

THERE'S A LIGHT AT THE END OF THE TUNNEL. . .  
(THE FUTURE OF NUCLEAR POWER IN THE UK)

By Steven Vaughan\*

The energy produced by the breaking down of the atom is a very poor kind of thing. Anyone who expects a source of power from the transformation of these atoms is talking moonshine.

Lord Earnest Rutherford (1933)

We have come a long way in a little over seventy years. On 23 May 2007, the Government of the United Kingdom published an Energy White Paper ('Meeting the Energy Challenge') in which a tentative green light was given for the development of nuclear new builds, it being . . . *the Government's preliminary view. . . that it is in the public interest to give the private sector the option of investing in new nuclear power stations.*<sup>1</sup> This article will set the background to 2007 Energy White Paper and detail a number of the outstanding matters which need to be progressed before decisions are made (by the Government and potential promoters) on the future of nuclear power in the UK's energy mix.

THE PATH TO THE "PRELIMINARY VIEW"

The breadcrumb trail to the 2007 Energy White Paper is a long and, at times, circuitous path. February 2003 saw the publication of a Government Energy White Paper entitled "Our energy future – creating a low carbon economy." This Paper endorsed the (at the time) emerging view that renewables and energy efficiency could play a central role in the UK's future energy policy. On the subject of nuclear power generation, the White Paper commented that, "Although nuclear power produces no carbon dioxide, its current economics make new nuclear build an unattractive option. . . We do not, therefore, propose to support new nuclear build now. But we will keep the option open."<sup>2</sup>

In July 2006, the UK Government published 'The Energy Challenge' Energy Review which highlighted two overriding challenges in the energy sector: climate change; and security of energy supply. Although further measures were required to promote renewable energy and energy effi-

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1. "Meeting the Energy Challenge," UK White Paper on Energy, May 2007.  
2. "Our Energy Future – Creating a Low Carbon Economy," UK White Paper on Energy, February 2003.

ciency, the 2006 Energy Review stated that these measures, on their own, were insufficient to address climate change and security of supply concerns and, as such, nuclear new builds had a “role to play.” This announcement caused widespread controversy, in part because of the Government’s commitment in the 2003 White Paper that, “Before any decision to proceed with the building of new nuclear power stations, there would need to be the fullest public consultation.”<sup>3</sup> In October 2006, Greenpeace brought judicial review proceedings against the UK Government alleging that the consultation process leading to the decision on nuclear power in the 2006 Energy Review was procedurally flawed and thus unlawful. In February 2007 at the High Court, Mr Justice Sullivan held that “the consultation exercise was very seriously flawed” and accepted the proposition put forward by counsel for Greenpeace that “something has gone clearly and radically wrong.”<sup>4</sup>

While embarrassing for the UK Government, the decision in the Greenpeace case was not one of substance against the promulgation of nuclear power generation but rather a strong criticism of the processes leading to the 2006 Energy Review’s conclusion that nuclear new build has a role to play in the UK’s future energy mix. In a press release following the decision, the Department of Trade and Industry commented that the “judgement is about the process of consultation, not the principle of nuclear power.” To secure “the fullest public consultation” on the topic of nuclear power generation, the Department of Trade and Industry published, in May 2007, a Consultation Document (‘The Future of Nuclear Power’) which sits alongside the 2007 Energy White Paper and sets out the information the Government has reviewed as part of the process of reaching its “preliminary view” that new nuclear power stations should be given the green light. The consultation period ends on 10 October 2007.<sup>5</sup>

#### KEEPING THE LIGHTS ON

Nuclear power currently provides around eighteen percent of the UK’s electricity generation and 7.5 percent of total UK energy supplies. However, most of the existing nuclear power stations are scheduled for closure over the course of the next fifteen years. Despite legislative measures and policy initiatives to encourage and improve energy efficiency, the UK Government estimates that the UK will require around thirty to thirty-five GW of new electricity generation capacity over the next two decades (and around two thirds of this capacity by 2020). On a global view, the International Energy Agency forecasts that between 2004 and 2030, global primary energy demand will rise by fifty-three percent.<sup>6</sup> As

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3. “Our Energy Future – Creating a Low Carbon Economy,” UK White Paper on Energy, February 2003.

4. *R (on the application of Greenpeace Ltd) v Secretary of State for Trade and Industry* [2007] EWHC 311 (Admin).

5. See <http://nuclearpower2007.direct.gov.uk>.

6. “World Energy Outlook,” International Energy Agency Report, 2006.

the House of Commons Environmental Audit Committee put it, . . . *very substantial investment in new generating capacity and energy efficiency will be required if the lights are to stay on.*<sup>7</sup>

As detailed above, there are a number of factors relating to the shift in Government policy from non-committal on the UK's nuclear future to "preliminary" support:

- Increasing evidence of climate change, rising carbon emissions and wider recognition (at national and international levels) of the need for immediate global action coupled with the general acceptance of nuclear power as a low carbon source of electricity;
- Increasing reliance in the UK on imported energy, which requires management of, "the risks arising from the concentration of fossil fuel reserves in fewer and further places, some of them in less stable parts of the world."<sup>8</sup> Over fifty percent of proven natural gas reserves are located in three countries (Russia, Iran and Qatar) and it is expected that by 2020, the UK will be obliged to import eighty percent of its gas needs. The European Commission has commented that, "Nuclear energy generation has a role to play in the response to the Strategic Energy Review and, in particular, to the main priorities. . . [of] security of supply, competitiveness and sustainability."<sup>9</sup> It is hard to argue against the proposition that including nuclear power in the UK's energy mix would increase security of supply through diversity; and
- Interest from the private sector in investing in new nuclear power stations, due in part to increasing fossil fuel prices which make the economics of nuclear new build more attractive. Nuclear plants are largely insensitive to changes in the cost of fuel and the Organisation for Economic Co-operation and Development (OECD) Nuclear Energy Agency reports that the rising price of uranium has had little impact on nuclear electricity costs.<sup>10</sup>

#### OUTSTANDING ISSUES

While the case for new nuclear plant in the UK has been clearly stated, a number of outstanding issues (requiring debate and progress by Government and investor and NGO stakeholders, as well as the wider UK populace) remain:

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7. "Keeping the Lights On: Nuclear, Renewables and Climate Change," House of Commons Environmental Audit Committee, Sixth Report of Session 2005–06.

8. "Meeting the Energy Challenge," UK White Paper on Energy, May 2007.

9. "Nuclear Illustrative Programme," Commission Communication COM (2006) 844, January 2007.

10. "Uranium 2005: Resources, Production and Demand", OECD Nuclear Energy Agency and International Atomic Energy Agency Report, May 2006.

*The Regulatory Environment*

Under current law, the construction and operation of a new nuclear station in England and Wales<sup>11</sup> requires a number of consents and approvals from different regulatory bodies:

1. A nuclear site licence from the Nuclear Installations Inspectorate (part of the Health and Safety Executive);
2. Consents, under sections 36 and 37 of the Electricity Act 1989, from the Secretary of State for the Department of Trade and Industry (granting licence to operate an electricity-generating power plant with capacity greater than fifty MW and deemed planning consent). Generally, this includes a public inquiry where there is a detailed consideration of the proposal and any objections; and
3. Radioactive waste disposal and discharge authorisations from the Environment Agency.

The application and approval process can last upwards of three years. Indeed, the Sizewell B planning inquiry (into the building of Britain's first pressurised water reactor power station) alone lasted for 340 days and heard evidence from 195 witnesses. The Barker Review concluded that the UK planning system is consistently one of the top six concerns for investors in the UK.<sup>12</sup> A lack of a clear policy framework (due to different and overlapping development consent regimes) has discouraged promoters from bringing forward proposals for development. Cognisant of the fact that *[t]he process for dealing with major infrastructure projects, from submission of the proposal to decision in particular, is too slow and complicated*<sup>13</sup> the UK Government published, on 21 May 2007, a White Paper entitled, 'Planning for a Sustainable Future' which sets out wide ranging reforms. A detailed review of the proposals is outside of the context of this article, but in brief the Government is proposing that:

1. National policy statements will be introduced for nationally significant infrastructure projects. These will set out the national need for the relevant infrastructure and "integrate national economic, environmental and social goals to deliver sustainable development."<sup>14</sup> In the energy sector, the 2007 Planning White Paper details that the national policy statement would consider objectives in relation to security of supply, the UK's increasing energy demand and the aim of reducing carbon emissions. In the 2007 Nuclear Consultation Document, the Government comments that streamlining the nuclear plant consent process "could take the form of a National Policy Statement." Indeed, it would be somewhat peculiar were the nuclear sector to be outside of the

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11. The power to consent the construction of power stations has been devolved in Scotland to Scottish Ministers (and is also devolved in Northern Ireland).

12. "Barker Review of Land Use Planning," Final Report, December 2006.

13. "Planning for a Sustainable Future," UK White Paper, May 2007.

14. *Id.*

- remit of the planned revisions to the major infrastructure development consent regime;
2. Infrastructure project promoters will receive better advice in the preparation of development applications (requiring public consultation and earlier engagement with statutory environmental and heritage bodies);
  3. An independent infrastructure planning commission be established to take the decisions on nationally significant infrastructure cases. The commission would approve any application for development consent which had main aims consistent with the national policy statement unless the local consequences outweighed the benefits; and
  4. The existing development consent regimes be rationalised and inquiry procedures improved. The infrastructure planning commission would grant project consents, confer powers and amend legislation, necessary to implement nationally significant infrastructure projects. The authorisations conferred by the commission could include deemed planning permission, compulsory purchase of land, permission to construct associated infrastructure, hazardous substances consents and powers to stop up or divert highways.

The aim is that the reforms will reduce the time taken from application to decision on major infrastructure projects to under a year in the majority of cases. However, this estimate does not take into account the time required in preparing for the application (including stakeholder consultation, which the May 2007 Planning White Paper calls, “the hallmark of good scheme development”). It remains to be seen whether these proposals will effectively reduce the average time period for a major infrastructure project development consent application or merely reallocate the global time taken to receive project consent by front-loading the pre-application stage. It is intended that the independent infrastructure planning commission would be operational by 2009.

#### *The Low Carbon Economy*

The International Energy Agency’s 2006 “World Energy Outlook” estimates that by 2030 forty-four percent of global energy related emissions will derive from power generation. As the Government put it in the 2007 Nuclear Consultation Document, “Growing concern about climate change has put pressure on the electricity supply industry to adopt technologies that do not add to the world’s emissions of carbon dioxide.”

While it may be possible to label the operation of a nuclear power plant as zero-carbon, an holistic approach to evaluating carbon emissions highlights power plant construction, uranium mining and fabrication, fuel transportation and waste management as nuclear lifecycle emission sources. A March 2006 report by the Sustainable Development Commission (SDC) concluded that, “Our evidence shows that taking into account the emissions associated with plant construction and the fuel cycle, the emissions associated with nuclear power production are relatively low,

with an average value of 4.4tC/GWh, compared to 243tC/GWh for coal and 97tC/GWh for gas.”<sup>15</sup> However, these figures did not include emissions from nuclear decommissioning and waste treatment (which are more difficult to accurately quantify). Certain other studies have put the emissions levels somewhat higher, although significantly less than those for coal and gas.

The SDC acknowledges that overall emissions reductions in the construction of a nuclear power plant could be further achieved by incorporating construction inputs into emissions trading schemes. They conclude that a new nuclear programme could contribute an eight percent reduction in UK emissions against 1990 levels. Obviously, this is not enough (in and of itself) to achieve the UK's emissions reductions target of sixty percent by 2050 (as detailed in the 2007 Energy White Paper) but nuclear power is not intended, and should not be regarded, as the panacea cure-all for climate change. It is but one of a variety of interlocking future options.

*Money, Money, Money. . .*

At present, there is nothing stopping applications for nuclear new builds in the UK. Admittedly, the existing regulatory processes are time consuming and cumbersome, but these are not, in and of themselves, actual barriers to new development. Instead, it is perhaps fair to say that the perception of nuclear power generation in the UK has been one of a particularly high risk investment. The House of Commons Environmental Audit Committee detailed the high cost of planning applications, the need to sell electricity generated at a certain minimum price and the need to cap decommissioning and waste disposal costs as key risk factors.<sup>16</sup> Nuclear power plants require initial high capital investment (with the European Commission estimating that construction costs for nuclear plant are two to four times greater than for a combined cycle gas turbine)<sup>17</sup> and a subsequent relatively long period (five years, being optimistic) before any such investment starts to show a profit. The question was once one of whether the rate of return on a new nuclear power station justified the risk in investment.

In their joint evidence to the House of Commons Environmental Audit Committee, the Department for Environment, Food and Rural Affairs and the Department of Trade and Industry commented that:

There is very little evidence on the robustness of cost estimates for new nuclear build as there is currently only one plant being built in Europe. [. . .] Past experience of cost overruns in non-

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15. “The Role of Nuclear Power in a Low Carbon Economy,” SDC Report, March 2006.

16. “Keeping the Lights On: Nuclear, Renewables and Climate Change,” House of Commons Environmental Audit Committee, Sixth Report of Session 2005–06.

17. “Nuclear Illustrative Programme,” Commission Communication COM(2006) 844, January 2007.

liberalised electricity markets, however, provides no guide to the prospects for new nuclear build in a liberalised market.<sup>18</sup>

With the reforms detailed in the 2007 Planning White Paper (set out above), it is hoped that a more streamlined regulatory process will increase certainty in the framework of nuclear new builds and lead to decreased long-term cost risks. Questions remain on certain of the unique economic problems relating to the construction of new nuclear plants but it is ultimately for the individual investor to decide whether a sufficiently profitable rate of return can be achieved and investment in nuclear new builds is financially viable.

Concerns have been raised over the possibility of the UK Government being required to step into the shoes of a nuclear plant operator and/or provide financial support in the case of economic difficulties. To allay this fear, the 2007 Nuclear Consultation Document states that the Government will develop, “arrangements that would protect the taxpayer by ensuring that private sector operators of nuclear power stations securely accumulate the funds needed to meet the full costs of decommissioning and full share of waste management costs.” To this end, the UK Government is planning on enshrining in legislation the financing structure in relation to new nuclear power stations, “to be satisfied that the arrangements are sufficiently robust, even in the event of insolvency or early decommissioning of the power station.”<sup>19</sup> It is likely that such legislation will focus on a funding arrangement plan, which will require Government approval prior to plant construction (although it is not clear how this consent process sits with the proposals in the 2007 Planning White Paper, which seeks to rationalise development consent procedures by having a single application to the infrastructure planning commission). Of the various funding options, the Government has stated a preference for an approach whereby nuclear site owners/operators are required to make payments to a separate body, such as a trust, to secure adequate accumulation of monies in relation to decommissioning and waste management costs. The 2007 Nuclear Consultation Document states that nuclear financing legislation would be presented at an “early opportunity,” although no estimate time frames are given (perhaps as this could be said to be pre-determining the outcome of the consultation process on whether investment in nuclear new builds should be given the green light).

### *Waste Disposal*

Radioactive waste is one of the most emotive outstanding issues in the context of nuclear new builds. Though Ronald Reagan once (oversimplistically) quipped that, “All the waste in a year from a nuclear power

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18. Paragraph 27 of Ev269 to the House of Commons Environmental Audit Committee, Session 2005–06.

19. “The Future of Nuclear Power,” DTI Consultation Document, May 2007.

plant can be stored under a desk," it is estimated that the UK has an historic legacy of nuclear waste that will total 475,000m<sup>3</sup>, being a complex mix of wastes from civil and military nuclear programmes. Through the Nuclear Decommissioning Authority in the UK, the public sector is ultimately responsible for delivering and paying for a long-term waste management solution as regards historic waste. However, the UK Government has made it clear that the private sector will pay its "full share" of the costs of long-term waste management arising from any nuclear new build.

The Committee on Radioactive Waste Management (CoRWM) was asked by the UK Government in 2003 to make recommendations for the long-term management of the UK's higher activity wastes that would both protect the public and the environment, and inspire public confidence. In their July 2006 report, CoRWM recommended that geological disposal by way of deep underground facilities is: *the best available approach for the long-term management of all the material categorised as waste in the CoRWM inventory when compared with the risks associated with other methods of management. The aim should be to progress to disposal as soon as practicable, consistent with developing and maintaining public and stakeholder confidence.*<sup>20</sup> CoRWM placed heavy emphasis on public and stakeholder engagement, which it believes, "will be essential to build trust and confidence in the proposed long-term management approach, including siting of facilities." CoRWM's approach to the management of radioactive waste suggests an iterative process (interim storage followed by geological disposal coupled with intensive research efforts) with heavy community and regulatory involvement. CoRWM's remit did not include the implications of additional waste from nuclear new builds (the volume of which will depend on the number and nature of proposals for new nuclear power stations), but a number of its conclusions are nonetheless relevant. Indeed, the UK Government in the 2007 Energy White Paper cited, "significant progress in tackling the legacy waste issue" as one of the factors which led to its "preliminary view" that nuclear new builds should be given the green light. It is expected that the UK Government will publish a consultation on the implementation process for developing a long-term waste management solution during the summer of 2007.

### *Public Acceptance*

Public perception about nuclear power (in particular, its safety aspects) is arguably low. Incidents at Three Mile Island (1979) and Chernobyl (1986) have led to heightened fears (justified or otherwise) regarding the social and environmental costs from power station accidents or acts of terrorism directed at nuclear plants. Safety risks lie in the operation of nuclear power stations, the transport of fuel to the plants and the storage of radioactive waste. However, the nuclear sector is heavily regulated, nuclear plants have multiple, redundant safety mechanisms

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20. "Managing our Radioactive Waste Safely," CoRWM Doc 700, July 2006.



and the House of Commons Environmental Audit Committee concluded in 2006 that “At least in the West, the safety record of civil nuclear power stations has been good.”<sup>21</sup> In addition, the SDC commented that: *Modern reactor designs have substantial containment buildings which are unlikely to be breached even by a crashing commercial airliner and the reactor fuel is protected against impact and fire by other structures.*<sup>22</sup>

The crux of the problem appears to lie in perceived risks which may not, as a matter of fact, be sufficiently likely that they justify a blanket ban on the promulgation of nuclear energy. There is an obvious difficulty in weighing the likelihood of an incident (intentional or accidental) against the potential for disaster. Historically, lengthy consultations on nuclear energy matters (such as Sizewell B) have not given a ‘voice’ to all potentially interested stakeholders (either through lack of resources, lack of interest due to consultation fatigue or intimidation of an often adversarial system of information gathering). The 2007 Planning White Paper seeks to bolster public consultation and engagement, making stakeholder dialogue a recurring and continual process from national policy statement drafting through to an ‘open floor’ stage in planning inquiries.

#### CONCLUSIONS

The nuclear new build option has become recently more attractive to investors due to, among other matters, the: (i) rising carbon emissions; (ii) need to strengthen the UK’s security of supply through a diverse energy mix; and (iii) fluctuation in fossil fuel prices. However, it is nigh on impossible to predict how fossil fuel prices (and the price of carbon under EU, national and later international, emissions trading schemes) will fluctuate going forward. It is also difficult to assess the rate at which renewable energy technology will develop and become more cost efficient (and the impact of promoting nuclear power on the renewable energy sector).

It is perhaps all too easy to focus on the future of nuclear power in the UK in isolation, as the matter is so politically and culturally charged. Because of the necessary lead-in times, new nuclear power stations are not an immediate answer to either the requirement for increased generating capacity or the pressing need to tackle climate change. In the context of the UK’s energy efficiency and emissions goals, there is no single solution. New nuclear power stations are not a panacea cure-all, but it is hoped that they can form part of a multi-headed complex web of measures necessary to combat climate change and improve security of energy supply.

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21. “Keeping the Lights On: Nuclear, Renewables and Climate Change,” House of Commons Environmental Audit Committee, Sixth Report of Session 2005–06.

22. “The Role of Nuclear Power in a Low Carbon Economy,” SDC Report, March 2006.