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Reducing Uncertainties in the Management of Higher Activity Nuclear Wastes

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The United Kingdom has one of the largest and most diverse nuclear waste inventories in the world arising from Magnox, AGR, PWR and prototype reactors. In part, this reflects the country's long history of reactor development and operation, but the issue has been compounded by frequent changes in government policy. Proposals for disposal of low (LLW) and intermediate level (ILW) waste repositories have been advanced and then withdrawn whereas significant research into high level waste (HLW) disposal has re-started only recently after a hiatus of more than 40 years, necessitated by the decision to cease fuel reprocessing. Retrieval and relocation operations for legacy fuels are imminent owing to the deterioration of storage ponds operating beyond their design lifetimes.

Policy considerations notwithstanding, there are major technical challenges associated with ongoing waste storage and geological disposal. This paper will discuss attempts to address two of the main sources of uncertainty; the fate of spent nuclear fuel during prolonged storage and the validity of the 'chemical containment concept' in which cements perform an essential role within the disposal system by creating a favourable environment that limits the aqueous concentrations of key radionuclide species and their subsequent migration.

The cost of managing legacy sites currently exceeds €4 billion per year with a guaranteed route to a final solution still elusive. Enhanced understanding of the evolution of both the waste and its environment will help mitigate the risks during interim storage and final consignment to a geological disposal facility.

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