

*Geological Repository Systems for the Safe Disposal of Spent Nuclear Fuels and Radioactive Waste* Edited by Joonhong Ahn and Michael J Apted. Woodhead Publishing Ltd 2010. 762pp ISBN 9781845695422. Price £180.

It is 34 years since the Royal Commission on Environmental Pollution recommended that there should be no commitment to a large nuclear power programme “ *until it has been established beyond reasonable doubt that a method exists to ensure the safe containment of long lived highly radioactive waste for the indefinite future.*” <sup>i</sup>

That is what this book is about. The two editors and 23 academics, engineers and regulators have contributed to a study of how such safe containment may be achieved below ground for 1 000 000 or more years. There is no doubt that we have to try because 60 years of legacy waste is with us now and few believe that it is safe on the surface. The cost of dealing with UK legacy waste, civil and military, is now more than the government’s 2003 estimate of £85bn

The contributors are drawn from many countries and the geological formations considered range from massive igneous formations to salt domes. Safe disposal underground is the optimistic objective of several current projects abroad but there is nothing ‘gung-ho’ in the contributors’ estimates of the probability of success. Multiple layers of containment are appraised in scholarly detail. The ultimate failure of metal containers is assumed. The vulnerabilities of engineered barriers are explained and ultimate containment by geological formations is explored critically.

The United States Yucca Mountain Repository Program is interestingly described as facing some uncertainty. Several of the papers explain why. Predicting seismic and volcanic events, erosion and uplift rates, climate and sea level change is not underestimated and, in one chapter, some inscrutable mathematics, later described as unsolvable, is offered in a discussion of how to assign probabilities.

The Waste Isolation Pilot Project in New Mexico after legal challenge has so far placed 120 000 containers of Department of Defense transuranic waste in a salt formation. But it is acknowledged that no nation yet has a fully functioning deep depository for high level waste. Tony Blair’s claim that there are waste management “solutions” which justify the building of new nuclear reactors producing highly active spent fuel waste is not supported by this book. If you recall seeing a photograph of one in a government publication <sup>ii</sup> be assured it is wrongly described. Chapter 3 and the company SKB <sup>iii</sup> describe it as a shallow facility for interim storage.

Professor Gordon MacKerron, former Chairman of CoRWM <sup>iv</sup>, says that we are seeking a solution of least harm. The editors seem to agree when they refer to the task of “limiting” the amount of radiation to which future populations will be exposed. If members of parliament agree the Secretary of State for Energy, Chris Huhne, in seeking parliamentary approval for his ‘Justification’ for new reactors and the

**production of more waste will have a difficult task. His Conservative partners in government say they will vote for new build provided that there is no taxpayer subsidy.**

**Areva-EDF and Westinghouse, the two remaining parties requesting Generic Design Assessment (GDA) of reactor designs, have not yet in five years submitted designs acceptable to the UK Nuclear Installations Inspectorate. Nor have they made any application to build a nuclear power station. Fuel design and fuel burnup rates for their proposed reactors remain to be decided and waste management is more difficult for waste from high burnup fuel.<sup>v</sup> Such waste may have to cool at the surface for more than 60 years before being placed underground. Depository excavation and management will fall to generations not yet born.**

**The Nuclear Decommissioning Authority (NDA) is already engaged in design studies for a deep geological facility for a UK site. Local communities are invited to propose sites for later geological appraisal. An early cost estimate is £12bn.**

**The editors have succeeded in examining the engineering, the physics, the mathematics, the regulatory issues and the societal aspects of nuclear waste management. Decision makers in government and members of the communities involved will find it readable and necessary. Journalists could use it too to make the issues better understood by themselves and the public. It should appear in college and local libraries.**

**Christopher Gifford**

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<sup>i</sup> HMSO 1976

<sup>ii</sup> *Managing Radioactive Waste Safely* BERR June 2008 Front cover, piii and p41.

<sup>iii</sup> The Swedish Nuclear Fuel and Waste Company facility at Forsmark

<sup>iv</sup> The first Committee on Radioactive Waste Management

<sup>v</sup> The NII's GDA Report September 2010.