

THE MANAGEMENT OF HAZARDOUS RADIOTOXIC WASTE

(3rd Edition)

*Neville Chamberlain and Dan Meneley/
The International Nuclear Energy Academy*

SUMMARY

The nuclear industry desperately needs to answer those critics who accuse it of not having a solution to the management of its radioactive waste arisings. Untreated wastes can be a threat to health and the environment. Moreover, many argue that this failure is depriving society of the continued use of nuclear energy as an important contributor to mankind's energy needs and the reduction of greenhouse gas emissions, generally accepted as the most pressing challenge of our age.

The interminable arguments on how, and, perhaps more importantly, where to dispose of hazardous radiotoxic waste (HRW) must stop. This paper proposes that long-term, safe intermediate storage of such wastes should now be pursued whilst making technical and financial provision for ultimate disposal in the distant future. An internationally co-ordinated approach should be adopted to protect the international community from inadequate standards and from failure to act by individual nations.

INTRODUCTION

Decades of nuclear power programmes have left several countries with significant stocks of untreated radioactive waste, much of it presenting very little threat to health or the environment. This so-called Low Level Waste is not the concern of this paper. However, some of the legacy of the early programmes is definitely in the form of unstable hazardous radiotoxic waste (HRW). Some of the stocks of these materials are so unstable as to present a significant health risk to local workers, their neighbours and perhaps even to the wider international communities and environment. So much so that Governments are deterred from making or allowing further nuclear energy investment just at the time when this potentially important source of energy should be assessed as an alternative to burning more carbon. Our descendants will rightly accuse us of failing them if we, today, do not apply a sensible and logical approach to the nuclear option. The first step must be to remove the HRW issue from the equation by formulating a recognisable and logically defensible plan.

ORIGINS OF THE PROBLEM

In the early rush by some countries to develop nuclear power both for military and civil use, little attention was paid to the disposal of HRW arisings. Some of this material was just left where it fell, some was dumped at sea and some was buried. There is no doubt that its careful management was not

considered a priority. Increasing awareness of environmental issues changed all that. Nuclear programme managers and their scientists, however, underestimated the nature of the issue as they sought to deal with it by identifying suitable deep, underground depositories, in which they were confident the HRW could be buried and sealed from the biosphere. Alerted to the new hazards of nuclear energy and radiation, thanks to Windscale, Three Mile Island and Chernobyl, the public was not to be so easily satisfied. No local community wanted to volunteer to be the gullible host for others' waste management problems. Any attempt to show how ideal any potential site for a repository was, was bound to produce a suggestion of an even more "ideal" alternative. A broadly based survey to find the "perfect" site simply raised anti-nuclear sentiment in ever more communities. The only real beneficiaries of this process were the inquiry lawyers and geology researchers. Court rulings such as the very recent one against the Yucca Mountain repository* place the technology in the position of having to prove the unprovable. Moreover, communities hosting any nuclear facility feared the permanent stigma of waste would be left with them forever.

It is quite evident, that this point in time is exactly the wrong moment in our social history to try to find a suitable, permanent HRW repository. What progress has been made, in countries like the USA, Sweden and Finland, invariably leaves open the potential at some future date for any waste deposited to be relocated to another site. Even so, there is often considerable suspicion that the local community has been, somehow, duped.

WAY FORWARD

There is probably little doubt that if the disposal issue were left to engineers and economists, the world's HRW would be shipped to one of a small number of regional global centres with very stable geology and disposed of in a deep underground repository. This is the line consistently taken by the International Atomic Energy Agency and supported by well respected academics**. In technical terms this is one of the easiest problems to solve. The aim would be to replicate conditions now existing in an ore body of substantial age, perhaps half a billion years. There are several examples of potentially successful solutions of this kind in the world. At last, those nations with boring stable geologies, offering no prospect of valuable oil or other mineral deposits, could cash in! It is certainly ludicrous to expect every country, no matter how tiny, to find within its own boundaries its own suitable site for permanent disposal of HRW. However, present day politics clearly rule out the global optimum solution.

Thus, building on the meagre successes achieved so far in countries such as Sweden and Finland, other countries facing the HRW problem should now, openly, declare for the long-term, safe storage option and build in the desired features to ensure that appropriately high standards of design and management will be used, that effective monitoring will be installed, that the waste can be retrieved whenever necessary at reasonable cost, and that genuine attempts are being progressed to find internationally agreed permanent solutions to the disposal issue.

In practice, this way forward, in each country not having already established an interim HRW storage system, will probably involve the establishment of a National HRW Authority which would be charged with

- Receiving, for a specified fee, custody and title of HRW from those who create it;
- Verifying that the HRW received has been suitably treated to ensure that it is immobilised and encapsulated (perhaps by an intermediary on contract, at the waste creator's expense);
- Arranging for the encapsulated HRW to be stored in suitably designed facilities, above or below ground, built to internationally agreed standards to last, say a thousand years, capable of withstanding earthquakes, aircraft crashes, terrorist attacks etc, with high levels of integrity monitoring and of physical security to deal with potential threats to extract wastes that could be useful in the production of nuclear weapons, while keeping the capsules easily removable in the event of a problem or to move the waste to another site;
- Using part of the fee receipts to fund the indefinite maintenance and operation of the storage complex;
- Setting aside in a separate fund another part of the fee receipts to fund the eventual permanent disposal of the HRW; (a modest sum invested today should go a long way in a thousand years' time!);
- Using a final part of the fee receipts to endow an ongoing national contribution to an international research programme looking at alternative future disposal options; by locating this national element of the research at the HRW storage site, the site can genuinely be presented as a centre of excellence rather than as a "nuclear dustbin"!

It is likely that the total fees payable by the waste creators will be no more than the level envisaged as payable to waste repositories under earlier models. Each National HRW Authority would be responsible for representing its country's national interest in the international forum for co-ordinating the research programmes and for establishing and maintaining appropriate standards for the HRW storage facilities. Only a statutory government body is likely to generate the necessary sense of permanence and status that a National HRW Authority needs if it is to enjoy the confidence of the public and international community.

CONCLUSION

Efforts in each country should be directed to establishing a reliable and safe interim storage system with the credibility and status to generate the confidence of the public and as part of a centre of excellence engaged in research contributing to a satisfactory ultimate solution to the HRW problem. It appears that the most promising direction for the work of this centre of excellence is to characterise "successful" past repositories; i.e. natural uranium ore bodies that have been stable for many millennia, and then to copy their best characteristics in the design of an international man-made repository.

Refs.:

* US Court of Appeals for the District of Columbia, 9 July 2004.

** Prof. W. Haefele: Uranium Institute Annual Symposium, September 1996.

This paper and the views expressed therein do not necessarily represent the views of the INEA. It represents the views of the authors and its publication was approved by the Executive Committee of the Academy as a contribution to the responsible development of civilian nuclear energy.