

Nuclear Free Local Authorities **RADIOACTIVE WASTE POLICY** Briefing on the Government Review

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REPROCESSING AND RECYCLING

An important issue for the impending review of radioactive waste management is whether or not there is a genuine recycling rationale for the continued reprocessing of spent reactor fuel. This rationale has been described by the reprocessors as follows:

.. world reserves of uranium can be preserved by reprocessing and recycling used nuclear fuel and making full use of the recovered uranium and plutonium.

The purpose of this briefing is to examine this rationale. If it is found to be flawed - because recovered uranium and plutonium are not being fully recycled - then serious questions are raised about what should happen to those materials, and about the future of reprocessing itself.

This issue is particularly topical because of the launch of a third period of consultation on the start-up of the Sellafield MOX Plant (SMP), which is intended to manufacture Mixed-Oxide fuel for overseas customers using plutonium separated by reprocessing in THORP.

URANIUM RECYCLING

Before looking more closely at the SMP, it is important to focus on reprocessed uranium - or RepU as it is known - which is often ignored in discussions of reprocessing. Part of the reason for this low profile is widespread recognition of the poor commercial case for RepU recycling. Indeed, there is such little interest that BNFL has quietly dropped plans to enable customers to have their RepU turned into fuel.

Although the company is operating a plant at its Springfields site which could in principle manufacture fuel using RepU, it has suspended work on the facility which is needed to convert RepU into a form suitable for enrichment prior to fuel fabrication. BNFL has done this because of a lack of demand for RepU fuel, even from THORP customers (who presumably prefer to pay for indefinite storage of their RepU at Sellafield). Indeed, the company admits that no contracts have been signed for RepU fuel manufacture, nor letters of intent received.

The lack of demand arises because fuel fabricated using RepU is significantly more expensive than that made from fresh uranium. Furthermore, an oversupply of uranium on the market means that this position is likely to persist for the foreseeable future.



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PLUTONIUM RECYCLING

Although commercial realities have forced BNFL to more or less abandon its plans to facilitate RepU recycling, it has pushed on doggedly with the SMP in the belief that overseas THORP customers will eventually sign up to have their separated plutonium returned in MOX fuel.

BNFL's determination to proceed with the SMP is also rooted in the plant's political and strategic significance. In the short-term, if the company cannot convince the Government that current THORP customers want to recycle their plutonium, then an important rationale for continued reprocessing is seen to unravel. In the longer-term, company officials have privately argued that the MOX option is needed to preserve technological expertise, "eventually smoothing the transition to fast reactors".

BARRIERS TO MOX USE

Unfortunately for BNFL, a combination of economic and political factors are discouraging THORP customers from signing SMP contracts.

Firstly, a large number of sources point to the uneconomic character of MOX utilisation. For example, after an extensive review of the literature, the US National Academy of Sciences found that MOX fuel fabrication prices were some 7-8 times the price of uranium fuel fabrication. More recently, a German utility has stated that it would take a six-fold increase in uranium prices to eliminate the current cost advantage of uranium fuel over MOX. There are also cost penalties associated with the use of MOX fuel, including operational, transport and disposal costs.

Secondly, the transport and use of MOX is highly controversial. In particular, utilities in THORP's main customer country, Japan, will be acutely aware that the political feasibility of large-scale transports of MOX from Europe is yet to be demonstrated. After the furore surrounding previous transports of plutonium oxide, the hope now is that the return of plutonium in the form of MOX fuel will attract far less attention. However, this is unlikely to be the case. Indeed, the announcement in early 1999 that a shipment of MOX from the UK and France would not be accompanied by a dedicated escort vessel attracted opposition from South Pacific island states and has been the subject of international environmental opposition. This was followed by news that the shipment would be delayed, perhaps by as much as six months.

Japan's fledgling MOX utilisation programme - its first attempt to use MOX in LWRs on a commercial scale - also faces domestic hurdles. These arise in part from the complex relicensing procedure that is required before MOX fuel can be loaded in a reactor. This procedure involves Japan's regulator (the Nuclear Safety Commission) and the Prefectures within which the reactors are located. Although progress has been made in the relicensing of the first three reactors scheduled for MOX loading, delays have recently been announced.

In Germany - THORP's other main customer country - a sharp slow-down in MOX use took place in the mid-1990s after the abandonment of a new fabrication facility at Hanau. By 1996, although 12 reactors had MOX licences, only six were using MOX fuel, because of the higher costs involved. More recently, the new coalition Government's fundamental reappraisal of civil nuclear policy has cast further doubts over the use of MOX in Germany.

SMP CONTRACTS?

So, against this difficult background, how is BNFL doing in the quest for SMP contracts? The answer, in short, is not very well.

BNFL has tried hard to create a contrary impression in the new round of consultation on the SMP. In particular, it claims that:

.. in order to cover .. future costs (commissioning, operation and decommissioning) .., BNFL would need to secure only 30-40% of Japanese, German and Swiss sales within the prudent Reference Case market of the SMP economic case .. Some two thirds of the sales required to cover such future costs are either already contracted or covered by reservations/letters of intent.

To begin to judge the significance of this claim, it is first necessary to consider the percentages of BNFL's 'Reference Case' which are covered by different categories of customer commitment. These are set out in the table opposite.

Category	% of 'Reference Case'	Cumulative %
Contracted	6.7	6.7
Letter of Intent/Reservation	11	17.7
Under Offer	25.7	43.4
Forecast	56.6	100

Even taken at face value, BNFL is exaggerating its case. To be able to argue that "two thirds of the sales required to cover future costs are either contracted or covered by letters of intent/reservations" it has rounded the 17.7% up to 20% and compared it with the low end of the 30-40% range required to cover costs. In contrast, comparing the 17.7% with the upper end of the range leads to the position that "less than half of the sales required to cover future costs are either contracted or covered by letters of intent/reservations". Furthermore, a more prudent comparison is between the 6.7% contracted and the 40% required to break even. Then the position becomes "less than 20% of the sales required to cover future costs are covered by contracts".

It must be stressed, however, that a focus on the modest requirement that future costs should be covered detracts from the real test of whether the plant will "attain a sufficient level of profitability to be of unquestionable economic advantage". This test is of central importance in judging whether the plant should be allowed to operate. In previous consultation material the "sufficient level of profitability" was taken to be a minimum Net Present Value (NPV) of £100 million, excluding capital costs which are sunk. Of course, if less than 20% of the sales required to cover future costs are covered by contracts, then a much lower % of the sales required to achieve a minimum NPV of £100 million must be covered by contracts.

This is a pretty dismal state of affairs and demonstrates the strength of the economic and political barriers to MOX use. Indeed, it suggests that some THORP customers may prefer to pay for the cost of storing their separated plutonium at Sellafield, pending development of facilities to immobilise it into a form suitable for ultimate disposal.

RADWASTE IMPLICATIONS

The near collapse of BNFL's recycling vision has important implications for radioactive waste management. In particular, it means that the task is complicated by the need to manage RepU and separated plutonium as wastes.

The implications of this are only just beginning to be considered in the UK. For example, work for the Government on a High-Level Waste and Spent Fuel Disposal Research Strategy has noted that the deep disposal of RepU and plutonium would have a "substantial impact on the required repository design and thus the size of the supporting R&D programme". As such, it points out that the types of wastes to be included in the programme should be specified as early as possible.

This point was taken up in the recent House of Lords report, which highlighted that the UK's stocks of separated plutonium far exceed the amounts that might possibly be used as MOX or that might be kept as a strategic reserve for a future fast reactor programme. It therefore recommended that the Government develops a clear policy on the long-term management of the UK's plutonium stock. It added that this should consist of maintaining a minimum strategic stock and declaring the remainder to be waste.

IMPLICATIONS FOR THORP

BNFL's main 'sustainability' rationale for the continued operation of THORP - that it will lead to the recycling of uranium and plutonium - has very little force. There are no serious prospects for the commercial recycling of RepU in the foreseeable future and, if the SMP is allowed to operate, at best only a limited programme of MOX use in THORP's main customer countries can be anticipated.

In such circumstances, why continue to reprocess spent fuel in THORP? The answer is bound up with the perception that continued operation of the plant will make more money for BNFL than alternative strategies based on the interim storage and ultimate disposal of spent fuel.

However, a major new report has challenged this 'conventional wisdom'. The report, 'THORP: the Case for Contract Renegotiation', shows that the argument that in future THORP will make more money than alternative strategies, partly because of the huge sunk capital, is in fact wrong. Modelling all future costs for a variety of options for contract quantities of German spent fuel, the report shows that there are substantial savings (£440 million to £520 million) in switching from reprocessing to interim storage and direct disposal. Although the savings obtainable by renegotiating reprocessing contracts with other overseas customers are not modelled, the authors estimate - based on the German modelling results - that cost savings of between £200-570 million might be possible by ending the reprocessing of Japanese spent fuel. The report concludes that there is a strong case for contract renegotiation, with an opportunity for BNFL and its customers to achieve financial benefits from a move away from reprocessing.

This move would also bring waste management advantages, including a reduction in the amounts of RepU and separated plutonium that would otherwise have to be managed as wastes.