Subject: Consultation on the proposed justification process for the reuse of plutonium

It must first be established whether the UK's plutonium inventory is viewed as an asset or a liability. NDA has already assessed that the entire depleted uranium, enrichment tails and plutonium inventory, with considerable investment, would only fuel three one gigawatt reactors for their lifetimes. The residual spent fuel from the use of the inventory as fuel would still require some hundreds of years to manage. So the concept was dismissed. The calculations included the contribution from MOX based on the use of the entire plutonium inventory.

Mixed with depleted uranium uranium to form a mixed oxide, plutonium cannot therefore be considered as an asset, but with the large investment in plant is more of a liability.

Plutonium could be considered as an asset in connection with a fleet of fast breeder reactors, always assuming that the breeding gain is not lost in the consequent processing of the blanket due to a poor chemical yield. (Also assuming that the breeding process will work).
In the breeder the neutrons from the uranium+plutonium expended in the reaction are used to generate more fissile material, viz., plutonium. OECD/NEA in its "Red Book" sees that the sustainability of nuclear power (for thousands of years) is provided by the fast breeder, in that, in a sort of perpetual motion, it generates its own fuel after the initial charge.

The proposal to employ a fast "burner" reactor from GE/Hitachi is apparently a means of ridding NDA of a liability, while generating electricity, but its spent fuel would still contain some actinides and would remain a problem.

For reasons that are obscure, NDA wishes to build another MOX plant, but it has lost the current market for it with the loss of the Fukushima Unit 4 and it is not an effective way of reducing the plutonium liability, because the arising spent fuel still contains 5% plutonium from the initial content of 7%.

See http://www.world-nuclear.org/info/inf29.html

Normal spent fuel contains but 1% plutonium, the separation from which has produced the current plutonium inventory. MOX contains 7% Pu (65% fissile), while the spent fuel from it contains 5% Pu (55% fissile). The percentage reduction of fissile material is therefore only 40%, or just 29% of the whole Pu.

Therefore as a means of destroying the plutonium inventory, which is seen as a liability, its mixing into MOX is not very effective. NDA has already shown that the conversion of its entire waste heavy metal (including the Pu) into fuel is uneconomic and only able to fuel three reactors.

The proposed method of waste management for the new build is for the spent fuel to remain on site, first in spent fuel ponds and then in dry casks. There is no plan to separate the plutonium from the spent fuel in a processing plant. The current

plutonium inventory is of no use to the new build and as above the processing of it would only to provide for three reactors and the inventory would not be augmented from the arisings from the new build as it would remain in the dry casks.

The search should therefore be a method of storing plutonium safely, perhaps in a special design of dry cask in which the heat of reaction can be dispersed safely. The quanitity of plutonium in each cask may be quite small, given that a small quanity can make an effective weapon. There is no justification for the building of a new MOX plant.

I trust that DECC/OND will find these thoughts of interest.

John Busby 28 May 2012

My articles: http://www.after-oil.co.uk/articles.htm