The downstream consequences of reprocessing

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This is surely the time for all advocates of nuclear power to abandon their allegiance to the reprocessing of spent fuel. After all, reprocessing - and the transport and use of the separated plutonium - increases the chance of catastrophe, raises costs, encourages secrecy and exacerbates controversy. To stand a chance of ever building new nuclear power stations again in the UK, it is in the industry's own interest to engineer the swiftest practical switch to an alternative strategy based on the storage of spent fuel.

Clearly motivated by a need to reduce costs, British Energy is trying to cut free from its contractual ties to the reprocessing of spent fuel from its AGR stations. As an oxide fuel, this is currently reprocessed in BNFL's THORP plant. If British Energy succeeds - and let's hope that BNFL's new top team seizes the opportunity for change - benefits will be secured which go beyond the short-term cost savings of a switch to spent fuel storage. These arise from avoidance or minimisation of the 'downstream' consequences of reprocessing. Chief amongst these are the problems associated with the management of high level waste (HLW) and plutonium.

In the case of HLW, the most immediate issue is the rate at which the highly radioactive liquid arisings from reprocessing can be turned into glass blocks (vitrified HLW). This is important because liquid HLW is a major accident hazard, whereas the glass blocks can be stored in a passively safe way. The Nuclear Installations Inspectorate (NII) has recently made it clear that it is prepared to take regulatory action to make sure that most of the liquid HLW is converted to glass by 2015. A substantial reduction in British Energy's AGR reprocessing commitment would help BNFL achieve this target (and better), thereby reducing the duration of an extremely serious hazard.

In the case of plutonium, British Energy has clearly stated that it does not consider its use as a fuel in its reactors to be economic. It is therefore faced with the prospect of meeting a bill for indefinite plutonium storage at the Sellafield site. Worse still, the company will know that the policy debate is shifting towards categorising plutonium as a waste. When that happens, there will be an onus on conditioning the plutonium - which is currently stored as an oxide powder - so that it can be stored in a passively safe form. This conditioning will also entail costs, thereby providing an added reason for not separating the plutonium from spent fuel in the first place.

But what of THORP's main overseas customers, reactor operators in Germany and Japan? Here the downstream consequences are even more severe because of the contractual commitments to return vitrified HLW and plutonium to these countries. Although the return of HLW from the UK has not started, similar shipments from France have attracted widespread

opposition and presented the companies involved with a PR nightmare. Indeed, the first delivery of vitrified HLW from La Hague to Germany required protection by 20,000 riot police and cost the State of Lower Saxony around DM 100 million.

The return of plutonium is also fraught with difficulties. In 1984, a shipment of plutonium oxide from France to Japan - escorted by French and US navies - made news around the world and attracted international protests. In 1992-93, a further shipment from France became an international news event and highlighted safety and proliferation concerns associated with the international transport of plutonium. BNFL's hope now is that the return of plutonium in the form of Mixed Oxide (MOX) fuel will attract far less opposition. However, this is unlikely to be the case. Indeed the announcement in early 1999 that a shipment of MOX to Japan from the UK and France would not be accompanied by a dedicated escort vessel attracted opposition from various states on route and was the subject of concerted international environmental opposition.

Against this background - and the fact that MOX fuel is significantly more expensive than conventional uranium fuels - BNFL's main overseas customers have been extremely reluctant to sign contracts to have MOX manufactured in the new Sellafield MOX Plant (SMP). In fact, contracts amounting to only 6.7% of these customers' total plutonium arisings from THORP have been signed. The controversy surrounding the falsification of quality control data in BNFL's MOX Demonstration Facility has further damaged customer confidence, increasing the difficulty of securing further contracts.

The Department of Trade and Industry - BNFL's sponsoring department - must now act to sort out the situation. It should take the lead in initiating negotiations between the company and its main overseas customers. The aim would be to follow British Energy's lead and seek to turn reprocessing contracts into spent fuel storage contracts. We know there are cost savings to be made and these should be shared between the parties. And environmentalists should be flexible in their response: isn't the long term storage of foreign spent fuel that is already in the UK an acceptable price to pay for a negotiated route out of reprocessing in THORP? Maybe a solution lies in the UK retaining the overseas spent fuel that is already here and returning a radiologically equivalent amount of vitrified HLW?

And what of existing stockpiles of plutonium? Well we're in luck. The UK already has a plant which could be used to condition separated plutonium into a ceramic waste form: the Sellafield MOX Plant. This could be used to produce 'low spec' MOX, which would be cheaper than fuel-grade MOX because less exacting requirements would have to be met. Although safeguard and security arrangements would still be required, the storage of plutonium in a ceramic waste form would be passively safe. It could also facilitate final disposal should that ultimately be required.

Finally, there's the vexed question of the reprocessing of Magnox spent fuel. Unlike the relatively stable oxide fuels used in AGR and overseas

Light Water Reactors, this is a chemically reactive metallic fuel which presents more of a technical challenge for alternative strategies based on extended storage. Because of the limited cash generating capabilities of most of the ageing Magnox reactors, it has been widely accepted that there is little practical prospect of setting up long-term storage facilities for Magnox spent fuel.

With BNFL's recent announcement of a Magnox closure programme, the end of Magnox reprocessing is now in sight. This is projected to occur in 2012, six years after all but two of the Magnox stations will have closed. BNFL hopes to keep the two remaining stations - at Oldbury and Wylfa - running longer (2013 and 2016 respectively) by using a new oxide fuel called MagRox. The switch to this more stable fuel presents the company with spent fuel management options: it can either be taken through THORP or dry stored on a long-term basis. This raises an important issue for debate: if life extensions of Oldbury and Wylfa are to be allowed, should they be made conditional upon the development of dry storage facilities? There is surely a radioactive waste management case for this. Not only would a dry storage strategy secure greater discharge reductions than taking MagRox spent fuel through THORP, but it would also prevent an increase in the generation of liquid HLW and in unwanted separated plutonium.