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The Knowledge Network

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Dear Sirs,

The Future of Nuclear Power – The Role of Nuclear Power in a Low Carbon UK Economy

The Institution of Engineering and Technology (IET) is pleased to respond to the Government Consultation on “The Future of Nuclear Power”.

The IET agrees that tackling climate change and ensuring the security of energy supplies are urgent and critical priorities for government policy. A new generation of nuclear power stations could contribute to meeting these goals in the long term (post-2020). However, new nuclear build is unlikely to be generating before 2020 and will therefore not address the capacity shortfall expected to arise over the next two decades from the retirement of coal and nuclear stations. It is therefore imperative for Government to act urgently to ensure, firstly, that the overall policy framework promotes a diversity of low carbon energy sources and sustainable energy use, and secondly that the barriers to new nuclear build are lifted.

For the former, it will be necessary to create a clear and consistent market framework which gives clear signals in favour of low carbon options and improves security through diversity. This will create a favourable context for nuclear but will also promote sustainable options in the shorter term. For the latter, Government should focus on reducing the uncertainties and mitigating the risks which currently inhibit investment in new nuclear build. In addition to the factors examined in the Consultation, investors’ decisions will be affected by their perception of uncertainties around planning delays, waste management, competition for skills, global raw materials costs, vendor capacity and carbon prices. We identify these issues and make more detailed recommendations in response to the consultation questions in the attached annex.

The IET is the largest engineering body in Europe, representing over 150,000 members in the global engineering and technology sectors. The IET acts as an independent and authoritative voice for the profession, and aims to provide policy makers and the public with reliable and factual information on engineering and technology issues. This response has been prepared on behalf of the IET

Trustees by the Energy Sector Panel with support from the Environment and Energy Expert Group. (More information on the IET's policy process in these sectors can be found at <http://www.theiet.org/publicaffairs/energy/index.cfm>).

If you require further information or amplification of any aspect of this response, or would like to arrange a meeting with the members of our policy groups to discuss our recommendations in greater detail, then please do not hesitate to contact me.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Paul Davies', with a stylized flourish at the end.

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Annex 1

**Submission on
THE FUTURE OF NUCLEAR POWER –
THE ROLE OF NUCLEAR POWER IN A LOW CARBON
UK ECONOMY**

QUESTION 1

To what extent do you believe that tackling climate change and ensuring the security of energy supplies are critical challenges for the UK that require significant action in the near term and a sustained strategy between now and 2050?

We agree that tackling climate change and ensuring the security of energy supplies are urgent and critical priorities for government policy.

A wide array of solutions is available to address the challenges of security of supply and climate change. Stronger political will, greater urgency and persistence are needed to implement them effectively across the whole energy system¹.

The challenge for Government is to promote diversity and flexibility across the energy mix, using the full range of low carbon options, by putting in place clear and consistent policies across the board. While some of the barriers to new nuclear build are specific to this technology, most are generic to the energy and electricity sectors.

Government needs to find robust ways of signalling its longer-term intent to allow the market to deliver solutions. Clarity and consistency will be key to gaining the confidence of potential investors and the public at large in the necessary steps to meet the energy challenge.

QUESTION 2

Do you agree or disagree with the Government's views on carbon emissions from new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

A new generation of nuclear power stations could contribute to the UK's long term climate change mitigation goals. The conclusions presented in the Consultation Document follow from generally-accepted ways of assessing lifecycle emissions.

However, new nuclear build will offer no short term emissions benefit, and will not contribute significantly to achieving our 2020 emissions targets. Even if companies decide to invest in new nuclear build now, the first reactor is unlikely to come on line before about 2020, and it could be a further decade or more before nuclear recovered a significant (say, 20%) share of the UK electricity production. In this respect, the modelling results presented in Chapter 5 of the

¹ The IET's views are summarised in "*The IET Energy Principles*":
www.theiet.org/factfiles/energy/energy-principles.cfm.

Consultation Document (e.g. Chart 5.5) appear unrealistic in anticipating new nuclear build as early as 2016.

From the point of view of climate change mitigation, Government needs to be clear and upfront with the public about where the contribution of new nuclear lies, and avoid 'overselling' its benefits. The lack of early impact from new build makes it imperative that complementary policies are pursued with urgency, particularly those aimed at reducing energy demand and increasing the share of other low carbon sources in the energy mix.

QUESTION 3

Do you agree or disagree with the Government's views on the security of supply impact of new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Nuclear generation could play a key role in ensuring the future diversity of Britain's energy supplies in two ways. Firstly, by increasing the diversity in primary energy sources in a way that is relatively insensitive to short-term fluctuations in fuel supplies. Secondly, nuclear generation provides low-carbon base load electricity, and to some extent can be load-following (i.e. controllable). This is valuable in offsetting GB system risks such as those introduced by greater penetration of intermittent generation types. Over the period 2020-2050 replacement nuclear build could make a positive contribution to electricity supply security in the same way as the present nuclear fleet. Government must take the necessary and appropriate steps at this time to facilitate this.

However, new nuclear offers no short term security of supply benefit, as it is unlikely to come on line in any quantity until after 2020 (see response to Q3 above). Therefore the projected 30-35GW capacity shortfall created by the retirement of existing generation capacity over the next two decades (Consultation Document §131) will have to be filled largely by other means, including other generation technologies and demand reduction.

QUESTION 4

Do you agree or disagree with the Government's views on the economics of new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Whilst it is appropriate for the Government to have a view, it will be the private sector investors that will decide whether an investment in new nuclear makes economic sense for their shareholders. The fact that many companies are actively considering new nuclear suggests that nuclear economics are at least marginal and may be sufficient to prompt a positive investment decision.

We believe that the assessment of the economics of new nuclear build presented in the Consultation Document could understate the potential for cost escalation and the perceived risks for potential investors. Some broader dimensions of the investment decision do not appear to have been given adequate consideration in this part of the study. These include:

- The potential for cost escalation due to potential planning delays, uncertainties around waste management (see answer to Question 8)

competition for skills, global raw materials costs, vendor capacity and vendor risk appetite (see answer to Question 13);

- The characteristic risk profile of investment in new nuclear build and the ways in which the risks are amplified by uncertainties in the current policy context (see answer to Question 18).

While investors will take their own well-informed views on these issues, we believe that as part of the commitment to clarity and openness, Government should strive to avoid over-optimistic presentations of the costs of new nuclear to the public at large.

QUESTION 5

Do you agree or disagree with the Government's views on the value of having nuclear power as an option? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We agree that nuclear should have the same opportunities as other technologies to contribute to Britain's long-term energy mix. As noted in our answers to Questions 2-3, the value of new nuclear build for security of supply and carbon emissions will be felt in the post-2020 period.

Government should be more explicit about what it means by giving energy companies the 'option' of investing in nuclear power. The UK's energy market does not presently preclude new nuclear build, if companies consider it to be in their long-term commercial interests. At present, some of the major barriers to investment stem from policy uncertainty and regulatory risk (see our response to Question 18, below), which Government needs to address to make nuclear a more attractive option. In addition, Government must acknowledge that by subsidising competing low carbon technologies and influencing demand growth, it does have an indirect influence on the market's appetite for new nuclear.

Security of supply incentives merit wider consideration from Government beyond the specific case of nuclear. For example, given the current weakness and uncertainty surrounding the carbon market, moving entirely to gas generation would not attract any financial penalty other than the risk of a concentrated portfolio. A new 'dash for gas' would improve short term security of supply by replacing retiring plant, but would result in a less diverse generation mix in the medium to long term, with high sensitivity to gas supplies and gas prices, and a relatively high-carbon generation mix. There are currently no market or policy signals strong enough to mitigate this outcome.

QUESTION 6

Do you agree or disagree with the Government's views on the safety, security, health and non-proliferation issues? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Nuclear's safety record has been good in comparison with other technologies. And it is likely that new nuclear stations will be at least as safe as their predecessors. The UK has a robust industrial health and safety process and as long as any new reactors satisfy these requirements, there is no reason why new nuclear should be ruled out as an option.

However, there should be no compromise on safety to reduce costs and so influence the economic investment case. Government must also be prepared to

face the potentially severe consequences, both politically and in terms of public opinion, of any future nuclear accidents or incidents arising from proliferation.

QUESTION 7

Do you agree or disagree with the Government's views on the transport of nuclear materials? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

See our response to Question 6.

QUESTION 8

Do you agree or disagree with the Government's views on waste and decommissioning? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

The outcome of the CoRWM consultation opens the way for the development of a technically robust solution to radioactive waste management², which should be pursued without delay. However we note that CoWRM explicitly excluded waste produced by new nuclear build which therefore requires further consideration. The waste issue could pose a significant uncertainty in the investment case for new nuclear. As the process for selecting a site and finalising the design solution is far from complete, there is a significant risk of cost escalation should the solution for new nuclear build be taken as an extension of the solution for waste arising from legacy and the existing power plant.

QUESTION 11

Do you agree or disagree with the Government's views on environmental issues? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We agree that the environmental risks from nuclear generation are manageable. However, nuclear differs from other forms of electricity generation in producing very long lived wastes, and in creating a potential security risk from proliferation. Government should therefore seek to address these issues robustly and transparently.

QUESTION 12

Do you agree or disagree with the Government's views on the supply of nuclear fuel? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

The overall generation cost of nuclear power is not very sensitive to fuel cost. However, there is some risk of escalation of fuel costs due to global competition, over which the UK government has little direct influence. There are

² The technical requirements are outlined in "UK Long Term Nuclear Waste Management – Next Steps?" (February 2007), a report co-sponsored by the IET in association with a number of leading science bodies, academic departments and nuclear stakeholders:
<http://www.lboro.ac.uk/departments/cm/research/LTNWM/UK%20Long%20Term%20Nuclear%20Waste%20Management%20Report.pdf>

significant but finite quantities of economically extractable uranium ores in the world, and it will be for the global market to determine the appropriate price and production rates. Unless nuclear fuel is procured for the lifetime of the new reactors, there is a risk that prices could rise significantly, especially as it can be expected that other countries also have new nuclear build programmes. This should be recognised as a potentially important factor in the private sector's investment appraisal of the merits of new nuclear build.

QUESTION 13

Do you agree or disagree with the Government's views on the supply chain and skills capacity? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We do not share the Government's confidence that skills and supply chain issues will not form a significant barrier to moving forward rapidly with new nuclear build. It is likely that the skills market and the supply chain will respond positively to strong signals from Government and decisive action by energy companies to begin new nuclear investment. However, both skills and equipment may be subject to a price premium in light of global competition for new nuclear build.

The consultation document focuses too narrowly on the skills required for nuclear build and R&D, allowing for an unwarranted degree of complacency. Whilst it may be 2020 before new nuclear reactors would be operational, it should be noted that far more skilled staff will be required in the shorter term to evaluate designs and to plan, construct and commission new reactors. Some of the skills required for a new build programme are global and could become short owing to non-UK factors. UK skills are also influenced by other UK decommissioning, infrastructure and construction activity, making for a very complex and competitive employment market. The fundamental problem is the lack of students and apprentices in general science engineering and technology (SET).

There is therefore unlikely to be a 'quick fix' solution for producing a new generation of nuclear skills. A longer term approach is required, but the corollary is likely to be longer lead times for the emergence of a sizeable skilled workforce, and higher costs set by the global marketplace in the short term. We feel that 1 GW/a is reasonably achievable delivery capacity, but attempting to deliver more than this will most likely be exposed to elevated risks through skills shortages.

The global supply chain for reactor parts is likely to become bottlenecked if there is a global build boom, meaning delivery times move out and costs increase. It will not take many new orders to create such a boom, and a significant increase in orders seems quite likely worldwide. While the energy companies and technology providers likely to be involved in new nuclear build are global and have established access to the supply chain for equipment, we may expect to pay a premium in a more active global market for nuclear components, and also for construction programmes to become longer to accommodate supply chain bottlenecks and risks. This is typical in large construction projects in global boom periods, it is currently being experienced in the CCGT power plant market, for example.

QUESTION 16

In the context of tackling climate change and ensuring energy security, do you agree or disagree that it would be in the public interest to give energy companies the option of investing in new nuclear power stations?

We agree. However, it should be made clear that the public benefits from new nuclear build will not be felt until after 2020 and therefore other measures are necessary to address climate change and energy security with more immediate effect (see our responses to Questions 1-3).

QUESTION 17

Are there other conditions that you believe should be put in place before giving energy companies the option of investing in new nuclear power stations? (for example, restricting build to the vicinity of existing sites, or restricting build to approximately replacing the existing capacity)

We see no point in introducing additional conditions or limits on new nuclear build, as developers will naturally select the easiest sites to permit, and build will be limited by considerations of risk and supply chain. The only context in which a nuclear quota seems appropriate is in the event that some form of public sector support is provided for nuclear, in which case the quota would minimise disturbance to market confidence.

QUESTION 18

Do you think these are the right facilitative actions to reduce the regulatory and planning risks associated with such investments? Are there any other measures that you think the Government should consider?

While great attention is paid to the unit cost of nuclear electricity is important to understand that risk plays an equally important role in determining the outcome of investment decisions³. The biggest risks to development of new nuclear capacity in the UK arise from a number of uncertainties, some of which are specific to nuclear and others which are exacerbated by generic issues in the UK energy markets:

- a. *Planning for new stations.* Proposals to streamline planning signify a move in the right direction, however they are as yet untested and great care should be devoted to their implementation⁴.
- b. *Long-term economic operation of stations, including all operating and back-end cost.* Nuclear has a different risk profile from most other

³ UK Energy Research Centre (2007) "Investment in Electricity Generation: The role of costs, incentives and risks" (May 2007): <http://www.ukerc.ac.uk/content/view/410/014>.

⁴ It is also important to consider planning for ancillary infrastructure. If nuclear build becomes very protracted and takes place significantly later than existing nuclear stations it may be necessary for government to consider securing potential sites and their grid connection capacity. It is conceivable that large offshore wind arrays will wish to take up the grid capacity of retired nuclear stations. In other cases existing grid connections may need to be upgraded to meet the requirements of new reactor designs, requiring further planning consents.

generation technologies, with all costs incurred up front and very long build times.

- c. *The impact of market-based policy measures on operating costs and revenues, particularly carbon prices.* A government-guaranteed floor price for carbon was mentioned in the Energy Review but not the White Paper.
- d. *The cost implications of a radioactive waste management programme* still under development.
- e. *Reputational risk* given continuing significant public opposition.
- f. *Risk of stranding by new technologies* before the investment is recovered.

Government efforts should be directed to minimising such risks by putting in place a clear and efficient planning regime and energy market framework which actively promotes diversity and flexibility in the energy mix. There can be a fine line between 'facilitative actions' and subsidy. The Government needs to be transparent and be careful not to step over this line.