The economics of reprocessing

The reprocessing of spent nuclear fuel was always at the heart of the civilian nuclear enterprise. Separating plutonium and unburned uranium from the fuel matrix was regarded as indispensable. This was because uranium would become scarce, fast breeder reactors (dependent on large amounts of plutonium as a fuel) would come to dominate, and radioactive waste management (RWM) would become easier with the smaller volume of high level waste (HLW) that reprocessing would isolate.

All these justifications have now evaporated:

- Fast breeder reactors had become commercially impossible even before electricity liberalisation had increased investment risk-aversion and rendered even the relatively cheaper conventional reactors uneconomic
- World uranium resources are now clearly plentiful and they have been substantially augmented by the large stocks of ex-military plutonium now slowly being released on to the market
- The smallness of HLW volumes matter much less than their heat-generating properties, obviating the apparent RWM advantage, while reprocessing also creates large new streams of intermediate level waste (ILW).

Meanwhile reprocessing is expensive compared to the alternative approach of spent fuel storage. The pro-nuclear NEA (Nuclear Energy Agency of the OECD) concluded in 1994 that reprocessing was twice as expansive as storage, despite using assumptions heavily skewed in favour of reprocessing. Very recently, British Energy (overall BNFL's biggest reprocessing customer) declared reprocessing to be "economic nonsense". Only Japan has a major reprocessing facility under construction and neither BNFL nor France's COGEMA seriously contemplate new reprocessing construction. Some 75% of the world's nuclear fuel is not currently being reprocessed and its owners have no plans to do so.

So why does reprocessing continue at all? There are two main reasons:

- In the reprocessing of oxide fuel (BNFL's THORP and COGEMA's plants) there are stringently enforceable contracts stretching back 20 years and more, while the Japanese Government retains the belief that recycling plutonium is an important objective
- In the reprocessing of Magnox fuel in the UK alone, there is currently no technically viable alternative available, as long as reliable dry storage for Magnox fuel does not exist.

The policy issue is therefore not whether to encourage expansion or contraction of reprocessing: it is rather whether to hasten its demise or let it run for its 'natural' life (perhaps another 15 years). Is this such a big question? Why not let reprocessing run to the end of its natural span and let it die off spontaneously? There are three reasons why the timing of the ending of reprocessing matters

- It is almost certainly cheaper, even after ignoring all sunk costs, to implement fuel storage rather than continue reprocessing

- It is damaging to security and proliferation policy to continue to separate plutonium when there is no use for it (the attempt to pretend that it is useful in mixed oxide fuel or MOX for conventional reactors is doomed, for straightforward economic reasons)
- It would help focus BNFL and COGEMA more strongly on the more important and potentially much more profitable questions of developing waste management, decommissioning and general clean-up activities around the world (not least in the USA and former USSR).

In principle, and in technical terms, the ending of oxide reprocessing would be straightforward, as the storage of spent fuel is simple, cheap and relatively safe. The issue is then political and diplomatic: how to satisfy Germany and Japan, the only important foreign customers, that storage will not undermine national or utility objectives. For Germany this is unlikely to be difficult, while for Japan it may be more problematic, though unlikely to be impossible if the issue is given high political priority.

The ending of Magnox reprocessing at Sellafield is technically more difficult in the short term, though little publicised. Lacking adequate dry storage, Magnox fuel needs to be reprocessed to avoid dangerous corrosion when the fuel is wet-stored. Even if Magnox generation ended at once, there would still be up to 10 years' worth of reprocessing left to be done. However adequate dry storage could be constructed and if THORP were to stop, Magnox reprocessing would be highly vulnerable, especially given probable external pressure from Ireland, Norway and Denmark.

Nuclear power is now being promoted again as a new investment option in response to concerns about climate change and the practical need for European Governments to find ways to meet commitments on greenhouse gas emissions made at Kyoto in 1997. As a zero carbon-emitter in normal operation, nuclear has legitimate claims to consideration in this process. Those who most enthusiastically champion the nuclear revival are often among the keenest supporters of reprocessing. The irony is that the chances of a nuclear revival would actually be greater if the practice of reprocessing could be seen to be ending soon, rather than dragged out to a slower end.