Geschäftsstelle

Kommission
Lagerung hoch radioaktiver Abfallstoffe
gemäß § 3 Standortauswahlgesetz

Beratungsunterlage zu TOP 3 der 6. Sitzung

Zusammenfassung des Kurzvortrages von Prof. Dr. Anne Bergmans

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“Internationale soziale und politische Aspekte bei der Endlagerung hoch radioaktiver Abfälle“

My contribution to this committee hearing is based on the results of a number of research projects focusing on repository governance (for different categories of radioactive waste and at different stages of policy preparation and implementation) and the interaction between ‘the social’ and ‘the technical’ on this subject.

InSOTEC: on the interconnectedness of the social and the technical

We recently finalized an EU funded project called InSOTEC, which stood for International Socio-Technical Challenges for geological disposal (www.insotec.eu). I would like to refer to this project in particular, because of the emphasis it puts on characterising radioactive waste management in general and geological disposal in particular as socio-technical activity. The outcome of the project demonstrates that, while one could distinguish certain aspects that are mainly social or technical, the boundary between them is often fluid, sometimes relatively arbitrary and in many cases the result of ‘an act of separation’ by one or more concerned parties, either unconsciously, or consciously, for strategic or practical reasons. We therefore view the process of defining what constitute ‘technical’ and ‘social’ aspects as being inherently dynamic and subject to change. In practice, this means that, ‘technical’ and ‘social’ are inevitably unstable categories that constantly reconfigure themselves, for example, under influence of concerned parties, such as scientists and local communities.

Geological disposal is a fine illustration of these processes. A dedicated expert community has been working for decades in relative seclusion from the wider society on a particular technical solution, the boundaries of which have been set mainly by technical experts and scientists. When confronted by a society reluctant to accept unconditionally the implementation of this solution, the challenge was initially considered to be a social and political problem, not a problem with the technology that was being developed. While this was understood as a challenge worth addressing and researching, it was seen as quite separate to the existing scientific and technical research and development (R&D) and management programmes, reinforcing within the field the divide between social and technical aspects.

InSOTEC set out to challenge this taken-for-granted and apparently common-sense distinction between technical and social aspects; and aimed to illuminate the nature of the challenges encountered by radioactive waste management and the dynamics at play by focusing on the interconnectedness and reciprocal influence of these two aspects.

Practical implications

I will now make these relatively theoretical reflections a bit more concrete.

The issue of TIME

The question of the interconnectedness and reciprocal influence of social and technical aspects is of particular relevance in the case of radioactive waste management (RWM) and geological disposal (GD), because of the extremely long timeframes involved. From my perspective, the issue of time is the most crucial ‘social’ aspect in relation to GD. This is due, first, to the longevity of some of the concerned radio-isotopes, and, second, the intrinsically long period between initial design, siting, construction, operation and aspired final closure.

With regard to the longevity, GD is an extreme example of the inevitable fact that any technology is confronted with a decrease in control, and an increase in uncertainty once unleashed from its experimental laboratory test environment. For many technologies, real verification only comes after implementation outside the laboratory. This is to some extent the case for your cell phones and wireless internet, but even more so for e.g. genetically modified organisms or GD facilities.

Any such facility will be an on-going sociotechnical experiment, and this at full-scale and in real time. Experiment in the sense of open-ended exploration, rather than the narrowly scientific definition of controlling all variables. Some authors use the term ‘social experiment’ (van de Poel 2011). But realising the concept of GD entails a long-term process in which experimental complexity (both with regard to the disposal technology and its social environment) can be reduced, but never fully avoided. Hence we prefer the adjective sociotechnical (Landström & Bergmans 2014).

With regard to the second aspect, the long implementation period implies that with or without deliberately adding reversibility to the concept of GD (I will come back to this notion later), it will take several generations before a fully-fledged passive GD system will be realised. The following passage from the InSOTEC final report, using the Finnish case as an example, illustrates this in a pertinent way (InSOTEC 2014: 22):

> … the timeframes for implementing geological disposal exceed those of any ordinary industrial project. Building a nuclear power plant, for example, may take a

decade (as the case of Olkiluoto 3 demonstrates[1]) and the operational lifetime of some of the existing reactors can be four decades[2]. But this amounts to only half of the time estimated for 'pre-closure' activity in many of the most advanced (and thus most concretely estimated) geological disposal projects, which one needs to consider a timeframe of at least 100 years, as the following quote from Posiva (2014) shows:

"The first preparations for final disposal already began in the 1980s. In 2000, the Olkiluoto island in Eurajoki was selected as the site for final disposal. The construction licence application for the repository was submitted in 2012 and the operation licence application in 2020. The final disposal is scheduled to start in 2022. According to current plans, the final disposal would end in 2112 and the repository would be sealed up by 2120."

This is, of course, under the assumption that no major deviation of this proposed schedule arises. However, the longer the timeframe the greater will be the potential for deviation. When we consider the historical timeline, nearly fifty years have passed between geological disposal featuring for the first time in 1957 as a formally proposed solution by the US National Academy of Science (NAS 1957) and the "decision in principle" for the repository in Olkiluoto that was ratified by the Finnish Parliament in 2001. A licence application for the construction of the concrete facility was submitted by Posiva in 2012. The Swedish implementer SKB applied for a license in 2011. As the above quote shows, the further implementation and operation is to take at least another century.

Over such an extended period of time, a changing socio-political and economic environment as well as evolution of techno-scientific knowledge will be inevitable. Governance processes will have to be able to face such evolutions.

Combining the two time-related observations (the inability to demonstrate 'upfront' the long-term safety of the facility and the longevity to implement GD as a full passive system), leads us to propose approaching the implementation of geological disposal as a '(scientifically) controlled, open-ended exploration towards a possible solution'. This may seem a subtle nuancing of the approach taken, but it has important ramifications with respect to the choice of geological disposal as a national RWM strategy.

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[1] In July 2014, twelve years after the decision in principle to build a third reactor unit at Olkiluoto power plant, and exactly nine years after the start of construction and first concrete pouring, due to repeated delays the new plant had still not been delivered. It is now estimated that construction of Olkiluoto 3 will be completed in mid-2015, which would put back full operation to 2018-2020 (AREVA 2014).

[2] Olkiluoto 1, to stay in the logic of the Finnish example, was connected to the grid in September 1979, following a five-year construction period (IAEA 2014).

A controlled, open-ended exploration towards a possible solution

First, this approach urges to be careful about presenting GD as a ‘product’, as the final solution to be implemented now in order to avoid burdening future generations. Future generations will be burdened. We have a moral obligation to pass on to the next generation all the necessary means to continue down the path we think to be the most promising, safe and sustainable long term option, but we have no means to ‘force’ them and thus no guarantee of reaching the end stage of a passive system. This has both policy implications, and implications for how to address the safety case.

It implies that a long-term management strategy and policy should be flexible, that is to say it should remain open to change, adaptation and correction. Flexibility thus also means the ability to maintain the capacity for technical innovation, which implies the continuation of research programmes as an integral part of the implementation process. This may have implications in terms of costs, but on the other hand allows for a more realistic implementation of an inevitably long and still-developing process, taking several generations to accomplish. A classical project-based approach, with a clear beginning and end-point does not work in this situation.

For example, in France, this flexibility in policy is being implemented through the Radioactive Materials and Waste Planning Act 28 June 2006 (*Loi n°2006-739 du 28 juin 2006 de programme relative à la gestion durable de matières et déchets radioactifs*). This Act stipulates three complementary areas through which “the sound management of long-lived high-level or intermediate-level radioactive waste” is ensured and “all investigations and studies relating to those waste categories shall be carried out”. The three areas of investigation are (art. 3)[3]:

- Partitioning and transmutation of long-lived radioactive elements
  “Corresponding studies and investigations shall be conducted with those concerning the new generations of nuclear reactors referred to in Article 5 of Planning Act N°. 2005-781 of 13 July 2005. Setting the Orientations of the Energy Policy and those concerning accelerator-driven reactors dedicated to the transmutation of waste, in order to provide by 2012 an assessment of the industrial prospects of those systems and to commission a pilot facility before 31 December 202”
- Reversible waste disposal in a deep geological formation
  “Corresponding studies and investigations shall be conducted with a view to selecting a suitable site and to designing a repository in such a way that, on the basis of the

[3] For an English translation of this Act, see: http://reviewboard.ca/upload/project_document/EA0809-001_ANDRA-_Radioactive_Materials_and_Waste_Planning_Act_.PDF

conclusions of those studies, the licence application of such a repository be reviewed in 2015 and, subject to that licence, that the repository be commissioned in 2025”

- Storage
  “Corresponding studies and investigations shall be conducted with a view to creating new storage facilities or to modifying existing ones by 2015 at the latest in order to meet requirements, notably in terms of capacity and time, as determined by the plan referred to in Article L. 542-1-2 of the Environmental Code.”

Other elements of this approach in practice

In view of implementing GD as a ‘controlled, open-ended exploration towards a possible solution’, a long term governance strategy is required, both at the national and local level.

At the national level, examples of existing bodies that could support such a policy would be the Swedish National Council for Nuclear Waste (Kärnafvallsrådet) and the UK Committee on Radioactive Waste Management (CoRWM). Both explicitly emphasise an interdisciplinary approach, independence and transparency as key elements.

The Swedish National Council for Nuclear Waste consists of members representing “a broad scientific knowledge in natural science, technology, the social sciences and the humanities in order to give a broad perspective to issues relating to nuclear waste and spent fuel”. The Council’s assignment is “to investigate and clarify matters relating to nuclear waste and decommissioning and dismantling of nuclear facilities and to give advice to the Government in these matters. The Council also serves as a knowledge base for other stakeholders such as concerned public authorities, the nuclear power industry, municipalities, NGOs, interested public and the mass media.” (http://www.karnavfallsradet.se/en)

CoRWM consist of experts in different aspects of radioactive waste management. According to its mission statement, CoRWM is “responsible for:

- providing independent scrutiny of and advice to ministers on their plans and programmes for the long term management of the UK’s higher activity radioactive waste (in England and Wales long term management includes geological disposal together with robust interim storage)
- scrutinising and providing advice to Scottish government ministers on their programme for managing higher activity radioactive waste in Scotland
- maintaining an independent overview of issues relevant to the government’s delivery of its radioactive waste programmes
- bringing any issues that we consider to be worthy of note or of concern to the attention of ministers”

(https://www.gov.uk/government/organisations/committee-on-radioactive-waste-management/about)

Also on the local (or regional)[4] level governance strategies should allow for a process of technical democracy. This means efforts need to be made to engage concerned parties in all stages from concept and policy development over siting to implementation.

Relevant experience can be drawn from the Belgian local partnerships for low and intermediate level waste (LILW). Bringing together local political actors and representatives from civil society, these participatory bodies investigated and considered the technical and social feasibility of implementing a repository facility for LILW in their municipality. They have developed a proposal for an integrated repository project (encompassing societal preconditions covering technical features, safety related measures, as well as socio-economic conditions and a strong demand to continue the participatory process) which was put to the respective Municipal Councils who were to decide whether or not to volunteer to become a host community.

From the Belgian case (and parallels can be drawn with Sweden and SKB's negotiations with potential host communities for GD) the following would appear most relevant:

- When the local level comes into the picture, communities hosting the waste in storage to date are by definition concerned parties that should be implicated in siting discussions, preferably early in the process.
- The notion of an integrated project gives a potential host community the opportunity to help shape the project to the benefit and well-being of its residents. Denouncing DAD (Decide – Announce – Defend) in favour of an ADD (Announce – Discuss – Decide) approach, has a potential for creating a broader ownership of the project.
- A shift from siting to hosting emphasises the relationship between the repository and its host community: both in Belgium and Sweden, the concerned communities expect further engagement with the preparations and subsequent implementation, from construction to closure and potentially beyond. This prompts us to see siting not as an isolated, 'single event' in the stepwise implementation process as identified by the NEA (NEA 2006) as is too often still

[4] This will depend largely on specific context elements, such as morphology, social and political geography, etc.

the case, but as part of a broader process of *near long-term* governance (Landström & Bergmans 2014).
- Meaningfully engaging local stakeholders in the conception of a complex technical project has proven to be feasible (Bergmans 2008).
- Monitoring and control are technical features of importance for local support and acceptance (Bergmans et al. 2013).
- Regulatory intervention should not be restricted to the phase of the licence application. Both implementer and regulator should be committed to engaging with and taking seriously local actors and their (safety) concerns.

To Conclude

The intrinsically long timeframes involved prompt us to think about geological disposal as a ‘controlled, open-ended exploration towards a possible solution’. A classical project-based approach, with a clear beginning and end-point does not work in this situation. Instead, it calls for flexible a long-term management strategy and policy that remains open to change, adaptation and correction.

For such a flexible approach, the capacity for technical innovation needs to be maintained. If this is to unfold in a democratic environment, long-term governance strategies are called for both at the national and local level, engaging a wide variety of scientific disciplines and concerned parties (among which necessarily communities hosting the waste in storage to date). Participation and stakeholder consultation activity should not be restricted to a delineated period of siting and should address all aspects (be they social, technical or socio-technical) of the long-term radioactive waste management strategy.

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