MANAGEMENT OF THE UK'S PLUTONIUM STOCKS

Response form for the consultation on the long-term management of UK owned separated civil plutonium.

You may respond to this consultation by e-mail or post.

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Tick this box if you are requesting non-disclosure of your response. ☐

Please respond by 10 May 2011

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Please select the category below which best describes who you are responding on behalf of.

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Thank you for taking the time to let us have your views.

The Government does not intend to acknowledge receipt of individual responses unless you tick the box. X

The consultation document sets out the Government's proposed approach to the longer term management of the UK's plutonium stocks for public scrutiny and consultation. Comments on any aspect of this issue are welcome, but the key questions posed in this consultation are:

No	Question
Q1	Do you agree that it is not realistic for the Government to wait until fast breeder reactor technology is commercially available before taking a decision on how to manage plutonium stocks?
Response	Yes but see below that more assessment is required. The problem of the management of UK's Plutonium stocks needs addressing for several reasons and it would not be reasonable to wait for the development of mature fast reactor technology before making any decision to take action. UK needs to develop a more active policy for Plutonium management the reasons: 1. UK has the largest stocks of civil Plutonium in the world; 2. As an inaugural signatory of the NPT and as a weapon state, UK has responsibilities to provide and to demonstrate that it is dealing with what is a potential proliferation hazard; 3. Plutonium stored for a long period become much less useful as a fission energy source because of the growth of Americium, a daughter nuclide of Plutonium produced by decay – see attachment (*Some calculations regarding the management of the UK's Plutonium Stocks – D Coate*s) Fast reactors though demonstrated in several countries including the UK, have technological challenges and cost impediments when compared with existing thermal reactor types. Even if these are solved the need for fast fuel cycles in this century has been questioned by the *MIT Fuel Cycle Study September 2010*. They argue that Uranium is available in much large quantities than has previously been thought, and at lower prices than fissile fuel alternatives such as Plutonium. Also, the ability to extend the existing nuclear fuel sources (Uranium and possibly Thorium) using converters or low gain breeder reactors using thermal fission technology will push back the time when fast reactors will be needed.

	Further, accelerator driven sub-critical reactors may be considered as alternatives to pure fast reactors. Fast reactor developments are being conducted in Russia and Japan, and they are being proposed again in France. The UK should participate in these developments because of incomparable (at least other than fusion) opportunity for developing low carbon energy stocks for the next century and beyond. A realistic expectation is that such development is unlikely to provide a commercial/proven design for wide applications until sometime after 2040. Therefore if a decision were to be taken for fast reactor incineration of Plutonium, it will be forty or fifty years before this programme would become effective. Other means of managing the Plutonium stockpile either exist or can be realised on shorter timescales in ways that depend on the wealth of thermal reactor technology for which the experience base is substantial.
Q2	Do you agree that the Government has got to the point where a strategic sift of the options can be taken?
Response	No. The proposal on which consultation is sought does not examine the range of issues which need to be considered in sufficient detail to be able to make a sound decision at this stage.
Q3	Are the conditions that a preferred option must in due course meet, the right ones?
Response	Broadly Yes We would suggest separating: • Health safety and environmental objectives from • Non-proliferation and security objectives as individual bullet points in a list of four.

Q4	Is the Government doing the right thing by taking a preliminary policy view and setting out a strategic direction in this area now?
Response	As stated above, the consultation document is not of the depth and scope needed for a policy decision of this importance. The UK should have a deeper body of reliable knowledge at the disposal of policy makers. It is unclear whether the Government wishes to act for security, waste management or economic reasons. *A low carbon nuclear future: Economic assessment of nuclear materials and spent nuclear fuel management in the UK* from Smith School of Enterprise and the Environment at Oxford University March 2011 addresses economics even if the specific cost and price data might be open to debate. Work of this depth is needed to inform good policy making, but that study cover only some of the relevant issues for Plutonium management. One key element in assessing the case for Plutonium re-cycle is the likely demand for these services. Because MOX fuel is more expensive than low enriched Uranium fuel, the demand for MOX is currently low with the NDA having only a single contract from Japan and no plans to use MOX in UK reactors. We propose that the consultation be re-run with a stronger evidence base.
Q5	Is there any other evidence government should consider in coming to a preliminary view?
Response	See response to Q4 The consultation document does not provide enough information on which to make a clear recommendation. Some relevant points: Utilisation of UK plutonium in a once-through MOX cycle appears to be a sensible and a constructive suggestion. The UK stockpile would be fabricated into MOX fuel and used to produce electricity in existing types of light water reactors. Though the new reactors that are expected to be built in the UK are planned on the basis that they will use Uranium fuel, both the EPR and AP1000 have been designed so as to be able to accept full cores of MOX fuel. Hence the UK will have reactors which could employ MOX fuel and hence affect the UK Plutonium stocks. Once burned-up, the MOX fuel would then be treated as spent nuclear fuel without an assumption of further reprocessing. This spent nuclear fuel could then be treated in the same manner as other spent nuclear fuel - as high

	level waste. However as discussed below in Response 7, these reactors are not optimised to consume Plutonium and therefore would not be the best means of destroying Plutonium.
Q6	Has the Government selected the right preliminary view?
Response	Based on the consultation document it is hard to be certain because the evidence presented seems shallow and some key issues are either ignored or are omitted. A rethink of the policy options is needed and perhaps the reissue of the consultation.
Q7	Are there any other high level options that the Government should consider for long-term management of plutonium?
Response	Is the objective of the Government's policy to secure the Plutonium by irradiation to consume it in nuclear reactors? Thermal reactors such as those that can use MOX fuel produce as well as consume Plutonium. The balance between production and consumption depends several factors including, the time the fuel is in the reactor (burn-up) the enrichment of Plutonium and the neutron spectrum. Current core designs of EPR and AP1000 have spectrums that with Uranium based fuels lead to only a limited net consumption of Plutonium. More efficient burning of Plutonium can probably be accomplished with reactors having a higher proportion of moderator in the core and a softer neutron spectrum. Such cores can be designed to be utilised in the EPR and AP1000 by means of wider spacing between fuel elements and different control/poison arrangements. Another approach would be to use Thorium as the fertile part of the core. In this case Plutonium would not be produced in significant quantities instead fertile Thorium would be converted to the fissile $Uranium_{233}$ nuclide. There is relatively little data on the irradiation of Thorium other than that in the final core of the Shippingport reactor. There are some irradiation experiments being conducted using Thorium in CANDU reactors. Development of Thorium fuel designs including fuel irradiation programmes would be required to realise such a fuel concept.