# UK report recommends nuclear reprocessing

THE long-awaited 'Windscale report', the result of a 100-day inquiry into a planning application for a nuclear fuel reprocessing plant, was published this week by a subterfuge on the part of the minister responsible, Mr Peter Shore, Secretary of State for the Environment. The report recommends that outline planning permission should be granted "without delay" to British Nuclear Fuels Limited (BNFL) to build a new thermal oxide reprocessing plant (THORP) at Windscale, Cumbria. Mr Shore, legally bound to make a decision on the issue without further consultation, but wishing to involve parliament in the debate, has decided not to grant planning permission, but to seek a 'Special Development Order' through parliament which would reverse his decision and allow the plant to be built. Mr Shore is in favour of the plant; the arcane procedure is the result of the lack of an effective mechanism for reaching democratic technical decisions in the UK—a problem in which the UK is not alone.

BNFL began lobbying MPs some months ago in the expectation that a debate was likely. A substantial and vociferous lobby of MPs is against THORP, but BNFL are "99% sure" that THORP will survive the parliamentary process. Costing £600 million at current prices and designed to reprocess 600 tonnes of British and foreign spent oxide fuel a year by the PUREX process (see below), THORP will take 10 years to build once authorised.

The report, the lonely work of the Inspector, Mr Justice Parker, has been received by BNFL as a "complete vindication" of their proposals, and by Mr Shore as "cogent and persuasive". Friends of the Earth, on the other hand, "found it hard to credit the extent to which he [Mr Justice Parker] has overlooked or misunderstood key aspects of the argument". FOE single out the passages on waste management, energy economics and foreign policy for special attack. "We can only assume that the pressure to produce the report quickly left insufficient time to assimilate the evidence" said FOE.

Mr Parker's support for THORP is based on 12 principal arguments, which are as follows:

1. Stocks of spent fuel from AGRs (advanced gas-cooled reactors) presently existing and under construction will, unless reprocessed, continue to build up and will have to be stored until disposed of in some manner.
2. It is necessary to keep the nuclear industry alive and able to expand should expansion be required.
3. Keeping the industry alive will involve further reactors being constructed and further quantities of spent fuel arising.
4. All the spent fuel stored will contain plutonium. The inventory of plutonium will therefore continue to increase for as long as reprocessing is delayed.
5. Prolonged storage of spent fuel would involve the development of new storage methods, which would be a costly and lengthy process.
6. To store increasing quantities of spent fuel would only be sensible if it was ultimately likely to be decided to dispose of the spent fuel without reprocessing.
7. Such a decision appears to be unlikely and not in our best interests or in those of future generations; it would commit future generations to the risk of escape of more plutonium than is necessary; and the risk would be greater since the spent fuel is likely to be more vulnerable to leaching by water than solidified highly active waste.
8. If reprocessing is going to take place at some time then it is preferable to start without delay, to gain experience of the process and its dangers while amounts of fuel to be reprocessed are small.
9. The risks from the emissions involved in reprocessing are likely to be very small and, if reprocessing is to designed in to THORP if they proved correct.
10. The risks of accident will, if reprocessing is to take place at some take place at some time, will in any event occur at some time. Evidence that current estimates are seriously wrong "did not appear to be convincing" wrote Mr Parker but any new estimates would ultimately have to be time, also have to be incurred, at some time. At the present they are likely to be containable within tolerable levels. If reprocessing were to begin suddenly on a large scale after a delay, risks would be greater.
11. The risks from terrorism are not significant.
12. The risks arising from transport would be no greater than at present.

**Robert Walgate**

# New reprocessing technique promises diversion safeguards

BRITISH and American nuclear scientists have designed a new system for reprocessing spent reactor fuel which, it is claimed, makes the diversion of nuclear fuel for military purposes virtually impossible by ensuring that pure plutonium is not accessible at any part of the cycle.

The new system was announced jointly by scientists from the United Kingdom Atomic Energy Authority (UKAEA) and the Electric Power Research Institute (EPRI) of Palo Alto, California at a conference on energy technology held last week in Washington.

Developed in direct response to President Carter's concern that the worldwide expansion of nuclear power could lead to the increased proliferation of nuclear weapons, it is hoped by the nuclear community that the new process will calm many fears and open up the way for the 'safe' development of fast breeder reactors.

In contrast to conventional reprocessing techniques, whose prime aim is to separate pure plutonium and pure uranium from spent reactor fuel, the new system retains the plutonium mixed with both uranium and fission products making it lethally radioactive. In addition, the technology of the reprocessing process has been designed in such a way that even if a large force took over the plant, it would be unable, without making major and time-consuming modifications, to divert the process into producing pure plutonium that could be easily handled.

Speaking in Washington on Monday, Dr Walter Marshall, Deputy Chairman of the UKAEA and until recently chief scientist at the UK's Department of Energy, said that the UKAEA and the EPRI shared a belief that once a fast breeder reactor cycle had been developed, then it could be made proliferation proof. "You can make it so difficult to steal the plutonium from the cycle that you can virtually forget about it" Dr Marshall said.

In a paper to the conference prepared jointly with Dr Marshall, Dr Chauncy Starr, President of EPRI, said that recent concern over, for example, the possible theft of plutonium by terrorist groups made it important for the future guarantee of world energy supplies to develop a joint reactor and reprocessing system that was diversion-proof, in the sense that the difficulty

of extracting weapons material was roughly equal to or greater than that of doing so by independently processing long-stored fuel.

The fact that, in contrast to thermal reactors, fast breeder reactors were relatively insensitive to fission products in their fuel meant that it was possible to conceive of "a hypothetical idealised breeder fuel cycle which at all points has a plutonium-uranium mixture that does not exceed the 15 to 20% plutonium necessary for fresh fuel, that is only partially decontaminated from fission products, and is therefore highly inaccessible" Dr Starr said.

The net result of such a reprocessing system combined with a fast breeder reactor would be the creation of a diversion-proof nuclear power capacity that would effectively remove such nuclear power systems as a potential resource for weapons proliferation.

So far the new system, which is being submitted to the International Nuclear Fuel Cycle Evaluation Study (INFCE) set up last year at the suggestion of President Carter has received a cautiously optimistic welcome from the administration, keen to develop a politically-acceptable fast breeder nuclear reactor programme and reprocessing policy.

A spokesman for the US Secretary of Energy, Dr James R. Schlesinger, said that the concept described by the scientists would receive serious consideration because it fitted with the goals of the federal reactor research programme.

However, environmentalists still have their doubts. In a joint statement, two Washington-based environmentalists groups, New Directions and the Natural Resources Defense Council, criticised the new proposal for a failure to set high enough standards of safety, saying that the new technique could be used as a cover-up for the production of nuclear weapons.

The relative desirability of fast breeders over thermal reactors—even taking proliferation dangers into account—had been emphasised by Dr Marshall four days prior to the Washington meeting when he gave the Graham Young Memorial Lecture at Glasgow University in Scotland. Dr Marshall said that a policy of using thermal reactors alone in the once-through cycle was not a satisfactory non-proliferation policy since every fuel storage facility became, in essence, a 'plutonium mine'. Furthermore the net rate or production of plutonium by fast breeders was potentially lower than the production of plutonium as waste by thermal reactors.

**David Dickson**

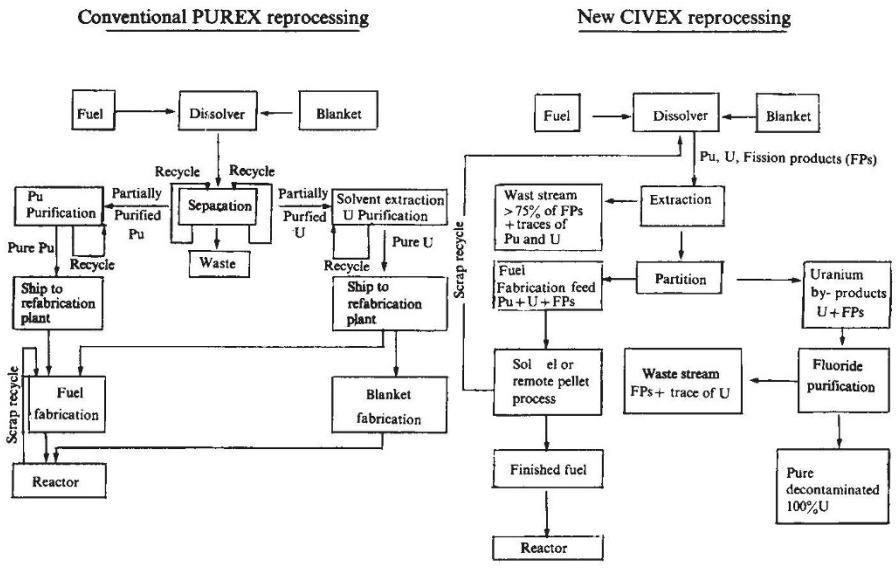
## How 'CIVEX' and 'PUREX' differ

DETAILS of the new reprocessing system—described as 'CIVEX' to emphasise its civilian character and distinguish it from the conventional 'PUREX' reprocessing process—were described to the Washington conference by Dr Milton Levenson, Director of EPRI's nuclear power division.

According to Dr Levenson, seven criteria were necessary to help define a diversion-proof reprocessing system These were:

- No pure plutonium in storage
- No pure plutonium at any intermediate point
- No way to produce pure plutonium by simple process adjustment
- No way to produce pure plutonium without equipment modifications
- No way to carry out equipment modification with facilities and components normally on site
- No way to carry out the required equipment modifications without plant decontamination or entry into extremely high radiation fields
- Length of time required for successful diversion such that adequate time is available for national and/or international response.

Dr Levenson said that a number of steps in the conventional PUREX process violated at least one of these criteria. Such unacceptable steps included the shipment of pure plutonium from a reprocessing plant to a refabrication plant, the final plutonium purification cycles, and the provision for recycling material that was not highly purified.




The first steps of the solvent extraction operation prior to the scrubbing of fission products from the plutonium/uranium streams did meet the criteria, and would be retained in the CIVEX process. However, the process was new in two ways, Dr Levenson said.

Firstly the chemical steps used for uranium purification use a fluoride purification process which is effective for purifying uranium but not for plutonium. The excess uranium which is to be recycled for blanket fabrication is collected for subsequent purification by a fluoride volatility process using bromine trifluoride or low temperature fluoridation to produce $UF_6$ and subsequent purification by distillation or sorption-desorption.

Furthermore the plant equipment and layout would be such that there is no way to change the mode of operation to produce plutonium. In the PUREX process, whose objective is to make the purest possible uranium and plutonium, free of radioactive wastes, equipment is provided to permit the recycling and decontamination of any material carrying radioactive impurities. Such equipment is not present in the CIVEX plant, and concrete process cells are constructed of such a size as to make it impractical or impossible to install any.

Further modifications in the CIVEX design include the absence of a separate scrap recovery facility, and the fact that the primary product stream is taken directly through a remote fabrication operation, using the sol-gel method of making oxide or remote application of the more conventional oxide process through to finished fuel.