

This discussion paper is an annex to a document of the Ministry of Natural Resources from which one gets the impression that the method of long-term disposal of Canadian high-level nuclear wastes has already been settled and that all that remains to be decided is the choice of site. The document does not specify the location of the sites being considered, and in this respect I simply remark that the local people must have a veto on any project for a DGR (deep geological repository) in their community, since the impact on their lives would be both immediate and long lasting. On the other hand, the decision to build such a facility cannot be theirs alone, since the problem that has to be dealt with is one of a much wider society. I am especially alarmed by the possibility that a decision to accept a DGR by one community or another in a democratically conducted referendum will be presented to this wider society as a fait accompli.

In any case, on turning to the discussion paper I could find no mention of any particular site, and it became clear that the actual method of disposal was still an issue. My confusion over this apparent contradiction gave way to shock when almost at the very end of the paper I found the statement "consideration for radioactive waste to be managed in such a way as to avoid imposing an undue burden on future generations". What did you intend to convey by "undue burden"? I always thought that the purpose of a DGR (deep geological repository) was that the waste would pose no environmental threat whatsoever over the hundreds of thousand of years during which there remains a significant level of radioactivity, and in any case would be irretrievable. Indeed, we read at the very beginning of the paper that "Disposal is the final step in the management of radioactive waste, and refers to the placement of radioactive waste without intention of retrieval." So if the waste is irretrievable, what action do you think our descendants in the remote future could undertake? And how you would communicate your instructions to these people? I must conclude that by "undue burden" you refer not to "onerous tasks" but rather to "undue harm", so that what you really mean is "consideration for radioactive waste to be managed in

such a way as to avoid imposing undue harm on future generations". That is the only way I can see for the original statement to make any sense. But then you would have to make clear what you mean by "undue": just how much harm do you think would be acceptable?

I see that the statement was taken from an IAEA report, but by quoting it as a guideline you have made it your own. It should be replaced by something on the lines of "consideration for radioactive waste to be managed in such a way as to avoid imposing any burden on our descendants, no matter how far in the remote future". This is how, until now, I have always seen the purpose of DGRs stated, and anything less is unacceptable.

The proposal for CANDU wastes is, I believe, to let them cool for a matter of decades in interim storage and then bury them irretrievably without reprocessing, i.e., without extraction of residual fissile material for recycling. For how long would such deposits remain radiotoxic? Various estimates have been given, but half a million years seems to be a typical figure. Can you guarantee that the method of containment would be leakproof for so long a time? My reading of the literature suggests that you cannot, and that you would have to rely on the exposed waste being sealed by the local geological environment. But how sure can you be that there will be no significant geological changes? And beyond that, how can you prevent the civil engineers, miners and archeologists of some future civilization from stumbling on the still toxic waste? All these questions have, of course, been asked many times, but the answers are not reassuring for the prospects of long-term safety.

But the situation is not hopeless, since with the technology of nuclear transmutation the chances are good that the radiotoxicity of the wastes can be made to fall to a safe level after only 300-500 years. This would change everything, as containers can be made to remain leakproof for at least this length of time. Moreover, some continuity of management, if at all necessary, can be envisaged: after all, we take care of our ancient monuments over much longer periods of time. A particularly attractive transmutation technology might become available with the Rubbia proposal for replacing uranium reactors

with accelerator-driven sub-critical thorium reactors (see Ref. 1, and Ch. 6 of Ref. 2), but it not the only option.

I strongly urge, therefore, that there be no irretrievable burial of waste until such a technology, which has already been shown to be feasible in principle, becomes available. Since this may take some years it is conceivable that a problem with the interim storage of waste will arise, in which case there should be no hesitation in making the appropriate cutbacks in the generation of nuclear energy: it would be intolerable to begin irretrievable burial simply because of a shortage of interim storage facilities. We must not attempt to solve the problems that we have created by dumping them on our distant descendants. To quote Jonas Salk: we must be good ancestors.

1. <https://www.weforum.org/agenda/2018/11/destroying-nuclear-waste-to-create-clean-energy-it-can-be-done/>

2. "Megawatts and Megatons", R. L. Garwin and G. Charpak (Knopf).