

# Comments on the Background Paper: "Adaptive Management in the Canadian Nuclear Waste Program"

## General

The paper lays out the potential advantages of adaptive management (AM), as summarised by an author who is one of the most knowledgeable experts in this area. The concepts that are laid out are of great relevance for any waste management programme and, in particular for the NWMO programme in its current phase, in which interactions with the public are a key element of choosing a future strategy. The intellectual level of the paper, however, seems to be more suited for professionals and to be rather high for public consumption. To improve this, the language could be simplified somewhat, and one could try to add more specific examples of the points being made.

The distinguishing features of adaptive management, as contrasted with other approaches, could be highlighted more. Not all is new in AM. For example, the importance of trust and confidence, of transparency and of seeking wide stakeholder input is recognized in most credible management approaches. The key features that distinguish AM are:

- an active commitment to systematic learning (coupled with open acknowledgement of uncertainties)
- the emphasis on retaining as much reversibility as possible, in case the chosen path proves not to be suitable for progressing towards the overall goal (which, in the present context, is safety managing radioactive wastes at all future times)
- the iterative evaluation of the "safety case" to provide feedback on the effectiveness of any stage and input for choosing further steps.

The appended figure on the decision process in adaptive management (taken from the National Research Council (NRC) report, "One Step at a Time", to which the author refers) has proven useful in discussion with stakeholders.

The fairly generic discussion in the paper could be strengthened by more specific considerations of what the application of AM could mean in practice for NWMO. The application will differ radically in the two up-coming phases:

- a) deciding which strategy should be applied in Canada for long term management of the used fuel
- b) implementing the chosen strategy in a manner compatible with AM.

The NRC report mentioned above focuses on narrower issues, in that it assumes that geological disposition has been chosen as the ultimate end-point and it therefore concentrates on the use of AM after repository siting has taken place.

A detailed reservation that applies to various statements made throughout the paper concerns the repeated choice of the word "experimentation" to characterise the AM process. Although it is clear to the insider that this is a legitimate description of one key

aspect of AM, it may cause confusion in a broader public, which tends to associate the word with completely open, and often risky, procedures, where the experimenter has little or no preconception of how things may proceed. I believe that, by emphasising instead the author's other very pertinent description – "making use of opportunities for learning" – , one may have more success in engaging the general reader.

## Detailed remarks by section

### *Introduction:*

An early reference to the Canadian situation, in which a highly technical programme was effectively stopped because a review panel with a much wider remit judged that there was a lack of sufficient societal support, might help set the context for the discussion.

The sentence in paragraph 2 about "knowledge that is both limited and substantial" is meaningful and important. It could usefully be expanded upon to make explicit the point that there is a vast reservoir of information already available on used fuel management options – but that, even when we have lots of information, there will be remaining gaps that will force one to take decisions in the face of the resulting remaining uncertainties.

The last sentence in paragraph 2 seems to lead the reader rather prematurely and unnecessarily to the issue of the future of nuclear power. I am not sure that this question has such a high profile in Canada as it does in many other countries. The Canadian emphasis can be more squarely on how to deal in an environmentally proper way with past and future arisings of used fuel.

### *Adaptive management and social learning:*

As an example of the general point on "experimentation" made above, the first sentence could read "Adaptive management treats policies as opportunities for learning, recognizing that surprises are likely and being prepared to use the new information gained from these".

The flight recorder example in paragraph 1 seems less instructive to me than an expansion of the application in ecological systems might be. Flight recorders are designed to give feedback primarily after things have gone (seriously) wrong. In ecological systems – and in waste management – the challenge of monitoring the effects of chosen actions on the system behaviour is more complex.

The economic management example in paragraph 2 is also very erudite. It could be backed up by a hands-on example of direct relevance to waste management – for example, the Swiss adaptation of their low-level waste repository concepts to include staging, retrievability and easy monitoring as a reaction to the negative public referendum on the Wellenberg project in 1995.

In paragraph 3, I am not sure that contradicting a hypothesis is always "more interesting". Confirming expectations and thereby contributing to validation of the system understanding and modelling that led to the prediction can also be "interesting". On the other hand, a contradiction does (or should) always have a bigger impact on future actions.

In paragraph 4, the good advice given on "controlling conditions" could be expanded to emphasise the importance of monitoring the outcomes and could possibly be illuminated by a specific example, e.g. on the problem of monitoring public feedback to the procedures being initiated by NWMO.

#### *How these ideas might appeal to used nuclear fuel in Canada*

In paragraph 1, it is unusual to talk about "repackaging" failed fuel elements. Does the author mean after container failure?

Paragraph 2 addresses the very important point about preparing the public and other stakeholders to understand that a change of plans (an adaptation) does not necessarily reflect a failure on the part of the implementer. It may be a natural result of a systematic learning process. This key message could be emphasised more.

In paragraph 3, the long time for which a plutonium hazard would exist seems to be less of a problem than the long time that almost certainly will pass before any release of any radionuclides from a repository will take place. This long period of containment makes it impossible to receive any direct feedback on the safety performance on a useful timescale.

Paragraph 5 returns to the above mentioned point of "conditioning" the stakeholders to see surprise in the correct light – i.e. as an opportunity for learning. The text concentrates on the media, but the topic is of course important also for decision makers and the public.

#### *Adaptive staging and the safety case*

As mentioned above, the quoted report was primarily on repository operational strategies. Applying the approach to the current NWMO stage of choosing basic options is an interesting challenge. In discussing repository operations, much debate centred upon the choice of monitoring methods that would feed data back into subsequent decision points. These methods were mainly (but not exclusively) technical. In the concept choice phase, monitoring of stakeholder views will be crucial.

In its current phase, the NWMO programme must address the task of using a safety case at a more general level, i.e. a safety case is needed for each of the waste management options that are to be seriously considered. For the extended surface storage option, there have been some attempts in the literature (e.g. from USDOE, the Scandinavian programmes, UK DEFRA, the Pangea organisation etc.), to construct a safety case that

could be compared with the geological disposal safety case. No completely satisfactory analysis has, however, been completed.

#### *Social condition for learning over long times*

Whilst all points made are good, the logical structure of the table is rather confusing. It is not clear whether the points raised and the related italic comments to these are meant to be initial conditions counterpoised against the challenges faced by AM or are simply relevant key facts and their impacts upon an AM approach. The differing introduction of the italic sections by the words "and" or "but" enhances the confusion for me.

I'm not clear why the 4<sup>th</sup> point should suddenly narrow concerns to "indigenous peoples"; it appears much broader to me.

#### *Conflict, trust and social learning*

The first paragraph contains a list of important messages that NWMO should be getting across to the public.

The fourth paragraph asserts that there has been a negative nuclear safety record in Canada. This is not my perception – although it is the case in many other countries.

The discussion on trust and confidence is all valid and useful.

When returning to the safety case, it could be worth emphasising again, as recommended above, that in its current phase NWMO needs a safety case for ALL of the options to be seriously considered. Even for the much discussed example of repositories, there is active debate on what exactly constitutes a safety case; for the other options, there has been little attention paid to this issue.

#### *Contingencies and questions*

The reservation expressed in the second paragraph about the relatively untried status of an AM approach are correct. In the NRC study, however, it was concluded that the chance of success with AM was enhanced by the fact that many of the principles of AM are in fact congruent with the principles of good and prudent project management.

When returning to the Seaborn report in paragraph 4, it could be useful to use this whole process itself as an example of AM. Stakeholder input to the process revealed, to the surprise of the technical managers, that more widespread support in the public was judged to be necessary before proceeding. This surprise and the resulting adaptation of the Canadian programme was looked upon by many as a "failure". However, the task that NWMO is now facing is to treat this as a learning experience and to adapt the way forward towards ensuring safe waste management.

Paragraph 5 is phrased in a way that is difficult to understand ("the strongest rival to adaptive management is probably a failed attempt at waste management:.."). It would be clearer to spell out what might occur with a linear rather than a staged approach and then to address the consequences (" .. dissipation of energy ..."etc – some of which happened already following the surprise ending of the linear approach taken by AECL.

Charles McCombie, 15<sup>th</sup> September 2003

Figure from "One Step at a Time:

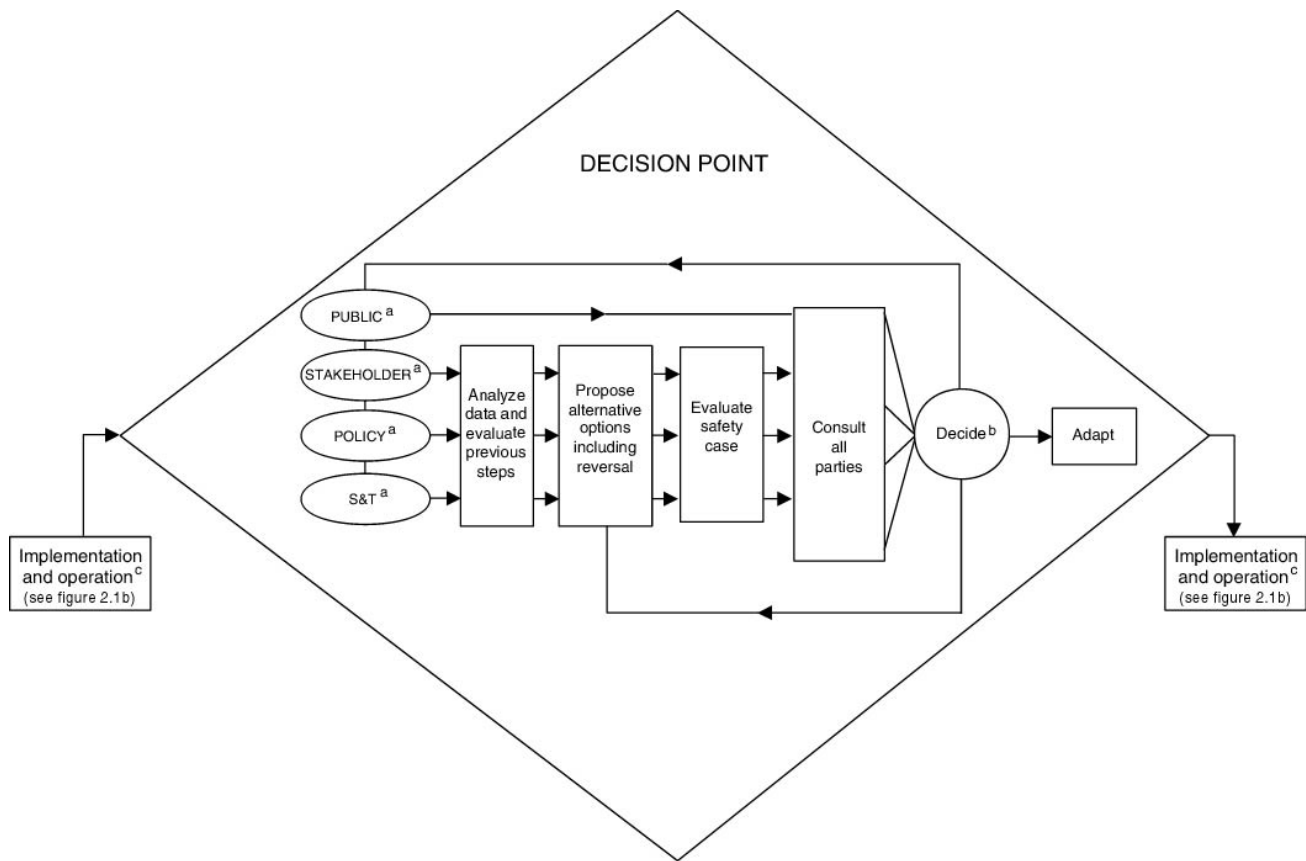


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