

ISSUES IN THE MANAGEMENT OF LOW-LEVELRADIOACTIVE WASTES

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One of the more controversial issues facing industrialised nations today is the management of hazardous byproducts or wastes. The development of systems for the disposal of industrial wastes, although very unpopular, is a necessity - a fact of life. All industry finds itself today enmeshed in a morass of regulation, political apathy and public antagonism when it comes to hazardous industrial waste. Our industry is a world-class leader on all three fronts. There are no disposal facilities in Canada for radioactive wastes and the prognosis for the future is bleak. As the industry gets older, more and more facilities will be closed and require decommissioning. New facilities require plans for the long-term management of their wastes. Indeed, one major public issue with the nuclear industry is the fate of the wastes produced.

In looking at the situation in which we find ourselves today with respect to the long-term management of naturally-occurring low-level radioactive wastes, one must wonder where we are going in the future, and whether indeed there is an end in sight.

In considering this situation, I am drawn to a parallel with the film "2001, A Space Odyssey". The Oxford English dictionary defines the word odyssey as, amongst other things, "a long adventurous journey"; or "a series of wanderings". Those involved in this waste business will undoubtedly agree that waste management is indeed an odyssey. Where are we, then, in this odyssey of trying to find homes for the various wastes arising, in this case, from the front end of the nuclear fuel cycle?

At this point I should define those wastes to which I shall largely refer. In Canada, the definition of low-level radioactive waste appears to be one arrived at by elimination. That is, low-level wastes are not uranium mill tailings and not high-level radioactive wastes. Within this definition of what low-level wastes are not, there are subsets, including historic, incidental and ongoing wastes arising particularly from the nuclear fuel cycle. For my purposes I shall also include uranium mill tailings.

Waste has been defined as "anything that can be omitted or reduced without reducing the output or the net value of the end product". More specifically, "any byproduct from a process or operation for which there is no end value". It might logically follow, therefore, that all wastes are created equal. And, more specifically, that all naturally-occurring low-level wastes are, like man, created equal. Further, that if this is so, we should be able to develop what I will call a unified theory of waste management.

However, it seems apparent that each of the main waste types - mill tailings, low and high level - are deemed to be different by both the regulatory agencies and, therefore, by the politicians. For example, a federally funded program for high-level wastes is underway to study only disposal concepts to the tune of 300 million dollars over a 10-year period. There is a federal research program on uranium mill tailings, the NUT Program, funded at 10 million dollars for five years. Finally there is a federal program, the Low-Level Radioactive Waste Management Office, funded for 10 million dollars over five years. It can be concluded that, from a political point of view, while all wastes may be created equal, some quickly become more equal than others. High-level waste would appear to represent the major political problem, the other waste types relatively minor problems.

However, consider the costs of disposing of low-level wastes. Costs of decommissioning the tailings at Eldorado's former Beaverlodge uranium mine, together with recent estimates of decommissioning our Rabbit Lake tailings area, indicate that for uranium mill tailings disposal the cost is about 1 dollar per tonne.

For Eldorado's refinery wastes in southern Ontario, disposal costs will probably be about 60 dollars per tonne. It should be noted that the refinery wastes are, radiologically, no different than tailings being produced in Saskatchewan.

In Scarborough, Ontario, there are some 4000 tonnes of soil around people's homes, slightly contaminated with radium. The cost of moving this material a few kilometers, and storing it

only, is estimated at some 800,000 dollars, or 200 dollars per tonne.

Where is the sense to all this? Where will it all end?

There is also a significant difference between these waste types as seen from the regulatory side. For example, disposal of uranium mill tailings is apparently a rather trivial problem compared to what Eldorado is being asked to do to dispose of waste material in southern Ontario which, as I previously noted, is radiologically little different from mill tailings. Amongst other things, we are being directed by the AECB to use, for guidance, one of its consultative documents entitled "Criteria for Concept Assessment: Geological Considerations in Siting a Repository for Underground Disposal of High-Level Radioactive Waste". This, together with the detail and effort required to be put into a decommissioning plan, is seen to be a direct parallel to the federally-funded conceptual studies for high-level waste disposal.

Surely there must be some logical and rational relationship between the different types of radioactive wastes? Surely the apparently ad hoc manner in which these wastes are being viewed and addressed leads both the public - and perhaps even politicians - to the conclusion that there is no logical method of approaching the waste disposal issue. Confusion prevails supreme.

As the situation appears today, a unified theory of waste management would seem to be unachievable. Perhaps it is too late. Perhaps the ad hoc decisions of the past and present, the increasing morass of regulation, together with the socio-political situation, precludes any rational approach to waste management. But I suggest that if the industry and the regulators are ever to achieve what might be termed public credibility in this matter, to convince at least some of the public and, who knows, even some politicians, that there is indeed a rational solution, we must develop some logical and explainable consensus on this subject.

One of the problems I see is our industry itself. There are really two industries - a uranium industry and a nuclear industry. And within the uranium industry, we have two solitudes - one in Ontario and one in Saskatchewan. There appear to be no formal or perhaps even semi-formal interaction concerning mutual problems. The only time we meet seems to be at meetings called by the AECB, or as a result of one of their consultative documents. As a result, the uranium mining industry is very vulnerable to a situation of divide and conquer. The rallying point could rationally be the CNA.

In all this business about wastes from the nuclear industry, in both the national and the international spheres, there are too many actors, and the whole situation is compounded by the amount of research money being spent and the literature being produced. It is almost mind boggling - particularly if you try to read the literature produced by the financial expenditures. And there is no end in sight. What we have here is living proof of Heisenberg's uncertainty principle, and certainly a prime example of the second law of thermodynamics. All this expenditure and effort is not necessary. All it is doing is ensuring that we will wait a long time - probably too long - before anything practical is done in waste disposal. Something practical must be done to help in obtaining public confidence in this matter.

Generally, the main issues involved can be conveniently divided into technical and socio-political, although they are not mutually exclusive of each other. Neither can the waste odyssey be separated from the more general nuclear odyssey.

On the more technical side there are issues related to ALARA* and the criteria involved; there is a developing issue of ALARA versus BAT**; there are issues relating to generic versus site-specific criteria; whether criteria should be provided a priori or not, and so on. The AECB philosophy would appear to be based on the ALARA principle. The fundamental problem with this principle concerns, as we all know, the phrase "reasonably achievable" and the quantification of an ALARA optimisation. ALARA optimisation was applied to an assessment of options for the decommissioning of Eldorado's Beaverlodge facility, from which I have concluded that this approach provides a powerful management tool with which to assess comparable options. Not in a quantitative and independent way, but in a relative and semi-quantitative manner. The relativity of the process

*The International Commission on Radiological Protection (ICRP)(1) recommends a system of dose limitation, the main features of which are:

1. no practice shall be adopted unless its introduction produces a positive net benefit (Justification Principle)
2. all exposures shall be kept as low as reasonably achievable, economic and social factors being taken into account (ALARA Principle); and
3. the dose equivalent to individuals shall not exceed the limits recommended for the appropriate circumstances by the Commission (Dose Limitation Principle).

**BAT - Best Available Technology

requires a frame of reference by which options may be assessed or judged, and the only reference one has in this situation is a "do-nothing" situation. Naturally, the optimisation process involves criteria, and this raises the question as to how such criteria are obtained. More particularly, whether the criteria are to be provided by a regulatory body or to be proposed by the proponent and then judged by the regulatory body as to their acceptability.

In Canada we have a different federal agency philosophy on criteria-setting than, for example, is the case in the United States. The AECB approach is one where, largely, the proponent proposes and justifies the criteria, and the AECB judges their acceptability. The US situation appears to be the opposite. As one who has tried both approaches with the AECB, I have concluded that the Canadian approach is, on balance, to be preferred. Moreover, I believe it is more in line with the philosophy of reasonably achievable. However, it must be remembered that there are other agency requirements in Canada with respect to criteria. For example, in Saskatchewan there are specific criteria provided with respect to surface water quality, and these are inflexible. One of the major problems with defining, a priori, criteria which have to be met is that such criteria are, by necessity, generic. Since all situations pertaining to mine-mill operations, particularly, are site specific it is reasonable to employ, to the extent possible, criteria which relate to site specificity, rather than theoretical generic criteria. Thus the situation of proponent-proposed criteria based on site specificity, coupled with an ALARA optimisation is, I believe, a workable and equitable approach to decommissioning and waste disposal. As a specific example of criteria proposal and acceptance, the criteria requirements for an ALARA optimisation with respect to dose minimisation from its decommissioned Beaverlodge facility, Eldorado proposed, and the regulatory agencies accepted, a deminimus dose rate of 0.1 mSv/year; a 1000-year time integration period; and a cost of \$10,000 per man-Sv.

In the area of regulatory agency philosophy, Environment Canada has recently made moves and statements regarding its views on the nuclear industry. Environment Canada uses, as its basic rationale, BAT rather than ALARA. And while Environment Canada claims that there is essentially no difference between ALARA and BAT, I suggest to you that the differences are significant. The BAT approach is based upon an ability to pay for technology-based standards, and does not involve a balance of cost and benefit. In its moves into the nuclear industry - with respect to the impacts of the industry and its wastes on the environment - Environment Canada is, I believe, taking the

approach of responding to and perhaps even leading public opinion rather than educating and protecting the public. Environment Canada is feeding on perceived risk rather than real or mathematical risk. Here I see a de facto challenge and contradiction to federal regulation, disguised as advice to industry and the provinces through the public workshop approach so popular with Environment Canada. It would seem that the strategy is to issue technology-based emission control standards irrespective of cost; to publicly recommend such standards and promote regulatory adoption of these more stringent requirements through the public forum. I would predict that we will shortly be into another issue battle - that of ALARA versus BAT. One federal regulator will be defending the integrity of real costs versus real benefits while another will be advocating perceived benefits regardless of real costs.

In the socio-political area, the main issues at this time include storage or disposal of wastes, institutional control of a closed-out waste site, the NIMBY* syndrome and the apparent inability of elected governments to fully address the radioactive waste disposal situation.

In dealing with the public with respect to siting and implementing a low-level waste disposal facility, there appears to me to be an increasing tendency towards leaving things as they are - that is, a long-term storage-management position rather than disposal. The same attitude appears with respect to hazardous chemical wastes. One would hope that we are not being forced into a disposal mode by regulators only to find that when we come to do the job, those living near a future disposal site want storage and management.

The issue of institutional control is also a major problem in disposing of low-level wastes - although with uranium mill tailings this is not a problem in Saskatchewan. In Ontario, the tailings situation is not as clear cut. The issue of institutional control requires an answer to the question - who has the final responsibility for radioactive wastes? While the responsibility for hazardous non-radioactive industrial waste appears to have been accepted by most provinces - with management of the site in perpetuity - the situation with low-level wastes, excluding mill tailings, is embroiled in provincial-federal politics. The provincial position is that such wastes are a federal responsibility. In replying to a

*NIMBY - An acronym for Not In My Back Yard wherein local citizens or citizen groups object to the disposal of wastes in or near the community in which they live.

question as to why Ontario's "Blueprint for Waste Management" does not contain reference to radioactive wastes, the Minister of the Environment stated that "this absence reflects the fact that methods for the safe disposal of low-level radioactive wastes are still undergoing development. Further, the Ministry of the Environment feels that such disposal methods should be established on a national basis." I miss the logic here - particularly since every facet of the nuclear industry is to be found in Ontario, and that low-level wastes have been disposed of successfully in other countries for over a decade. The federal politicians have taken their usual approach - fund research for some years to put off making a decision, and I referred to this earlier. This lack of political will to face up to the situation is creating far greater problems than the technical aspects. Meanwhile, the critics feed off this political procrastination, claiming there are no solutions to the problem.

I indicated that the so-called NIMBY syndrome was another major issue in waste management. The contaminated soils in the Malvern Crescent area of Scarborough, to which I referred earlier, is THE CLASSIC CASE. The latest situation in this odyssey is another injunction against moving the soil from around the houses affected, and safely storing it in a nearby site. The logic of the judicial decision escapes me. But perhaps more importantly, unless this ruling is appealed and the injunction overturned, I suggest to you that no waste is going to be moved to a disposal site in our lifetimes - certainly not before the year 2001. The inability of governments to face the issues of low-level waste management leaves the industry, the public, and indeed the regulatory agencies in an Alice-in-Wonderland situation.

So where are we going in this waste odyssey? I believe we must reach a consensus on the management of low-level radioactive wastes, and the concept of a unified theory of waste management, based on logical rules and waste classification. The technology is available, the major problem is to get the politicians to provide the leadership necessary for a total solution in contrast to the janitorial services we are being restricted to.

References

1. ICRP Publication 26, "Recommendations of the International Commission on Radiological Protection", Volume 1, No. 3, 1977.