beginning of the industrial revolution. Such an outcome would render climate security impossible.⁸
22. Nevertheless, energy security concerns mean that there is no politically available route to climate security that does not involve Chinese, Indian and North American use of their abundant coal reserves. Advanced coal technologies, such as Integrated Combined Cycle Gasification (IGCC) with Carbon Sequestration and Storage, provide a route to combine energy and climate security. Opening this route will require significant public investment in order to leverage the currently planned private investment onto a different technology deployment trajectory. However, were this route to be opened globally it would also become available for Britain.

The Role of Nuclear

23. The future role of nuclear power in Britain's effort to meet the twin challenges of energy and climate security needs to be considered in this context. Britain currently generates about a quarter of its electricity from nuclear power. The current reactors are ageing. All but one will close by 2023. The question has therefore arisen as to whether Britain should embark on a programme of new nuclear build in order to replace the reactors coming out of commission. A more pertinent question is whether new nuclear build could contribute significantly to the goal of ensuring both energy and climate security.
24. Nuclear power is unattractive to private investors. The Government has made it clear for some years that it would welcome proposals for new nuclear power stations from the private sector. None has been forthcoming. This should cause little surprise. Investors in nuclear power are exposed to a very particular set of risks.

⁸ Retro-fitting post-combustion carbon capture and storage to these power stations is a possible, if very expensive, option. However, even if stations were so designed as to permit such retrofits, the constraints on electricity generation in many parts of the world would make generators highly reluctant to take the plant off-line for the retrofit.

25. The economics of nuclear power are only viable if there is series ordering for a programme of 8 to 10 stations. This would require an extraordinarily high degree of cooperation between competing utilities to accomplish in Britain. Investors must also be willing to bear very high expenditures for a minimum of 7 years before generating revenues. They must be willing to risk periods of falling electricity prices⁹ during the long lifetime of the stations.
26. There are also uniquely difficult political risks surrounding matters such as the allocation of financial responsibility for radioactive waste management or the continued willingness of government to provide the bulk of insurance cover against accidents. Furthermore, the support from government would need to remain consistent over several parliaments. There are also wider concerns about the public acceptability of new nuclear build. It is hardly surprising that public concern over nuclear power should apparently have fallen during more than a decade when no new proposals have been made.
27. These considerations make it very unlikely that new nuclear power stations will be built in Britain without considerable Government support. This could take many forms including, for example, direct subsidies to construction and operating costs, or constraints on the operation of the electricity market to offset revenue risks, or both. The Government could also create a favourable regulatory regime through absorbing more of the risks associated with decommissioning and waste management. In all of these, and other, cases, the additional costs would be borne either by business and household electricity consumers, or the taxpayer, or both.
28. Clearly, the rationale for government intervention on this scale would need to be very compelling to attract private investors. The contribution of new nuclear build to the challenge of guaranteeing Britain's energy and climate security would need to be both significant and apparent to all. However, even if we assume the most favourable resolution to the problems outlined in paragraphs 26 and 27, there is good reason to doubt that this will be the case.
29. The Government has recently pledged to make a decision in principle on new nuclear build by the end of 2006. Depending on the exact mix of policies chosen to provide the necessary support to stimulate a practical proposal, which might require primary legislation, it is unlikely that a concrete order for a new reactor would be placed before 2008. It could then take another

⁹ The Government was recently forced to bail out British Energy at a cost of over £500 million because, as a result of the success of its energy liberalisation policy, the price of electricity fell!

two years to produce the detailed design necessary for review by the Nuclear Installations Inspectorate and the Environment Agency. Their consent, which would form an essential part of any planning application, would take at least another two years. Thus a formal planning application is hard to envisage much before 2012, by which time existing reactors would already be coming out of use.

30. Assuming a more rapid planning inquiry than for any previous nuclear reactor and a further year for the government to review the Inspector's report and it is possible that planning permission might be granted by 2015. A construction time of five years would be better than has ever been achieved before in Britain and a year to work the reactor up to full power means that series ordering could possibly begin somewhere around 2021 if all went well.
31. These are optimistic assumptions. Even so, it is clear that whatever other contribution it might make to Britain's energy and climate security, there is no prospect that new nuclear build will do so by replacing our existing nuclear reactors as they come out of commission. Thus, we will have to find another option for replacing the bulk of the current nuclear fleet before 2020 and we will have to do so in a way that helps maintain both climate and energy security. Clearly, if there are viable options for meeting our electricity security needs in a climate compatible manner prior to 2020 there is no obvious reason to suppose that those same options would not be available post-2020.
32. Finding these options is even more urgent for another reason. Older coal-fired power stations currently supply some 32% of Britain's electricity. Between now and 2015, some 50% of the current stations will close. They will also have to be replaced in a climate compatible manner if both energy and climate security are to be guaranteed. Without government intervention, this would be overwhelmed by a further shift to gas raising understandable concerns about future over-dependence on imported gas.
33. The issue is not whether or not there should be government intervention, but what form that intervention should take in order to deliver energy and climate security at the best value for money. This choice is often presented as a contest between nuclear and the renewables – in Britain's case, primarily wind. The grossly oversimplifies the choices. Coal, using advanced coal technologies with carbon capture and storage, is clearly an option to hedge against over-dependence on gas. The exact mix of advanced coal, gas,

especially to fuel co-generation, wind and other renewables, increased energy efficiency and even further life extension for our existing nuclear stations necessary to guarantee energy and climate security for Britain is exactly what needs to be explored by the development of the pathways referred to in paragraph 10 above. What is clear, however, is that in the timeframe within which government intervention will be essential, new nuclear build cannot make a significant contribution on even the most optimistic assumptions.¹⁰

Conclusions

These considerations lead me to the following conclusions:-

- > the problem of guaranteeing both energy and climate security is more urgent than is widely understood;
- > there is a good case for government intervention to deliver these public goods;
- > doing so will require defining and choosing pathways to this end, not simply choosing technologies;
- > any major error in the current policy choice will be very difficult and expensive to correct;
- > for this reason, and because delivery of the chosen pathway will need the active support of investors and consumers, not only must the government's conclusions command confidence, so, too, must the process by which they are arrived at;
- > new nuclear build cannot contribute to energy and climate security for Britain within the timeframe under consideration and is therefore a distraction.

¹⁰ It is worth noting that the IEA in the World Energy Outlook was clear that it did not expect there to be any significant global growth in new nuclear build and that its share of global electricity generation would fall in the period out to 2030. This year the total amount of electricity **delivered** by co-generation and the renewables (including only hydro below 10MW) will exceed that delivered by the whole of the world's nuclear fleet. Whilst there is no significant growth forecast for new nuclear, growth rates in these technologies are forecast to grow exponentially.