

## Radioactive Waste Is Also an Ethical Problem

Feature article by the 'Nuclear Waste Ethics Study Group': its members are Master of Arts Anne Albinus, Master of Science Jens Bjørneboe, Self-Employed Kirsten Braad Jacobsen, Master of Arts Niels Henrik Hooge, Master of Science in Public Administration Anne Lemcke, Vicar Jakob Fløe Nielsen, Bishop Karsten Nissen, Master Smith Bendy Poulsen and former Minister Bjørn Westh.

Published in the daily Politiken without the notes, 8 October 2014

WHAT SHOULD WE do with the radioactive waste in this country? That was the subject for a broadly composed study group that began working last autumn. The reason is that six sites based on technical and geological surveys have been designated as particularly suitable to host a final repository for Risø National Laboratory's nuclear waste. The decision triggered massive protest from the communities that risk ending up as 'nuclear waste dumps' and local citizens groups have worked hard to demonstrate that this solution is irresponsible and to find an alternative [1]. They are supported by foreign, particularly Swedish experts, and recently also by green NGOs that have argued that the Danish plans are not sustainable.

The study group did not only comprise of people with a background in natural science. A politician, two theologians, an intellectual historian and an academic philosopher participated. Also an editor of a website about radioactive waste and people active in one of the citizens groups. Our meetings took place in the bishop's residence in Viborg, because the diocese just as most of the country's other dioceses partake in the strategic environmental impact assessment of the waste repository and actively looks into the project.

IN MANY WAYS, our initiative reminded of a study group formed in France a couple of years ago to discuss the ethical basis of a geological final nuclear waste repository at the village of Bure in North Eastern France [2]. The originator was the bishop of Troyes and the members of the group, consisting of believers and non-believers, had all different backgrounds, convictions and perceptions of society and the world.

Just like the ethics group in Bure, we recognised that the planners of the repository must take on a much bigger responsibility for future generations than is customary for technical large scale projects, considering the long decaying periods of the nuclear waste. Because of the uncertainty connected with very long-term planning we also think that the precautionary principle plays a significant role.

The waste takes up approximately 10,000 m<sup>3</sup>. Most of it originates from the now closed down Risø National Laboratory [3]. Furthermore, hospitals, industry and research institutions produce approx. 6 m<sup>3</sup> waste annually.

THE MAIN problem is that even though the radiation from the waste abates, it is a very slow process. For most of it, it will take centuries before the radioactivity reaches a safe level. This part of the waste is called 'short-lived', not because a couple of centuries constitute a short time, but because the rest – the so-called 'long-lived' waste – keeps its radioactivity almost infinitively: hundreds of thousands of years or even longer.

Radiation is dangerous to humans and all living organisms. It can damage the genes and cause serious illnesses, so the fear of radiation is well-founded. Thus, we must find a safe method to deposit the waste in a way that guarantees that the risk of harming humans and the environment is as small as possible now and in the future.

But how is it to be done?

The Danish authorities' solution to the problem is to place the waste in layers of rock or soil so dense that they prevent the radioactive waste from entering the environment, when the artificial barriers no longer work.

This method is called final disposal and as the expression suggests, the waste is abandoned, when it is disposed of. In order for this method to work, one has to be certain that the layers surrounding the repository are not only impermeable, but also very stable. They have to keep their ability to isolate the waste for a very long time.

IN OUR OPINION, the problem with final disposal is scientific uncertainty: geology is not a predictive science and human intervention cannot be ruled out. The mathematic models that are applied are very simplistic descriptions of complex developments in the underground environment and cannot be verified over extraordinary long time. The geologists know the geological processes well and are able to describe a lot of, what has happened, but not so well that they can predict with certainty what is going to happen. To us, there is no doubt that the phrase 'final disposal' promises more than it can keep.

Considering that the responsibility to 'take care' of the radioactive waste is left to forces of nature that are known only to a certain degree, a final repository possesses a leakage risk both in the short and long term. Hence, future generations could be left with more serious environmental problems than the ones we currently have ourselves. At the same time we deprive them of the opportunity to treat the waste in a way that they themselves would perceive as proper. In our study group, we consider it a serious ethical problem that future generations are exposed to such a risk, because the scientific and technical arguments put forward in support of a final repository cannot guarantee that there is no release of radioactive substances into the environment. The problem is exacerbated by the fact that the authorities have downplayed this uncertainty.

THE QUESTION IS how to formulate these problems in – for lack of a better term – a *nuclear waste ethics*. In this context, in particular the principles of environmental ethics appear to be suitable: environmental ethics prescribes a duty to inform oneself on everything that could play a role in connection with a particular societal activity. If there is a disproportion between one's knowledge and the impacts of a planned project, it constitutes an ethical issue that can only be resolved, if the lack of knowledge is followed up by restraint.

In addition, it should be considered how to deal ethically with a risk situation, where the existing safety calculations are insufficient because of lack of information. In a situation, characterised by uncertainty, you cannot claim to have solved a problem just by demonstrating how much time and effort you have spent on solving it. In our opinion, this has a bearing on some of the general standards used in quality assessments of nuclear waste disposal facilities – e.g. BAT ('best available technology'), which normally is considered the highest standard.

IT IS ALSO worth noting that according to the international experts, the design and safety standards of the planned Danish final repository for nuclear waste do not live up to BAT.

Thus, we think that a criterion should be applied for the disposal of the waste, determining when there are no known probabilities of future events, the option, whose worst possible consequences are better than the worst possible consequences of all other options, should be selected. However, that would make it impossible to finally dispose of the radioactive waste until there is sufficient knowledge of how to do it in completely safe manner.

The question is then, if there are other possibilities of storing the waste, especially when the time perspective is considered.

It has been mentioned that it could be exported to a country with more experience in this field. The problem here is that other countries are also at a loss what to do with their nuclear waste. Exportation would only shift the problem from one place to another, whereas the ethical issues would remain the same.

Nonetheless, in our opinion it would be a good idea, if Denmark participated in an international collaboration to develop better methods to manage and store the radioactive waste.

THE CONCLUSION is, however, that it is not possible to get rid of the waste once and for all.

Thus – again considering the time perspective - we must look at the other options available to us. Is it altogether possible to protect ourselves and our descendants from the radiation from the nuclear waste in the ages to come? A nuclear waste ethics is only meaningful, if it can be put into practice.

Even though it has not yet been mentioned in the domestic debate, there is in fact an approach to the nuclear waste problem that lives up to the above-mentioned conditions and recommendations: realising that there is no safe method to keep the nuclear waste isolated from the environment for all future time, it has been suggested that the most responsible way to manage the waste is *rolling stewardship* – a concept first mentioned in 1995 by a committee under the U.S. National Research Council. Broadly speaking, it implies monitoring and maintenance of the radioactive waste in a period not specified in advance, where responsibility for the waste is transferred from generation to generation – including the possibility of retrieval, recharacterisation and repackaging of the waste [4].

The aim is to ensure that future decision-makers obtain the necessary knowledge, awareness and tools from earlier generations to make informed decisions about the management of the waste. First and foremost, it is important that current generations do not preclude future generations from exploiting the benefits of scientific and technological progress. The current generation cannot alter the course of action they will take, but it can ensure that the next generation is handed the proper tools and information needed to be aware of the problems it faces and make sound decisions. The concept can be described as a baton that one relay racer passes to the next leg of the relay. The runner carrying the baton cannot ensure that future baton passes will be executed smoothly, or that the race will ultimately be won, but has the capacity to run well during the current leg and can make sure that the baton passes without problems to the next.

TECHNICALLY SPEAKING, it is a framework for administrative decisions that can be tailored and improved over time by empowering each generation with greater information on stewardship tools and practices. Instead of guarantees that reach infinitively into the future, focus is on practical solutions that can be carried out today with some assurance of success. The framework comprises both technical and institutional control mechanisms and within these categories, a number of issues are considered, including legal, technological, financial, organisational and administrative, research and development, etc.

In our opinion, in the situation, in which we find ourselves at the moment, rolling stewardship cannot manifest itself in a final repository for nuclear waste - only in a modern interim storage facility, where the waste can be stored safely for up to a hundred years.

SUCH A storage facility - COVRA (Centrale Organisatie Voor Radioactief Afval) - exists in The Netherlands [5]. It has been in operation since 1981 and stores all the radioactive waste in the country. The waste is placed in solidly constructed buildings that are able to withstand extraordinary events such as airplane crashes, earth quakes, flooding, etc. They are designed to maintain a constant temperature and a constant low

humidity. The radioactive waste is encapsulated in barrels of steel and concrete, ensuring that very little radiation is released to the surroundings. At the same time, the low humidity minimises the risk of the barrels corroding.

Inside the buildings, the barrels are displayed on big shelves. This means that they can be watched at all times and easily repaired if there are signs of rust or cracks. Thus, it is possible to stop pollution at the source, whereas in a final repository, leaks are discovered only after the radioactive substances have entered the environment.

At the same time, COVRA is part of a deliberate set of measures to reduce the population's fear of radiation: not by downplaying the problems, but by demonstrating how to protect oneself against it. The storage facility has public admission and the staff is trained to communicate its knowledge to non-experts. On dosimeters handed out to visitors, they can see that they have not received more radiation than they would have received otherwise, and at the exit, they can make sure that there are no radioactive substances on their persons.

TO US THERE is no doubt that rolling stewardship and interim storage of the radioactive waste are supported by not only environmental and risk ethical considerations, but also by considerations for future generations. In our opinion, they should not be discriminated against. This view is shared by almost all types of universal ethics.

TO SUM UP, acting ethically with respect to nuclear waste management implies a willingness not to choose the immediately easiest solutions, but to make considerations for most other people the highest priority now and in the future.

Based on the above-mentioned, we have concluded that it is better to wait instead of rushing the flawed final repository concept through. The nuclear waste should be deposited in an interim storage facility, where it is safe and can be monitored until better solutions emerge. Alternative nuclear waste solutions need time to develop. In the meantime, resources should be invested in further development of nuclear waste management methods – primarily rolling stewardship. If no other solutions appear, the risks of interim storage should be weighed against the risks of final disposal. But there is no reason to make an irreversible decision now that there might be cause to regret later on.

Link to the original article in Politiken: <http://politiken.dk/debat/kroniken/ECE2417772/radioaktivt-affalder-ogsaa-et-etisk-problem/>

Notes:

[1] Five municipalities – five citizens groups against nuclear waste: <https://sites.google.com/site/atomaffaldklarhed/5kommuner5borgergrupper>

[2] Groupe de réflexion sur l'éthique de la gestion de déchets nucléaires: Gestions des déchets nucléaires, Réflexions et questions sur les enjeux éthiques, 2012: <http://www.villesurterre.eu/images/ethique-fascicule-complet-coul-sans-p-blanche.pdf>

[3] About the waste from Risø: <https://sites.google.com/site/atomaffaldklarhed/home/omaffaldet>

[4] Gordon Edwards: Comments on Consideration of Environmental Impacts on Temporary Storage of Spent Fuel After Cessation of Reactor Operation, submitted by the Canadian Coalition for Nuclear Responsibility to the US Nuclear Regulatory Commission, Docket ID No. NRC-2012-0246, 2013: [http://www.ccnr.org/CCNR\\_NRC\\_2013.pdf](http://www.ccnr.org/CCNR_NRC_2013.pdf)

National Environmental Policy Institute, NEPI: Rolling Stewardship: Beyond Institutional Controls, Preparing Future Generations for Long-Term Environmental Cleanups, 1999: <https://ndep.nv.gov/lts/rollings.pdf>

[5] Articles on COVRA: <https://sites.google.com/site/atomaffaldklarhed/besoegmellemlagerholland>