Nuclear Consultation **Gordon Taylor** **2007-10-09**

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?

a) This question should refer to 'energy services', whereupon I agree. People do not require energy as such, but energy services such as comfortable room temperatures, hot water, illumination, mechanical and electronic functions. All end-uses take more energy than best-practice, and far more than their technological limits. Hence there are significant 'saving' options for all end-uses. Under 7, the text refers to 'using every unit of energy as efficiently as possible', but I see no reference to 'saving' options. These are typically 30% for appliances and 80% for electric space heating. (See my quantitative energy study at http://www.energypolicy.co.uk/epolicy.htm).

b) Self-evidently, 'saving' options increase security of supply and reduce carbon emissions – many at negative cost. (See Question 4, my reply f)).

c) Paragraph 1.19 refers to 'Based on our expectations of demand growth', but no quantitative evidence is given. (Regarding hydrogen and electric heating, see my reply d) to Question 5).
No business would invest – particularly in capital intensive plant - without extensive 'due diligence' evidence. This must be based on a detailed breakdown of all electricity end-uses, since for each the saving and substitution options differ in nature and degree.

d) Regarding 'a sustained strategy between now and 2050', this is indeed essential for a smooth transition to a sustainable energy society. (See the Stern Review launch presentation http://www.hm-treasury.gov.uk/media/0/3/Slides_for_Launch.pdf Slide 4, and my presentation at http://www.energypolicy.co.uk/sustainpres.htm).

The document also sets out the evidence and information that we have considered and the preliminary conclusions that we have reached following our assessment of this evidence. We invite respondents to consider the evidence we have presented, and to comment on the following questions:

2. Do you agree or disagree with the Government's views on carbon emissions from new nuclear power stations? Disagree.
What are your reasons?

a) Climate change requires carbon reductions of 60 to 80% by 2050. Yet electricity accounts for only about 30% of the UK carbon emissions, and nuclear power for less than 20% of electricity. Therefore replacing the present nuclear capacity could only reduce carbon emissions by about 6%. Hence to imply that nuclear power is essential – much less sufficient - is wholly misleading.

b) Paragraph 1.19 says that 'energy companies will need to invest in around 30-35GW of new electricity generating capacity over the next two decades, with around two-thirds needed by 2020'. Yet the first NPP would be unlikely to start up before 2020 and may not be in energy profit before 2022. (See Paragraph 25 and c) below). Hence, nuclear power can offer nothing towards such a need. Since climate change, fossil fuel depletion and security of supply are pressing, all energy investments should reflect this. As there are many saving and renewable supply options that do so, these should be implemented forthwith, whereupon it would be most sensible to continue with more of the same. (http://www.energypolicy.co.uk/epolicy.htm).

c) A first NPP start up in 2020 would be far later than many energy saving and renewable supply options. For many end-uses, the stock could be largely or wholly replaced with low-energy equipment within the 14 years from now. Large wind farms can be built in only two years. Moreover, the 'invested' energy is low and is recovered in about half a year. (http://www.vestas.com/NR/rdonlyres/CB1E6A32-EB4E-4845-9451-4B5255BBB111/0/LCA_V9030_20MW_onshore_og_offshore_samt_energibalance_202005.pdf). Conversely for a NPP, the energy and carbon 'invested' over a six year construction period would be huge and the energy may take two years or more to recover. Moreover, construction delays or initial operating problems would further delay energy recovery, and hence any energy 'profit'.

Furthermore, if there was another nuclear catastrophe anywhere, this would force a nuclear shutdown so that there would be no energy profit, but only a loss.
d) The lifecycle carbon emissions cited fail to take account of the effect of uranium depletion during the lifetime of the NPP. Even at the present rate of use, the carbon emissions would increase over the lifetime of the NPP and may exceed that of gas-fired plant before the end of the lifetime. At any increased rate of uranium use, this effect would be aggravated. (See my reply to Question 12).
e) Nuclear power is not sustainable, so will need replacing sooner or later. (See my reply to Question 12).

Are there any significant considerations that you believe are missing? Yes.

If so, what are they? See above.

3. Do you agree or disagree with the Government's views on the security of supply impact of new nuclear power stations? Disagree.

What are your reasons?

a) The first NPP would be unlikely to start up before 2020, and may take a further two years before a net energy profit and any increase in security of supply. Large wind farms can be built in two years, starting now, and take only a further half a year before a net energy profit. Hence wind farms would increase the security of supply over thirteen years sooner.
b) Any major radioactive release - accidental or deliberate – in the 400-odd NPPs, most of which are very old - would mean nuclear shutdown. Any UK expenditure on NPPs would then become at least a 'stranded asset'. If the NPP had started up, the highly radioactive fuel would make it a 'stranded liability'. Either would cause a catastrophic loss of security of supply.
c) Uranium may be effectively exhausted soon, whereupon all NPPs will have to be replaced. (See my reply to Question 12).
d) Nuclear power precludes other options because it is so expensive in money and energy, which can be invested only once. Depending on such a fragile and unsustainable option would reduce security of supply, whereas energy savings and renewables such as wind farms, are indigenous, robust and sustainable, and increase security of supply.

Are there any significant considerations that you believe are missing? Yes.

If so, what are they? See above.

4. Do you agree or disagree with the Government's views on the economics of new nuclear power stations? Disagree.

What are your reasons?

a) The costs cited are 'levelised' with current fuel prices, which for any depletable fuel such as uranium, is misleading. The price must rise as reserves are depleted and if the demand increases. The costs cited fail to take full account of two major externalities – safety risk and waste storage.
b) Since the insurance industry will not cover it, and so put a finite value on it, the cost of the safety risk underwritten by the Government must be taken as infinite. (See http://eu.greenpeace.org/downloads/energy/EUsubsidiesReport.pdf p24). This is expressed as 'unquantifiable' in the Government accounts. (http://www.berr.gov.uk/files/file17806.pdf Section 30.2).
c) The cost of the waste storage must also be taken as infinite, since the present and proposed arrangements are ineffective. No long term waste storage yet exists, so it cannot be costed with certainty. Moreover, the operator can simply declare bankruptcy, and walk away from the liability. Since the state is the provider of last resort, the state must make an estimate of the cost of long term storage and the operator must pay into a fund managed by the state – as in Sweden.
Since both subsidies are infinite, they are gross distortions of the market.
d) The availability under the Euratom treaty of low-cost funds for nuclear power is another market distortion. Moreover, although the fund is limited, when exhausted it is topped up again. (See

http://eu.greenpeace.org/downloads/energy/EUsubsidiesReport.pdf p3 and p18). The UK should require that this fund be closed, since it contravenes the European rules on competition.
e) Paragraph 54 cites the IEA World Energy Outlook 2006 in support of the updated version of the cost-benefit analysis prepared for the Energy Review 2006. However, the latter considered only nuclear and gas-fired generation. Moreover, the WEO 2006 said that nuclear energy is the least effective measure for combating greenhouse gas emissions. In the 'Alternative Policy Scenario', the projected reduction of 6 billion tonnes of CO2 equivalent is 65% from improved energy efficiency, 13% from fuel switching, 12% from increased renewables and only 10% from increased nuclear. (See http://www.energywatchgroup.org/files/Uraniumreport.pdf Page 6).
f) An assessment of the costs of GHG abatement opportunities beyond business as usual was made recently by Vattenfall. (See http://www.vattenfall.com/www/ccc/ccc/569512nextx/573859globa/574118cost/index.jsp?origin=search). This showed that 5 billion tonnes of CO2e could be saved at negative cost. This study – like most others – understates the cost of nuclear power as in a), b), c), d) above. Since b) and c) are infinite subsidies, the true cost is infinite. However, this distortion affects only nuclear power.

Are there any significant considerations that you believe are missing? Yes.

If so, what are they? See above.

5. Do you agree or disagree with the Government's views on the value of having nuclear power as an option? Disagree.

What are your reasons?

a) National energy systems must be modelled first for energy and carbon, since these are fundamental. The known science and technologies minimise the uncertainties. No such study is cited, even though I submitted one to Government for the Energy Review of 2003. Entitled 'Energy Solutions for 60% Carbon Reduction', this shows that such solutions are available without nuclear power or carbon sequestration, using current technologies for energy saving and efficiency and increased biomass and wind turbines – as widely and increasingly deployed elsewhere, especially on the Continent. My study, including the full text, tables, figures and working files, may be downloaded from http://www.energypolicy.co.uk/epolicy.htm
b) Modelling is only as good as the input data. The MARKAL family lacks – or is inadequate – in respect of many current options for energy saving and increased energy efficiency.
c) The costs assumed for nuclear power are invalid, since they neglect the effects of depletion, the infinite subsidies of safety risk and long term storage, and the finite subsidy of the Euratom funds.
d) Some of the suggested technological developments make no sense. Hydrogen is a very poor energy carrier, especially for transport. This has been demonstrated analytically. (See http://www.energypolicy.co.uk/hydrogen.htm). It has also been demonstrated empirically by Daimler, who have suspended their NECAR programme, and Toyota, who have shown that a production engine-electric hybrid, the 2004 Prius, has a higher well-to-wheel efficiency than their prototype hydrogen fuel cell vehicle (FCHV-5). (See http://www.toyota.co.jp/en/tech/environment/ths2/SpecialReports_12.pdf Page 19).
The use of electricity for the provision of heat (for significant amounts of space and water heating) makes no sense thermodynamically. The exergy loss would be huge. (See the Second Law of Thermodynamics).
These developments would reduce energy efficiency and – if based on nuclear - would accelerate depletion and increase dependence on an option that is not sustainable. Moreover, the provision of electricity – especially nuclear power - is very capital intensive, so it makes no sense economically.
e) Markets – and therefore economic modelling – never address depletion and sustainability. They always assume 'trends continued' and discount the future, whereas depletion implies a fundamental discontinuity and energy cannot be discounted, since it is indestructible. (See the First Law of Thermodynamics).

Are there any significant considerations that you believe are missing? Yes.

If so, what are they? See above.

6. Do you agree or disagree with the Government's views on the safety, security, health and non-proliferation issues? Disagree.
What are your reasons?
a) I see no mention of any Reactor Safety Study for the U.K. Yet following Chernobyl, 'due diligence' requires such to inform the citizens of both the UK and neighbouring countries regarding the safety risk, probability and consequences of the maximum possible radioactive release. However, due to unanticipated events, any estimate of probability must be too low, and by an amount that is not just unknown, but logically unknowable. Hence attention must be focussed on the consequences. According to the Swedish Reactor Safety Study of 1978, these range up to 100,000 prompt human fatalities and a contaminated area of 10,000 to 100,000 km2. (See 'Swedish Reactor Safety Study: Barseback Risk Assessment', Industridepartmentet, Energikommissionen, Ds I 1978:1). While the area of the UK is 244,000 km2, the area of Europe contaminated by radiocaesium from Chernobyl was over 200,000 km2. (See http://www-pub.iaea.org/MTCD/publications/PDF/Pub1239_web.pdf Page 2). With such consequences, the only safe probability is zero, which means no nuclear power. Most Western states either have no nuclear power or are phasing it out.
b) Paragraph 6.19 says that 'The NII is not in a position to substantiate safety claims for reactor safety before it has a chance to carry out detailed assessments'. However, as shown in a) above, this can be confined to the consequences. For these, the 'source term' is dependent principally on the reactor size and fuel load and much less so on the plant design. The National Radiological Protection Board/Health Protection Agency should carry out such a study and publish their methodology and results openly - to enable 'peer review' - before nuclear power is considered any further. They might make use of the MARC (Methodology for Assessing the Radiological Consequences of Accidental Release of Radionuclides to Atmosphere) or CRAC2 (Calculation of Reactor Accident Consequences) programs or one of their successors.
c) In the light of Chernobyl, a foreign policy of the U.K. should be to urge the rapid phase-out of nuclear power worldwide, due to the evident unacceptable risk to humankind. Moreover, rather than contributing to the refurbishing of overseas nuclear facilities, they should be shut down and replaced by energy saving and renewable options that are sustainable.
Are there any significant considerations that you believe are missing? Yes.
If so, what are they? See above.

7. Do you agree or disagree with the Government's views on the transport of nuclear materials? Disagree.
What are your reasons?
The NPPs are on the coast, some distance from the major conurbations, but the transport arteries, both road and rail, pass through the major conurbations. Moreover, transport is inherently more vulnerable to accident or attack. Hence a given radioactive release may have greater consequences. Regarding the risk, the probability is unknowable, so only the consequences matter. (See Question 6, my reply a)). Paragraph 75 says that these are 'severe and wide-ranging'. This is unacceptable, so nuclear power must be excluded, and nuclear transport thereby confined to decommissioning the legacy plants.
Are there any significant considerations that you believe are missing? Yes.
If so, what are they? See above.

8. Do you agree or disagree with the Government's views on waste and decommissioning ? Disagree.
What are your reasons?
a) Under 86, nuclear waste can never be 'disposed of', but only put in long-term storage. This should be designed to keep it from the biosphere for ever, but cannot be assumed to do so.

b) Under 91, the ‘solutions’ cannot be termed ‘robust’ since they cannot be proved to be so. Because the consequences are unacceptable, ‘reasonably foreseeable’ is not good enough.
c) Under 93, nuclear power is not ‘likely to be more cost-effective than alternative forms of low-carbon generation’. Indeed, the opposite has been demonstrated both analytically and empirically. (See my reply to Question 4).
d) Under 94, to say that ‘as with all radioactive substances the activity would decline over time’ when the half-lives range up to billions of years, is grossly misleading.
e) Under 95, while ‘it could technically be accommodated in the same disposal facilities ... as the existing legacy’, no such long-term store yet exists even after more than 50 years.
f) Under 99, the store can be described as ‘interim’, but not as ‘safe and secure’, since this has not been demonstrated. Indeed, since it can only be demonstrated in retrospect, this is wholly misleading.
g) Under 101, ‘not allowing nuclear power to play a role’ means not adding to a problem that we have not addressed adequately in over 50 years, yet will threaten the biosphere for ever. Moreover, nuclear power has been shown to be less effective and infinitely less cost-effective than options that pose no comparable ethical implications. (See my reply to Question 4).

Are there any significant considerations that you believe are missing? Yes.

If so, what are they? See above.

9. What are the implications for the management of existing nuclear waste of taking a decision to allow energy companies to build new nuclear power stations?

Since the problem has not been addressed adequately in over 50 years, it should certainly not be added to. Therefore there should be no new nuclear.

10. What do you think are the ethical considerations related to a decision to allow new nuclear power stations to be built?

Allowing new nuclear would be unethical, since this would preclude options that are hugely safer, faster and capable of achieving a sustainable energy society. (See my replies to Questions 1 to 9).

And how should these be balanced against the need to address climate change?

The true cost of nuclear power is infinite and it would be the least effective, contributing no more than one-tenth of the carbon reduction required by 2050. (See my reply to Question 4). Hence this is a false dichotomy.

11. Do you agree or disagree with the Government’s views on environmental issues? Disagree.

What are your reasons?

a) Under 105, ‘Industry has indicated that the most viable sites are likely to be adjacent to existing nuclear power stations’. Yet all are coastal and therefore vulnerable to storm surges and sea level rise. This would increase the probability of radioactive releases to the biosphere. Moreover, any releases to the sea would be carried worldwide and affect all marine life, including that in the human food chain. Since such a consequence cannot be allowed, nor can nuclear power. Indeed, in the light of climate change – droughts and flooding - and sea level rise, possibly triggering earthquakes or tsunamis, existing nuclear plants on rivers or sea coasts must be phased out.
b) Under 107, ‘The Government believes that the environmental impacts of new nuclear power stations would not be significantly different from other forms of electricity generation...’. Since uranium is depletable, whereas hydro, wind and biomass are renewable, this cannot be true. (See my reply to Question 4). Moreover, the environmental impacts of nuclear include those of major radioactive releases which differ by very many orders of magnitude from those of all other forms of generation. For example, that from Chernobyl was about 14 ExaBq (i.e. 14 x10^18 Bequerel). (See http://www-pub.iaea.org/MTCD/publications/PDF/Pub1239_web.pdf Page 2).

c) Under 107, the proposition mentions 'generation'. Yet energy savings must also save any environmental impacts, and are the most cost-effective measures for GHG reduction. (See my reply to Question 4). Why are energy savings options not considered in this consultation ?

Are there any significant considerations that you believe are missing? Yes.

If so, what are they? See above.

12. Do you agree or disagree with the Government's views on the supply of nuclear fuel? Disagree.

What are your reasons?

a) The money cost of uranium and it's part in the cost of electricity is irrelevant. What matters is the carbon (strictly the GHG) intensity of uranium, including the effect of depletion, over the planned life of the NPP. The 'point of futility' depends mainly on the available uranium ore grade, and at about 0.01% the carbon intensity of nuclear power exceeds that of gas-fired generation. (See http://www.stormsmith.nl). At the present rate of use, this would be reached in less than 50 years from now – i.e. less than 40 years from 2020. Furthermore, any increased rate of use would shorten this period. (See http://www.energywatchgroup.org/files/Uraniumreport.pdf).

Of course, when compared with options having lower carbon intensities, such as energy savings and renewables, the 'point of futility' would be reached at higher uranium ore grades – hence sooner.

b) Under 111, although '...the Government believes that there should be sufficient reserves to fuel any new nuclear power stations constructed in the UK', this has not been shown to 'due diligence' standard. 'Believes' and 'should be' is not a sufficient basis for energy policy.

c) On the GHG intensity criterion, uranium may well be insufficient for the planned life of the NPP. Moreover, fossil energy would then be far more costly than today, making the necessary transition to a sustainable energy economy far more difficult. The only prudent 'no regrets' policy would be to deploy energy savings and renewables forthwith – so speeding the necessary transition to a sustainable energy economy. (See my reply d) to Question 1).

Are there any significant considerations that you believe are missing? Yes.

If so, what are they? See above.

13. Do you agree or disagree with the Government's views on the supply chain and skills capacity? Agree.

What are your reasons?

a) For nuclear power, there is hardly any supply chain or sufficient skills in the UK, nor is there any prospect of adding them by 2020. Even if the present Government favoured nuclear power, it would always be at risk of cancellation – especially in the event of another major radioactive release anywhere. Businesses and individuals would not invest money or careers in such a risky venture. Hence nuclear power hardware and builders would certainly have to be imported, and the UK would be even more dependent upon overseas suppliers. There could be no significant UK exports.

b) Conversely, for energy savings and renewables, there are many opportunities for businesses and individuals, both in the UK and overseas. A supply chain and skills capacity already exists for wind turbines. Moreover, they would not be at risk of cancellation, since they are not liable to political or catastrophic events. Hence energy savings and renewables would be increasingly indigenous, making the UK less dependent on overseas suppliers. Furthermore, there could be UK exports.

Are there any significant considerations that you believe are missing? Yes.

If so, what are they? See above.

14. Do you agree or disagree with the Government's views on reprocessing? Agree.

What are your reasons?

a) Reprocessing leads to increased amounts of 'pure' plutonium, which is even more dangerous – as a poison and bomb material - than Uranium 235. In the age of terrorism, this would be foolhardy.
b) Reprocessing leads to increased radioactive emissions to ground, air and water – as shown at Windscale/Sellafield and Dounreay (See http://www.zetnet.co.uk/oigs/n-base/dounreay.htm).

Are there any significant considerations that you believe are missing?

If so, what are they? See above.

The purpose of this major consultation exercise is to provide interested parties with information on nuclear power, and to assist parties to reach an informed view on the future of nuclear power in the UK. Based on the responses and evidence gathered during this consultation, we will consider whether it is appropriate to confirm our preliminary view as Government policy, and to allow energy companies to invest in new nuclear power stations.

15. Are there any other issues or information that you believe need to be considered before taking a decision on giving energy companies the option of investing in nuclear power stations?

a) All the omissions noted in my replies to the other Questions.
b) Delivery of an energy and climate change policy can best be achieved by Energy Service Companies (ESCOs) operating under Carbon Emission Obligations. (See http://www.energypolicy.co.uk/epolicy.htm Part II).

And why? See my replies to the other Questions and above.

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? Disagree, because it is the least effective and cost-effective option for tackling climate change and thus reduces energy security. Moreover, it would increase the risks to people and property in the UK and overseas and the 'unquantifiable' risk to the public purse. (See my reply b) to Question 4). Since nuclear power is not sustainable, it would delay the necessary transition to a sustainable energy economy, making this much more difficult. (See my replies to the other Questions).

In their responses to the consultation, we encourage parties to include the reasoning behind their conclusions and any evidence that supports their views. In reaching a conclusion on the future of nuclear power, we will assess the responses
to this consultation and the evidence and information that it brings forward.

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)

a) The Government must obtain the concurrence of all countries that have been or could be affected by radioactive releases – both operational and catastrophic. This must include the population of the UK by referendum and each individual member state of the EU. This would be only fair before facing them with the continuing threat of lethal pollution or even extinction. The pattern of radioactive fallout from Windscale 50 years ago is indicative. (See http://news.bbc.co.uk/1/hi/sci/tech/7030536.stm).

I disagree with giving energy companies the option of investing in new nuclear power stations. (See my replies to all other Questions). However, if they were:
b) The energy companies must pay for but the Government must supply iodine tablets free of charge to everyone in the UK and other countries thereby put at continued risk. This must be accompanied by a recurring publicity campaign regarding their use following a radioactive release. Such tablets are the most effective means of protecting the human thyroid – particularly of children - from the uptake of radioactive iodine. However, they must be taken immediately after the release. (http://www.who.int/entity/ionizing_radiation/pub_meet/en/Iodine_Prophylaxis_guide.pdf).
c) The energy companies should be required to eliminate all risks of radioactive release due to climate change, storm surge and sea level rise.
d) The energy companies should be required to obtain and themselves pay for full insurance for all risks, both operational and otherwise, with unlimited liability. After all, other energy supply options do so and anything less would be a market distortion.
e) Under 125, rather than 'ensuring that private sector operators accumulate the funds needed to meet the full costs of decommissioning and full share of waste management costs', the state should collect such funds regularly and in advance from the operators, since they may go bankrupt, leaving the state to pay. (See my reply to Question 4).

Alongside this in-principle consultation, there is a linked technical consultation on the details of running a Justification process and a Strategic Siting Assessment. Respondents to this consultation may wish to consider the information brought forward in these consultations[61].

18. Do you think these are the right facilitative actions to reduce the regulatory and planning risks associated with such investments?
No. Nothing should be done to facilitate nuclear power. (See my replies to other Questions).
Are there any other measures that you think the Government should consider?
Comparable facilitative actions for energy savings (such as large-scale district heating from CHP and industrial 'waste' heat) and renewables (such as municipal waste, biomass and wind turbines, both onshore and offshore). Unlike nuclear power, these are sustainable, and would contribute to the necessary transition to a sustainable energy economy. (See my replies to Questions 1 and 12).

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