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### **Demonstration and Dialogue: Mediation in Swedish Nuclear Waste Management**

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## **Abstract**

This report analyses mediation and mediators in Swedish nuclear waste management. Mediation is about establishing agreement and building common knowledge. It is argued that demonstrations and dialogue are the two prominent approaches to mediation in Swedish nuclear waste management. Mediation through demonstration is about showing, displaying, and pointing out a path to safe disposal for inspection. It implies a strict division between demonstrator and audience. Mediation through dialogue on the other hand, is about collective acknowledgements of uncertainty and suspensions of judgement creating room for broader discussion.

In Sweden, it is the Swedish Nuclear Fuel and Waste Management Co. (SKB) that is tasked with finding a method and a site for the final disposal of the nation's nuclear waste. Two different legislative frameworks cover this process. In accordance with the Act on Nuclear Activities, SKB is required to demonstrate the safety of its planned nuclear waste management system to the government, while in respect of the Swedish Environmental Code, they are obliged to organize consultations with the public.

How SKB combines these requirements is the main question under investigation in this report in relation to materials deriving from three empirical settings: 1) SKB's safety analyses, 2) SKB's public consultation activities and 3) the 'dialogue projects', initiated by other actors than SKB broadening the public arena for discussion. In conclusion, an attempt is made to characterise the long-term interplay of demonstration and dialogue in Swedish nuclear waste management.

## **List of abbreviations**

EIA	Environmental Impact Assessment
EFÖ	Energi För Östhammar
FEP	Features, Events and Processes
IAEA	International Atomic Energy Agency
KBS	KärnbränsleSäkerhet
MKG	Miljörörelsens Kärnavfallsgranskning
Milkas	Miljörörelsens Kärnavfallssekretariat
NEA	Nuclear Energy Agency
OECD	Organisation for Economic Co-operation and Development
RD&D	Research, Development and Demonstration
SERO	Sveriges Energiföreningars RiksOrganisation
SKB	Swedish Nuclear Fuel and Waste Management Company
SKI	Swedish Nuclear Inspectorate
SSI	Swedish Radiation Protection Agency
SSM	Swedish Radiation Safety Authority

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## 1. Introduction

While still in its infancy, the Swedish nuclear power programme was threatened with rapid dismantlement as widespread public attention and concern became focussed on the exceptionally hazardous nature of the wastes this programme would bequeath to future generations. Thus, although by 1976, plans had been initiated in Sweden to pursue nuclear reprocessing and radical innovations in nuclear fuel supply these were soon abandoned as the pursuit of nuclear fuel safety and key innovations in waste management gained top priority (Elam and Sundqvist 2009a). This prioritizing of nuclear fuel safety over nuclear fuel supply was effectively guaranteed by a new piece of legislation introduced in 1977 called the Nuclear Power Stipulation Act. What this new Act did was to serve the nascent nuclear industry with a combined political and technical ultimatum: Either it is *shown how and where* nuclear waste can be finally disposed of with *absolute safety*, or the fuelling of further reactors will not be permitted. This ultimatum, although phrased in less draconian terms after 1984, when the Stipulation Act was replaced with the Act on Nuclear Activities, has provided the basic underlying *institutional template* for the programming and co-ordination of Swedish nuclear waste management for more than 30 years now.

Following in the wake of the Nuclear Stipulation Act, and the adversarial nuclear politics associated with it, advances in Swedish nuclear waste management since the end of the 1970s have continued to be pursued through a process which can be labelled *mediation by demonstration*. For decades now, Swedish nuclear waste management has been primarily framed as an institutionalised confrontation between state authority, on the one side, demanding to be *shown* continuing progress in the development of nuclear fuel safety, and the owners of Sweden's nuclear reactors, on the other side, dedicated to succeeding in this task. Therefore, after 1984, the consolidation of nuclear fuel safety and steps towards the safe geological disposal of Sweden's spent nuclear fuel, have been steps first researched, developed and demonstrated by the nuclear industry, before being comprehensively inspected, assessed and adjudged by state authority. Carrying out and co-ordinating the research, development and demonstration work (the RD&D programme) we find the Swedish Nuclear Fuel and Waste Management Company (SKB) directed by Sweden's reactor owners. Carrying out the inspecting, assessing and adjudging we have until very recently found firstly, the Swedish Nuclear Inspectorate

(SKI) and the Swedish Radiation Protection Agency (SSI), who merged during 2008 to form the new Swedish Radiation Safety Authority (SSM).

While mediation by demonstration can be seen as the central organizing principle of Swedish nuclear waste management it has over time had to confront, and continually wrestle with, its own limitations. Both the ability to convincingly *demonstrate* progress in nuclear waste management, and the ability to convincingly *inspect and adjudge* such demonstrations are immensely challenging to cultivate and maintain. Both abilities demand the allocation of sizeable resources, and given this, the danger is always that the two sides will grow parasitic upon each other. In particular, because the Swedish nuclear industry has been forced to stake so much of its reputation on its ability to demonstrate and deliver nuclear fuel safety, the perpetual danger has been that so many of the available nuclear skills and competences will be bought up and consumed in pursuit of this task, that *too few will remain* to effectively carry out the work of inspecting and adjudging the safety of solutions proposed (Elam and Sundqvist 2009b). In this context, the merger of SKI and SSI in 2008 to form SSM, can be seen as the latest attempt to combat such a problem of diminished competence through a consolidation of existing powers of inspection. Regardless of such moves, however, mediation by demonstration has also been perennially afflicted by a deeper and darker suspicion that the division of responsibilities on which it is founded, between industrial demonstrators and state inspectors, is not as genuine and as clear-cut as it has been publicly presented.

By 1977, when the Stipulation Act was introduced, the involvement of the Swedish state with the development of nuclear power was already well established and thoroughgoing (Kaijser 1992). At the heart of Sweden's commercial nuclear power programme were the old partners the State Power Board/Vattenfall (nowadays a wholly state-owned public company) and the electrical equipment company ASEA, becoming ASEA Atom through merger with the state-owned Atomic Energy Company in 1969. Thus, rather than 'independent inspection', mediation by demonstration has more accurately implied the work of 'self-inspection' through which the Swedish state has sought to demonstrate nuclear fuel safety firstly to *itself* in order to police and discipline its own intimate and long-standing commitments to the development of nuclear energy in Sweden. During the course of this work of rigorous self-regulation and inspection, the Swedish state has also had to contend with both sudden and gradual shifts in popular and party political support for and against the expansion of nuclear power

in Sweden, including the official policy 1980-2009 that the pursuit of nuclear fuel safety should coincide with the implementation of a domestic burial programme for nuclear power (Sundqvist 2002).

It is just in relation to this underlying convergence of ‘independent inspection’ with ‘self-inspection’ that the mediation by demonstration of Swedish nuclear waste management has been liable over the years to negative characterisation as a ‘technocratic’ process. If independent inspection has always converged on a task of self-inspection (state authority to a significant extent inspecting state-owned industry), then it is hardly surprising to find that mediation by demonstration has had a tendency to assume the form of a relatively closed and opaque world of internal state-industry affairs. However, as soon as mediation by demonstration becomes such a self-enclosed world, centring on SKB and SKI and SSI meeting in closed session, its legitimacy is immediately brought into question, as the crucial divide between demonstrators and inspectors grows imperceptible to Swedish society at large. As this crucial divide comes to appear as less fact than fiction, so democratic rule appears in danger of being suspended, and the neutrality of the state undermined (cf. Turner 2001).

Hitherto, the most serious crisis of mediation by demonstration in Swedish nuclear waste management occurred during the mid-1980s in connection with initial attempts to advance the siting of a deep geological repository for the final disposal of Sweden’s spent nuclear fuel. In the beginning of the 1980s, SKB pursued a geology-led siting strategy for such a repository. Up until 1990 it was planned to carry out 10-15 study-site investigations leading to the identification of three sites for further detailed investigations during the period 1992-98 (SKBF 1983). Initial study-site investigations were selected in a way to attain both a geographical distribution of sites and a broad selection of rock types (primarily gneiss, granite and gabbro) (Sundqvist 2002: 113). However, these primary investigations quickly ran into stiff opposition as local ‘rescue groups’ formed in practically every location that test-drillings were initiated joining up to form a national network of local community groups (the so-called *Avfallskedjan*) (Lidskog 1994, Holmstrand 2001).

By effectively denying SKB (and by implication SKI and SSI) access to the nation’s bedrock, local protests during the early 1980s succeeded in *derailing* the mediation of Swedish nuclear waste management by demonstration. Deprived of detailed geological data which could be



objectively interrogated in a way capable of producing a credible demonstration of where the final disposal of Sweden's spent fuel should ideally take place, SKB were forced to re-orient the whole of their research, development and demonstration programme (Lidskog and Sundqvist 2004). As a derailment of mediation by demonstration, this crisis was also, of course, just as severe for those tasked with inspecting nuclear fuel safety.

Given these circumstances, we can witness that by the beginning of the 1990s, all the major actors in the Swedish nuclear waste management field, and SKB and SKI in particular, were in agreement that something needed to be added to mediation by demonstration to assure future progress in the siting and establishment of a final repository for Sweden's spent nuclear fuel. This additional something, which after 1992 has allowed SKB's R&D programme to get back on track and move forward, is an accompanying process which can be labelled *mediation by dialogue*.

After 1992, mediation by dialogue has to some degree enlarged public participation in Swedish nuclear waste management, but it has done so firstly by acting as a means to remedy the shortcomings of mediation by demonstration, and to help guarantee the latter's long-term survival as the dominant mode of mediation within Swedish nuclear waste management. However, just because mediation by dialogue has allowed new actors to participate in Swedish nuclear waste management it has also, to some extent, opened up the organization of nuclear waste management to broader discussion, where the hegemonic position of mediation by demonstration is no longer so secure (Elam and Sundqvist 2007).

The rise of mediation by dialogue in combination with mediation by demonstration coincided with SKB's turn in 1992 to a siting strategy for a repository based on the alternative principles of voluntarism and local acceptance. This represents a fundamental break with a geology-led strategy, as local acceptance and a willingness to work together with SKB towards the final siting of the repository are now the overriding criterion for inclusion in the siting process. After 1995, this has meant that a KBS-3 repository is firstly destined to be sited in close proximity to one of the two historical 'home bases' of the Swedish nuclear industry: either the reactor site in the municipality of Oskarshamn, or that in the municipality of Östhammar.

The potential for mediation by dialogue to more seriously rival mediation by demonstration, rather than simply act as a repair mechanism for the latter, has been heightened by the introduction of new and

comprehensive environmental legislation in Sweden during the 1990s. The Swedish Environmental Code introduced in 1998 has introduced a new legal framing of how Swedish nuclear waste management should proceed, both complementing and competing with the pre-existing framing established through the Act on Nuclear Activities from 1984. The Environmental Code has clearly served to elevate the role of mediation by dialogue in Swedish nuclear waste management, but at present, no agreement exists as to what mix of mediation by demonstration and mediation by dialogue is called for in order to manage Swedish nuclear waste management with greatest wisdom and virtue (Elam and Sundqvist 2009a).

### ***Conceptual Clarifications***

As noted in the introduction our attention is on different approaches to *mediation* and the role played by *mediators* in nuclear waste management. Mediation is the work, or process, of intervening for the purposes of achieving reconciliation and agreement between different parties, overcoming division and an absence of mutual understanding and perspective. Mediation is about establishing connections and building common knowledge. The work of mediation draws people and things closer together, structuring interactions between them and allowing for new combinations and alignments of people and things to emerge. We argue that demonstrations and dialogue are the two dominant approaches to mediation in Swedish nuclear waste management. Demonstrations and dialogue are not mutually exclusive, as neither can be pursued without an element of the other being present. However, each can be made clearly subordinate to the other in different processes of mediation.

*Mediation through demonstration* is about showing, displaying, and pointing out things. Andrew Barry (2001) talks about demonstrations as being both sights and sites of truth. Demonstrations are ocular rather than oral. They are overwhelmingly visual events to be eye-witnessed; typically designed to show hard facts, the safety of new technologies for example, and the reliability of data. Demonstrations attempt to impress directly upon the mind's eye of their audiences, reducing the need for further discussion and dialogue. Demonstrations can be events to be witnessed by smaller or larger publics; they are typically directed at, and intended to hail and bring together a particular assenting audience. Thus, an arm's length division between demonstrator and audience is a constitutive feature. This division

is hierarchical, as demonstrators are either attempting to point things out to a laity, or trying to prove something to a panel of judges. The role of the audience is limited to witnessing demonstrations and to reacting to what they are being shown. Audiences may ask demonstrators questions, and may end up talking at length among themselves concerning what they have been shown, but it is the demonstration itself which sets the agenda for discussion.

*Mediation through dialogue* on the other hand, is about acknowledging the contingency of the facts and the realities at hand. It is accepted that there is more than one way of looking at things, and that there might be other, currently unknown and unrecognized, things worth publicly pointing out. It is no longer about one party trying to show other parties something irrefutable. Mediation by dialogue implies collective suspensions of judgement and ‘extended peer review’ where existing expert frames and reasoning for and against a particular technology are ‘stretched’, and weakly or strongly contested by alternative forms of expertise and lay knowledge which have previously been ruled ‘out of court’. This means that standards of truth, reliability and safety are potentially opened up for broader and more inclusive negotiation.

Mediators can be both people or things, actors or actants. The term ‘actant’ is used in order to avoid the idea that only humans have the ability to intervene and influence a situation (see Latour 1987, Callon 1986). Mediators have the ability to assume and hold a position in the middle of processes of mediation. It is through the existence and agency of mediators that people and things are drawn together in search of reconciliation. Successful mediators are the ones who/which find processes of mediation revolving around and passing through them. In the case of mediation by demonstration it is commonplace to find human mediators standing behind non-human mediators. Things (forms of evidence) are typically advanced as truth bearing to be witnessed and hopefully accepted, thereby expanding the rule of solid facts over interested opinions in decisions over the matter at hand. Through demonstrations, things are meant to unequivocally speak for themselves, and to rise above their surroundings, delivering some measure of higher understanding. If human mediators are to play an active part in this process, they are obliged to act more as ventriloquists speaking through the non-humans they hold up for inspection, and less as raw and unsubstantiated opinion. So with mediation by demonstration, *bodies of evidence* such as safety analyses are treated as key mediators in the middle of things and the legitimate centre of attention.

In the case of mediation by dialogue, key mediators remain predominantly human, as decision-making processes are usually not deemed to have come far enough for bodies of evidence to be treated as capable of speaking for themselves. It is harder for human mediators to stand behind impersonal bodies of evidence, as agreement has not been fully reached over relevant frames of reference for resolving the matter at hand. The key mediators in mediation by dialogue are those apparently neutral human mediators skilled at bringing dispersed actors with different frames of reference evoking different bodied of evidence together. It is the task of such ‘guardians’ of dialogical process to construct arenas for dialogue, pointing towards the possibility of establishing ‘common ground’ which can draw in and accommodate as many as possible of the relevant parties implicated in a particular matter of concern. In other words, the key mediators initiating and maintaining mediation by dialogue are the ‘go-betweens’ who take it upon themselves to try and talk different actors (both expert and lay communities) into talking with each other. If key stakeholders do not want to ‘play’ and cannot be persuaded to participate in mediation by dialogue then its role is curtailed. It is the combined depth *and* breadth of discussion that counts in mediation by dialogue determining its success or failure in moving policy processes forward.

The opposition of mediation by demonstration versus mediation by dialogue appears to support a distinction between what can be termed ‘upstream public engagement’ versus ‘downstream public engagement’. Mediation by demonstration appears to support the latter, where the relevant bodies of evidence underlying policy decisions are already largely agreed upon, whereas mediation by dialogue appears more appropriate in contexts where fundamental framing issues remain unresolved. *Upstream engagement* refers to such processes where open and inclusive discussions take place before too many decisions are taken, and before new technologies and strategies for science and innovation have been firmly established. *Downstream engagement*, on the other hand, refers to arrangements opening up for greater public involvement and participation in policy processes after many important decisions have already been taken. Typically, downstream engagement encompasses large doses of mediation by demonstration designed to win broader public support for policies and strategies already reasonably well advanced, where accompanying moments of mediation by dialogue are also firstly intended to provide further clarification of things already known and agreed upon. Also, just as downstream public engagement can be dialogical to some

extent, so upstream engagement may at times centre on demonstrations rather than dialogues.

*Transparency* is another commonly encountered term that frequently appears in policy documents today dealing with risk governance and public communication of science and technology. Often connected with attempts to enhance public understandings and engagements with policy initiatives, ‘transparency’ is typically taken as a value in itself, and a sign of ‘good governance’ (Hood and Heald 2006). The idea is the more transparency, the better, heightening the legitimacy of decisions taken. On the other hand, transparency can be thought of as stage management, that is, ‘systems that shape in complex and nuanced ways the roles of experts and audiences, their powers of speech and observation, and their abilities to control the display of science on the public stage’ (Hilgartner 2000: 149-150). Rather than simply accepting transparency as an intrinsic value, it can be argued that there are different forms of transparency, i.e. different ways of managing the divide between a transparent public front stage in key policy processes, and a continuing opaque backstage. Which qualities and forms of transparency and participation that have shaped and are currently shaping Swedish nuclear waste management are firstly empirical questions, which we shall discuss in the remaining sections of this report.

### ***Structure of the Report***

In the following three chapters different tools and approaches to the mediation by demonstration and dialogue of Swedish nuclear waste management will be presented and analysed. Chapter 2 discusses three of SKB’s safety analyses as historical cornerstones in the mediation of Swedish nuclear waste management by demonstration. Chapter 3 deals with SKB’s public consultation activities focussing on the nature of their commitment to mediation by dialogue. Here we rely on our field-notes and participant observations from a number of public consultation meetings. We also provide an analysis of power point slides used by SKB to introduce and frame particular instances of public consultation and discussion. In Chapter 4, our attention turns to attempts to advance the mediation of Swedish nuclear waste management by dialogue initiated by actors other than SKB: that is to say by SSI, SKI, and the Swedish National Council for Nuclear Waste, as well as the municipalities of Oskarshamn and Östhammar. We focus on five, so-called, ‘dialogue projects’ building our analyses on interviews with key actors as well as reports and other

written documentation from the projects themselves. In a concluding chapter we draw conclusions on the basis of our different empirical materials regarding the long-term interplay of mediation by demonstration and dialogue in Swedish nuclear waste management.

## **2. SKB's Safety Analyses: The Core of Mediation through Demonstration**

The Nuclear Power Stipulation Act, passed by the Swedish parliament in 1977, transformed nuclear power into an expert issue of safe handling of nuclear waste. From being an issue centring on political visions of the future of society, the expansion (or phase-out) of nuclear power became a technical challenge for experts from the nuclear industry to handle. This resulted in a clear conception of political roles, with industry tasked with showing – demonstrating – absolute (!) safety to government authority tasked with performing an oversight role.

In this chapter the centrality of safety analyses designed to meet the requirements of the new legislation is described. Three particular safety analyses are discussed, each of them carried out at critical junctures in the Swedish nuclear waste management process. The first is the KBS safety analysis presented in 1977 as a response to the requirements of the Nuclear Power Stipulation Act. This analysis became a strategic tool for gaining permission to fuel more nuclear reactors. The second safety analysis, called SKB 91, was presented in 1992 when SKB tried to formulate a new siting strategy based on local acceptance and voluntarism after the company had met strong resistance in their efforts to carry out geo-scientific investigations in search of the best bedrock conditions for geological disposal of spent nuclear fuel. This analysis focussed on the importance of bedrock for safety and was of great importance for accommodating a more flexible view on the bedrock conditions. The third safety analysis, called SR-Can, was presented by SKB in 2006 and was first planned to be a safety analysis on the canister for disposal and the encapsulation plant (where the waste will be sealed in the canister), but was expanded to include also site-specific data. This analysis will be further developed and will become a vital part of the final application, due to be sent to the Government in 2010, for the licensing of a final repository for spent nuclear fuel in either the municipality of Oskarshamn or Östhammar.

By describing these three safety analyses we will focus on their foundations and how they are performed, discussed and communicated. Is

there any room for dialogue about the basic content of any safety analysis, or is solely a matter for SKB's technical experts to decide over? In a thematic discussion we focus on who participates, and what kinds of demonstrations or dialogue are taking place in the preparation of safety analyses.

### ***Three SKB Safety Analyses***

#### *The KBS Safety Analysis*

The Swedish reactor owners rose to the challenge posed by the Stipulation Act by establishing a research, development and demonstration project called Nuclear Fuel Safety, in Swedish, *kärnbränslesäkerhet* (KBS). Already by the end of 1977, the KBS project had generated the KBS concept of nuclear waste management encompassing the deep domestic disposal of Sweden's high-level waste after the reprocessing of its spent fuel in France by the company COGEMA (KBS 1977a, Sundqvist 2002: ch. 4).

The KBS project quickly assembled a central co-ordinating group of 20 people and then during an initial 9-month period employed roughly 450 scientists and technicians to produce more than 60 technical reports launching the KBS concept of nuclear fuel safety (KBS 1977a: 17). This work was carried out in a situation where four nuclear reactors were nearing completion giving rise to the large-scale mobilization of scientific and engineering personnel behind the KBS project. The result of the project was a multi-barrier technical concept where the spent fuel would be reprocessed, vitrified and encapsulated in canisters of steel, lead and titanium, and then finally stored in tunnels 500 metres down in the bedrock, surrounded by sand and bentonite (KBS 1977a). However, what remained to be done was to demonstrate that this programme of handling and storage constituted a recipe for absolute nuclear fuel safety. For this purpose, the KBS project set about developing safety analysis as a central waste management tool.

The KBS safety analysis has in hindsight been called a milestone in nuclear waste management. For the first time, all available knowledge was put together in a safety analysis on a final repository for nuclear waste (Nuclear Waste Council 2007a: 13). A safety analysis is characteristically divided into three parts (cf. Nuclear Waste Council 2007a: 12). Firstly, *safety requirements* – norms and criteria – are specified usually following

standards set by domestic and international authorities. Secondly, *descriptions* of the features of the barriers and the processes and events influencing these features are specified. Thirdly, *calculations* are provided offering a picture of what will happen to the repository over time.

In the KBS safety analysis the radiation protection criterion to be satisfied are set at a maximum dose rate of 10 millirem per person per year for the most exposed group of people (see SSI review in DsI 1978:29, cf. KBS 1977b: 11).

The features of the different barriers are described in some detail and after that a few cases are presented based on specific assumptions. In relation to the canister, two main cases are analysed, based on specific assumptions regarding the features of this barrier: i) initial damage on one canister – counted as total lack of protection – and ii) encapsulation break through after 1,000 years for all canisters. The transportation of groundwater from the repository to the biosphere is set to 400 years, and retardation for different nuclides is specified. Calculations for three types of catchment area are also provided: a well, a lake and the Baltic Sea (KBS 1977b: 84-99).

In addition to these calculations some so-called extreme events and their probabilities and consequences are briefly discussed. These are glaciations, seismic activities, earthquakes, falling meteors, acts of war and sabotage, as well as human intrusion. The probabilities of these events are considered very low and if they occur the consequences are considered of less magnitude than the cases discussed above, i.e. the reference case assuming a slow break down of the canisters.

The main conclusion drawn on the basis of all the calculations is that the most severe case – a drilled well for drinking water close to the repository – implies an individual dose of 0.4 rem during 30 years, which will not happen during the first 200 000 years (KBS 1977b: 108). Therefore, the last sentence in the safety analysis report is that ‘The proposed method for the final disposal of vitrified high-level nuclear waste is considered absolutely safe’ (KBS 1977b: 109).

But how were all these assumptions established and how were the cases to calculate chosen and the extreme events picked? It is not easy to detect this from the report. A lot is said about the ‘most realistic case’ and ‘low probability’ based largely on the combination of a literature survey (studies in Canada and USA are mentioned) and what appears as common sense reasoning.



### *The SKB 91 Safety Analysis*

In their 1992 RD&D Programme, SKB claimed that from the geological investigations they had already carried out, it was no longer certain that the siting process for a final repository for spent nuclear fuel should focus on specified regions or kinds of rock. It was argued that it is ‘possible to find sites that meet the stipulated requirements in most parts of the country’ (SKB 1992b: 21). SKB referred to its own new comprehensive safety analysis, SKB 91, where safety was analysed in relation to the importance of the bedrock as a safety barrier, which showed that ‘the rock as a barrier to radionuclide transport is very limited’ (SKB 1992c: xiii).

According to SKB, geological factors will only be of importance during the construction work, when the repository is locally adapted to the surroundings (SKB 1992b: 40). SKB explicitly objected to the requests by the reviewers for a geologically driven selection procedure pushed forward on a more detailed scale (SKB 1992c: xvii). According to SKB, these objections were now justified by the SKB 91 safety analysis. Therefore, a new strategy of site selection was formulated on the basis of the assessment of the role of the geological barrier for attaining safety as described above. Candidate sites should not be selected by SKB on geological considerations. Instead, the new strategy meant that *feasibility studies* should be carried out in municipalities, which ‘through their own initiative, display an interest in having a closer examination made of the potential for hosting a deep repository’ (SKB 1992a: 66).

The SKB 91 analysis is based on safety requirements from authorities in the Nordic countries that were in agreement with those outlined by the International Atomic Energy Agency (IAEA) (SKB 1992c: 10). International cooperation is referred to, and it is stated that the collective opinion of the IAEA and the Nuclear Energy Agency (NEA) within the Organisation for Economic Co-operation and Development (OECD) is that a satisfactory methodology to evaluate long-term safety for geological disposal of nuclear waste now exists (SKB 1992c: 5). The safety requirements state that the individual radiation dose is to be less than 0.1 mSv/year (SKB 1992c: 11).

The barriers constituting the KBS 3 technical system, as the new concept was called, were slightly changed compared to the original KBS system. The waste is now non-reprocessed spent fuel and is to be placed in copper canisters, which are filled with lead. A buffer material of bentonite clay is to be used, and the canisters are to be placed one by one in holes in

crystalline rock at a depth between 300 and 700 meter. Site-specific data for the SKB 91 are taken from the Finnsjö area, not far from the Forsmark reactor site, where SKB in the middle of the 1980s carried out an extended site investigation.

A reference scenario is chosen, and from this, variations in relation to 13 factors are evaluated (SKB 1992c: 8). In the reference scenario, which is not considered to be the most likely, the probability of a canister being initially defective, due to manufacturing defects, was set at 0.1%. This is calculated as five or six canisters having a hole of 5 mm<sup>2</sup> in their welded joint (SKB 1992c: 8). Moreover, it is assumed that the defected canister is isolated from groundwater the first 1000 years and that corrosion or rock movements during the first million years do not effect the defective canister, or all the other canisters.

The reason for choosing this scenario as a reference relates to the aim of the SKB 91 safety analysis to calculate the importance of the natural barrier (bedrock conditions) for safety. In order to be able to calculate the importance of this, there must be a leakage from the repository. It is however argued that the most likely scenario is that all canisters will be in good condition and that groundwater will not come into contact with the spent fuel for a very long time, due to corrosion (SKB 1992c: 7). It is concluded that the factor most readily summarising the importance of bedrock for safety is the groundwater travel time from the canister to the surface (SKB 1992c: 174). The results of the calculations show that changes in groundwater travel time for water from repository to biosphere are relatively short, by most of the variations of the different characteristics of the 13 factors that have been performed. However, one exception is ‘flat-lying, highly conductive zones’, which cause significant changes, but neither these are leading to the exceeding of dose limits (SKB 1992c: 175).

Calculations do show that the leaking radionuclides from an initially defective canister travel directly up to the biosphere, without being retarded or absorbed on-route, the individual dose would not exceed the criterion of 0.1 mSv/year. For all nuclides, except cesium-135, the dose will not exceed 0.001 mSv/year, and for cesium-135 it will give a dose around 0.03 mSv/year (SKB 1992c: 170).

The conclusion that SKB draw from the SKB 91 safety analysis is that variations in bedrock conditions are of little import for safety. The importance of the natural barrier is to provide long-term stable mechanical and chemical conditions to give protection to the technical barriers. These

general requirements of the bedrock can be met at most of the sites that SKB had investigated, it is argued. Therefore, a KBS 3 repository ‘fulfils the safety requirements suggested by the authorities with ample margin’ (SKB 1992c: 178).

### *SR-Can Safety Analysis*

In October 2006 SKB presented a safety analysis called SR-Can. SR is short for safety report and Can stands for canister. Originally the plan was to present one safety analysis for the application to construct an encapsulation plant and one for the final repository for spent fuel. The first was to be called SR-Can and the second SR-Site. But during the work it turned out that no safety analysis was required as part of the application for the encapsulation plant, while SKB chose to use the SR-Can as a preliminary version of, or a dress rehearsal for, the final SR-Site study. SR-Can uses site-specific data from the site investigations in Östhammar (the Forsmark site) and Oskarshamn (the Laxemar site), but since these were not finalised only data from the early phase were used. One objective behind the presentation of SR-Can is to get a response from the state authorities on the methodology used and the interpretations made of the safety requirements. Already in 2004 a preliminary report from SR-Can was published and reviewed by the authorities. SR-Site is expected to be presented in the 2010 and will then be an important part, the main argument, behind the SKB application to construct a final repository for spent nuclear fuel.

The safety requirements for SR-Can are set by the authorities, and the fundamental criterion are found in figures released by the SSI stating that ‘the annual risk of harmful effects after closure does not exceed  $10^{-6}$  for a representative individual in the group exposed to the greatest risk’ (SKB 2006: 57). By harmful effects are meant cancer or genetic damage. In comparison, the criterion implies doses that are about one per cent of what is the naturally given background radiation in Sweden today.

In the SR-Can report, the barriers are presented as 10 sub-systems. The reason behind this division is to find enough large and enough homogenous parts making the system manageable, i.e. not having a too large number of components to calculate. The repository system is the KBS-3 method and among the 10 sub-systems we find the copper canister, but now with a cast iron insert, the bentonite buffer, and the host rock (SKB 2006: 79).

The methodology used in SR-Can consists of ten steps. The first is about identifying factors of importance, all the features, events and processes (FEPs) that can influence long-term safety. An SR-Can FEP database has been established. The first half of the 10 steps describe the initial state, relevant processes based on FEP screening as well as external conditions. The second half is organized around a reference evolution and a scenario selection (including a main scenario), as well as analysis of these scenarios (SKB 2006: 51-52).

Two main variants concerning external conditions are discerned during the one million years that are analysed: one where the glacial cycles are expected to be similar to the most recent one and are to be repeated seven times (in cycles of 120 000 years), and one climate change scenario, where the effects of anthropogenic gas emissions are influencing the first 200 000 years (SKB 2006: 201). The consequences are summarized as follows: a loss of buffer material is expected to increase over time, leading to possible canister failures over one million years, but the consequences of this are 'well below the regulatory risk limit' (SKB 2006: 20). Large earthquakes, however highly unlikely, could also possibly lead to failure of a few canisters. The greenhouse scenario, it is argued, is favourable for safety, because most of the risks are connected to glacial conditions.

A main scenario and six specified scenarios are developed. Six critical questions – three related to the canister barrier and three to the buffer barrier – are analysed in relation to specific scenarios (SKB 2006: 460ff). The conclusion of the calculations in relation to the main scenario and the additional scenarios is that canister failures can occur due to advection and corrosion. The analyses of the scenarios show that two of them could lead to canister failures – the advection/corrosion case and the case of large earthquakes – which together make up the risk summation.

In the requirements from SSI it is stated that consequences of future human actions should be analysed separately and not be included in the risk summation (SKB 2006: 514). 23 cases of human intrusion, described in 4 categories are analysed. Only one of this, 'drilling in the rock', is assessed as plausible, technically feasible leading to canister failure (SKB 2006: 518). Finally a few 'bounding cases' are analysed, such as 'a completely fictitious loss of barrier functions'. In the calculation of the most pessimistic of these – an initial total failure of the canister and buffer in all deposition holes at the Forsmark site – yields doses 'that are comparable to those caused by background radiation' (SKB 2006: 542). Based on the

results from the SR-Can study it is argued that both the Forsmark and Laxemar sites fulfil the SSI risk criterion, but it is not possible to decide which one is the best.

### ***Thematic Discussion***

In this section we discuss SKB's safety analyses in relation to *participation*, that is, who can participate and how, and how safety is mediated through *demonstration* and *dialogue*. After this we will make some concluding statements about SKB's way of carrying out safety analyses.

#### *Participation*

One important similarity between the three safety analyses is that they are controlled by SKB and closed for other participants. The KBS project was the largest and gathered around 450 scientists and technicians. The group was recruited in order to produce a well-integrated package of knowledge that could convincingly demonstrate safety and thereby fulfil the strict requirements of the Nuclear Power Stipulation Act. No outside experts, and of course no lay people, were invited to take part in the upstream work on how to carry out the safety analysis. Uncertainties, alternatives, lack of knowledge were enemies to fight; absolute safety does not permit such things. Neither were the assumptions, cases and events chosen to base the safety analysis on reflected upon in a way that made them transparent to an outside reader. The processes and events are of course just 'assumptions', well suited for broader discussion with different kinds of groups. But neither the development of the KBS technical concept nor the safety analysis were subject to broad discussion.

When the analysis was completed and became part of a formal application the Swedish government set up a review process. The government sent the KBS report for review to 24 Swedish and 23 foreign authorities and organizations (DsI 1978:28, 29). This could be understood as a downstream process, to engage reviewers after the analysis had been carried out.

In Sweden it is common, as part of the government's preparation for important decisions, to use a review procedure, in Swedish *remiss*. In this process a wide spectrum of organizations, private organizations as well as public authorities, universities, labour organizations and other groups are

consulted. The public is also allowed to give comments as individual citizens. The review procedure is widely viewed as a political process, providing 'a formal mechanism for elements of society, holding very diverse opinions and values, to express their opinions as to whether a proposed action is acceptable, as distinct from whether it is technically possible' (Johansson & Steen 1981: 60). Due to the wording of the Stipulation Act and the dominant interpretation, that the review should be about the safety of the KBS concept, the selection of reviewers also showed that this was not to be treated as a traditional review, but a more purely technical one.

The reviewers were universities and technical authorities, which gave 'absolute safety' a technical definition relating to whether a technical method, under presumably realistic conditions, could lead to a storage system meeting specific radiation protection standards. When the review process was framed in this way no one complained about restricted participation. On the contrary, as a technical review the participation was impressive: 47 organizations reviewing the work of 450 SKB experts.

As in the case of the KBS safety analysis, the SKB 91 project did not take advantage of a broad discussion on the description of the processes, events, the selection of the reference case and the different variations calculated. It is not clear from the report how the reference case was selected. Moreover, the case calculated in the KBS safety analysis on canister defects is very different from the one in SKB 91. In the KBS analysis the defect is assumed to mean a total lack of capsulation, while in SKB 91 the assumption is a hole of 5 mm<sup>2</sup>. It is hard to understand how the assumptions and selection of reference case and its variations are chosen; these are not reflected upon in a way that renders them transparent to an outside reader.

After completion the SKB 91 analysis was reviewed again but this time only by SKI and SSI. SKI made a highly critical review and argued that the general conclusions drawn in the analysis are strongly connected to the assumptions made about the features of the technical barriers. If the technical barriers are in good shape, the natural barrier will of course be of less importance. SKB's general conclusion that a KBS 3 repository 'fulfils the safety requirements suggested by the authorities with ample margin' is a direct consequence of the assumption of the long-term stability of the technical barriers. In such a case no calculations are needed to prove the safety issue. SKI argued that, to be useful as a safety analysis less

favourable cases should have been analysed. This would have made it possible to assess the natural barrier independently of other barriers and thereby also to discriminate between different sites (SKI 1992: 40-41).

### *Demonstration and dialogue*

As already mentioned, all three safety analyses have been the responsibility of SKB and have resulted in clear statements that a KBS repository is safe. The main objective of the analyses has been to *demonstrate* safety and thereby to convince the readers of the reports that a KBS repository is safe. This process of convincing has taken place in a downstream review process. We have also noticed that a dialogue process could not be identified in connection with the KBS and SKB 91 safety analyses, but what about SR-Can?

The two state authorities, SKI and SSI, together in a joint report reviewed the two preliminary safety evaluation reports from the Forsmark and the Laxemar sites, published by SKB in 2005 and 2006. In the review of the SR-Can safety analysis, also this time in a joint project, it is evident that SKB has taken advantage of the earlier comments from the two authorities. Many comments from the authorities relate to follow up questions to earlier requirements, questions and comments. In the preparation work, the two authorities consulted the two municipalities Oskarshamn and Östhammar as well as some relevant environmental organizations and tried to take advantage of their opinions, which are also referred to in the report. This is an example of upstream dialogue between authorities, municipalities and environmental organizations, however strongly coordinated by the authorities. Also the close interaction between SKB, SKI and SSI during the last couple of years, which could be seen as an ongoing review process of safety, is a kind of upstream engagement process, which was not the case with the KBS and SKB 91 safety analyses. This, however, will make it harder for the state authorities to have completely new and critical comments on the SR-Site safety analysis, when they have already concluded their review of SR-Can by saying that ‘SKB’s safety assessment methodology is overall in accordance with applicable regulations’ (SKI/SSI 2008). When reviewing the SR-Site safety analysis, that will be part of the formal application and licensing process, the new authority SSM, is firstly tasked with asking itself whether or not SKB has responded to judgements already fed back to them.

Six months after the publication of the SR-Can report, a report of more than 600 pages, a popular version of less than 100 pages, with the ambition of being readable for anyone without earlier experience of nuclear waste and geological disposal, was published. A targeted audience for this report was politicians and citizens in the two municipalities where site investigations are being carried out, Oskarshamn and Östhammar. This report signalizes a clear ambition of downstream engagement with a local audience.

However, the SKB view on broader upstream engagement is still negative. In the popular summary report it is stated that it is hard for lay people, lacking specialist knowledge, to understand the validity of the calculations and thereby the results of the safety analysis. This understanding is only available to experts, foremost those from the state authorities, and laypeople have to trust these experts (SKB 2007a: 96). In the main report, however, SKB is arguing – when discussing how to choose relevant scenarios, which is a crucial part of a safety analysis – that an important part of the uncertainties in the safety analysis has to do with scenario selection and that ‘[t]he selection of scenarios is a task of subjective nature, meaning that it is difficult to propose a method that would guarantee the correct handling of all details of scenario selection’ (SKB 2006: 61). This means that the kind of subjectivity that the selection of relevant scenarios presupposes is an open question. If SKB would take this statement seriously it would also have to reconsider the question of participation in its work with safety analyses.

### ***Conclusions: Narrow Technical Analyses or Upstream Safety Work?***

SKB’s safety analyses, presented at several important junctures in the history of nuclear power and nuclear waste management in Sweden, have been constructed as cornerstones in the mediation of nuclear waste management. They have been put forward as representing comprehensive demonstrations: SKB *showing* and *pointing out* safety to an outside audience.

To a great extent the safety analyses have been produced by SKB for the authorities as their primary target audience, and the only audience that really matters in terms of the task of inspection, evaluation and review. When popular summaries have been presented these have been more as public gestures, where no feedback of any significance for the process as a whole is expected. Overall the SKB approach is quite narrow, eschewing



broader public involvement in upstream matters, such as debates about what constitutes safety.

It can be expected that more groups will be interested in the SR-Site safety analysis when the time comes closer to the final decision. This analysis will give answers to questions about safety at the two sites in Oskarshamn or Östhammar, and also which one is the safest. But not much points in the direction that the municipalities, environmental groups, politicians or citizens have the ambition to more strongly engage in questions about how to perform a safety analysis, and SKB persists in its view that this is a too complicated issue for lay people to deal with, and that all that remain for these groups is to trust the involved experts.

That this way of doing safety analyses has remained dominant in Sweden can be explained by history: the strong requirements (absolute safety) originally placed on SKB. The company has shown its ability to adapt to new conditions and redirect its work in ways conditioned by society, but this has never happened to the way of doing safety analysis.

### **3. SKB and Public Consultations**

The nuclear waste issue is not solely mediated through SKB's safety analyses but also through SKB's public consultation activities. These involve a broader set of participants and are, at least potentially, more dialogue-oriented activities. While SKB's safety analyses were originally established in relation to the legislative requirements on 'absolute safety', the consultation activities connect to different legislation, the Environmental Code, and its requirements on environmental impact assessments (EIA).

EIA is a preventive and participatory environmental management tool, and refers to a document as well as the process out of which the document is formulated, that evaluates the effects on the human- and natural environment that may occur in connection with major projects or other activities (Wood 2003:1-2). The concept of EIA was introduced into Swedish legislation in 1987 (Balfors 1995:123) and in the two most important acts regulating the final disposal of nuclear waste in the early 1990's (SSI 1995:1-2). When the Swedish Environmental Code came into force in 1999, all environmental legislation was combined together. The Code prescribes that an application for a permit for activities that has an impact on the environment must include an EIA. The EIA should provide a

description of the activity's location, design and range as well as a description of alternatives (Environmental Code Chap. 6, 7 §). The Code stipulates the process to start early and that consultations should be made with those affected and a general public. In the Swedish legislation the developer is responsible for carrying out the EIA. Since the law does not prescribe in detail how an EIA process should be organized, there is a high level of freedom for the developer to define who the affected people are, and how, and to what extent they, and a general public can be included in the process.

After a brief presentation of SKB's consultation and information activities, we will discuss these from the perspective of participation, demonstration and dialogue. We have analysed all power point presentations that SKB have shown during their consultation meetings between 2002 and 2007. In addition, between 2005 and 2008 we have observed and taken notes from 11 consultation meetings (four regional and seven public meetings). This makes it possible to combine the analysis of power point slides with references to what was said in connection to the consultation meetings when the power points were presented. In this report we will use only a small amount of this material in order to illustrate SKB's approaches to mediation in their consultation activities.

### ***SKB's Consultation and Information Activities***

#### *Regional and public consultations*

SKB conducts regional and public consultation meetings in the two site selection municipalities Oskarshamn and Östhammar. These consultations have focussed on both the encapsulation facility and the final repository. The participants in the regional consultation meetings are SKB, the nuclear waste authorities SKI and SSI, the county administrations in Kalmar and Uppsala, and the municipalities Oskarshamn and Östhammar. The working format of the regional consultations took shape as early as 1994, when a MKB-forum (*eng.* EIA-forum) was established in Oskarshamn in connection with the proposed encapsulation facility (Elam and Sundqvist 2007: 33). The legally stipulated consultations started in 2002 when the site investigations in Oskarshamn and Östhammar began. This was also when SKB reported its plans to the County administrations and the project became a legally defined project (Sundqvist 2002:185-186).

*The regional consultations* are held three or four times a year in each of the two municipalities Oskarshamn and Östhammar. In Oskarshamn the regional consultations are termed *MKB-forum* and in Östhammar *MKB-grupp Forsmark*. The County administration has the chairmanship and the agenda is set by a group with representatives of all the participating organizations. The meetings encompass about 20 participants. Once a year MKB-forum and MKB-grupp Forsmark arranges a joint meeting. After pressure from the environmental organizations the regional consultations are since 2005 and 2006 open for the public to observe.

*The public consultations* are held once or twice a year in Östhammar and Oskarshamn municipality. The consultation meetings are held at places with easy access for residents living close to the planned facilities. Participants have the possibility to send in written statements within two weeks after the consultation meeting, in order to get their input documented in the minutes. SKB sets the theme and the agenda for the meetings and provides participants with relevant information material. In 2004 SKB held consultation meetings especially targeted at the environmental organizations. This was abandoned after SKB received critique from the environmental organizations, who wanted the consultation meetings to be open to all. Since 2005 local citizens and the environmental organizations have participated at the same consultation meetings. The format of the meetings has changed since SKB received criticism from consulted parties that too much time was given to SKB's presentations and too little time was left over to discussion and comments from the audience. An example of this is the consultation meeting in April 2005. SKB gave their presentations the first 90 minutes of the meeting. When there was 30 minutes left of the meeting, 'time for questions' was announced, but then delayed as SKB gave an additional presentation that lasted around 15 minutes (Public consultation, 2005). Due to critique, SKB changed the format of the meetings. Since 2006, SKB organizes a separate 'information meeting', open to everyone that is interested, that lasts for around two hours. On the same date a two-hour long consultation meeting is organized that starts with a short summary of what was said during the information meeting and after this the remaining time is devoted to questions from the audience. Thus, the change of format both increases the time that SKB gives presentations and the time devoted to questions and comments from the audience.

### *Local information activities*

SKB makes a distinction between formal consultations and other local information- and communication activities. SKB realized the need for good and respectful relations and communication after the mistrust they met locally in the beginning of the feasibility studies. These experiences founded the base for SKB's local information activities. The types of information activities ranges from seminars, meetings with schoolchildren and people in the neighbouring areas, study visits and Christmas fairs. An important part of the work is to create relations with local citizens in a more informal way and to spread practical information about the projects and ongoing activities in relation to the site investigations. Study visits are arranged for local citizens with guided tours, lectures and time for informal communication. For example, during 2004 more than 20,000 people visited SKB's facilities, around 6,000 of these were schoolchildren. Of the total amount of visitors about 5,000 people were from Oskarshamn or Östhammar (SKB 2004). The main body of visitors is thus not local citizens in the municipalities subject to site investigations. Another central information activity that started already in 1989 is the tours and exhibitions that SKB has organized onboard their ship m/s Sigyn, the ship that transports the spent fuel to Oskarshamn for interim storage (Eriksson 2003:107).

### ***Thematic Discussion***

The following sections aim to discuss SKB's consultation activities thematically: the first theme is about participation in a second section we discuss mediation through demonstration or dialogue at the public consultation meetings. This latter section includes an analysis of a selection of SKB's overhead slides that they present at the consultation meetings.

### *Participation*

Participation in the various consultation activities differs as the activities are organized differently and include different actors. The regional consultations involve SKB, the County Administrative Board, representatives from the municipalities and the authorities SKI and SSI as *participants*, and the general public, including environmental organizations as *observers*. The public consultation meetings are open to the public, including interested parties such as environmental organizations. In addition, SKB emphasizes that consultations take place all the time and that

the local information activities are important occasions for contacts between SKB and parts of the public (see Johansson 2008).

Representatives of the municipalities and the environmental organizations have expressed the opinion that they would like to be included also in other fora that they do not have access to. For example, the project leader of the nuclear waste project in one of the municipalities said that she experienced that they have little insight into the dialogue between the authorities and SKB:

We have asked about the possibility for us to participate as observers at some meetings, the expert meetings between SKB and the authorities. And the answer we've got is that it's not possible, we can't [...] The motive for this was probably [...] that you don't want too many at these meetings, and the meetings cannot be interrupted by questions (Interview, Östhammar).

The regional consultations are since 2005 and 2006 open to the public, including NGOs, to attend as observers. Environmental organizations have requested to be official participants at these meetings. SKB and SKI denied this, with reference to the need to maintain an efficient meeting format (SKB 2005; SKI 2005). A representative of one of the environmental organization argues that the regional consultations are not proper consultations according to the Environmental Code, since everyone is not welcome and that it is not acceptable to raise all type of questions. The same representative argues that it is unfortunate that the participation of environmental organizations has given the meetings a higher level of legitimacy:

With our participation we make the "consultation meetings" appear as "consultation meetings". In some minutes, [SKB] can show that we had influence on the discussion. At the same time, we are not allowed to talk, we cannot contribute to the material that is sent out to all participants in advance, we cannot send in written statements afterwards and we do not get any written material before the meeting, things like that. So I believe we have contributed in watering-down the process. (Interview, environmental organization).

The lists of participants at the regional and public consultation meetings from 2005 to 2007 in SKB's minutes indicate that there has been an increase in the variety of participants. In 2005, the environmental organizations participating were MKG (*Miljöorganisationernas kärnavfallsgranskning*) and Milkas (*Miljörörelsens kärnavfallssektariat*) and to some extent a local section of the Swedish Society for Nature

Conservation. Since 2006, other NGO's like SERO (*Sveriges Energiföreningars RiksOrganisation*) a national association for the promotion of renewable energy, and a local association, EFÖ (*Energi för Östhammar*), have also been involved. Since the regional meetings were made public, between 10 and 20 people representing the public and the above-mentioned organizations have participated as observers. The public consultation meetings have on average involved about 50 participants at each meeting, and the number of people representing the public (i.e. not representing SKB or any of the authorities or above-mentioned organizations) varied from 10 to 40 (SKB 2005-2007).

Compared with SKB's work on safety analysis, which primarily involves technical experts; the consultation process involves a broader set of actors. While participation at the regional consultation meetings is restricted to a few actors (authorities, representatives of the municipalities and the county administration, and SKB) there is at least a possibility for a wider public to attend the meetings as observers. The public consultation meetings are in principle open to everyone that is interested. That the public consultation meetings have not attracted many participants is not surprising, this is more the rule than exception in public consultation processes. One aspect of the public consultations that potentially could be different from SKB's work with safety analysis is *the framing* of the nuclear waste issue: since the consultation process gathers a broader set of actors, such as, citizens, local politicians, interest groups, it is perhaps less technically framed and more open for dialogue rather than demonstration.

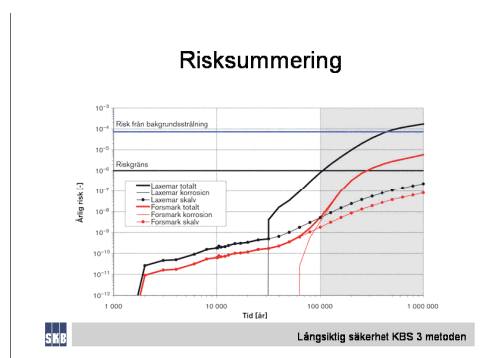
### *Demonstration and dialogue*

In order to analyse SKB's approach to mediation at public consultation meetings we now turn the focus to SKB's presentations that precede the comments and questions from the audience. SKB's presentations form a significant part of how issues are framed and what type of questions and comments that can be expected from the participants at the consultation meetings. As SKB uses a substantial number of overhead pictures at their information meetings in connection with public consultation meetings, we will in the following discuss how these can serve as 'mediators', when SKB present their analyses of safety and the KBS-3 concept in relation to alternative methods for nuclear waste disposal.

A public consultation meeting in Östhammar municipality, on the 31<sup>st</sup> May 2007, focussed the theme *safety, radiation protection and long-term safety and the results from the safety analysis SR-Can*. About 50 people

attended the meeting and of them, about 15 were representing NGO's or the general public. Other attendees represented the authorities, the county administration, and Östhammar municipality (SKB 2007b).

At the information meeting that preceded the consultation meeting on the same day, SKB presented their work with the safety analyses. SKB's overhead slides contained text and pictures, plans and sketches of technical details, questions, and some conclusions. One example is the risk curves presented below (Picture 1). Risk estimations of the investigated sites in case of 1) corrosion of the copper capsules and 2) quakes, are in this picture put in relation to the background radiation (the upper horizontal line at the top of the picture) and the risk limits set by the authorities (the lower horizontal line at the top of the picture):

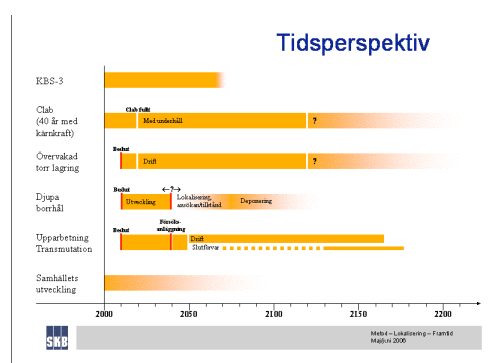


Picture 1: Risk summary

The picture shows that the risk with KBS-3 is lower than the allowed limit. When the risk connected with final disposal is put in relation to background radiation in this way, the impression given is of a very small risk. One way to interpret the picture is that since the risk curve for the nuclear waste repository shows less risk than the curve for background radiation, the repository is virtually safe.

At another public consultation meeting, in Forsmark on June 1<sup>st</sup> 2006, the theme was *alternative methods, the siting process and society's future ability to take care of the spent nuclear fuel*. At this meeting one of SKB's consultations showed results from a study of society's future capacity to take care of spent nuclear fuel. The consultant showed a series of slides, that illustrated that KBS-3 was the only reasonable alternative within a time span that we reasonably can foresee society's development (which the consultant argued was around 50 years). Other, alternative methods, it was

argued, would need more than 50 years to be developed to the same degree of maturity as KBS-3 has reached today. At the bottom of one picture is one line, showing the society's future development and at the top is the line that shows KBS-3, the four time lines in between show other, alternative methods, in the following order, starting from above: 1) the zero-alternative, the waste continues to be deposited in the central interim storage, 2) surveilled dry deposit, 3) deep boreholes and 4) transmutation.



Picture 2: Time perspective

The picture demonstrates that the KBS-3 method is the only method that is fully compatible with the development of society. This is a clear example of mediation by demonstration: the picture speaks for itself and leaves the audience with an impression that the KBS-3 alternative is the only choice. The same picture was also shown the day before at the equivalent public consultation meeting about alternative methods that was held in Oskarshamn the 31<sup>st</sup> May 2006. This time, the picture was shown in connection with a list of requirements reference-points, for example that safety should be based on multiple barriers; that the final disposal should not require monitoring and service, and that the goal should be to avoid putting burdens on future generations. The presenter from SKB said that “I stop there without doing any valuations; I think this picture is worth a thought” (Public consultations 2006). This gives an even clearer impression that there is only one method that can be chosen, because none of the others can cope with all the requirements recounted. It serves as free-standing evidence of KBS-3 as the superior method, and that it has to be built soon, before society gets unstable. The picture with time perspectives has been used and given a prominent function at both meetings. In the way that alternative methods are presented and put in relation to the



development of the society and long term safety makes it an argument rather than a neutral description.

SKB often refers to legislation to reinforce the reasons behind its undertaking, for example by showing slides with quotes from the environmental code. There are also a number of references to SKB's own reports and studies, describing what has been studied in each report. When we have searched the entire material with SKB's overhead slides for pictures showing safety, the same pattern appears: safety is mainly mediated through demonstration. There are some examples of overhead slides that show uncertainties, however, these examples either declare that more studies are needed on specific areas, or show pictures describing what SKB does not have all the answers to *yet*. For example, at a regional consultation meeting on the 5<sup>th</sup> December 2007, a slide described in text that SKI believed that SKB has not been able to fully write stress corrosion off as a reason for capsule breakage, and that SKB, for this reason had initiated a new research project focussing on this.

Over all, the pictures are demonstrative and the slides communicate that something is safe, often by presenting pessimistic estimations that have been made and complicated results from technical studies. They include text or pictures that convey trust and argue that SKB can control safety. In addition, the meeting format at the public consultations does not allow dialogue to take place: they are shaped by SKB setting the agenda and starting off with long presentations on which questions from the audience follow. It is the audience that asks questions to SKB, not the other way around. There is little background given to the results, SKB communicates results and ready-made facts, not the background behind them.

### ***Conclusions: Demonstration Disguised as Dialogue?***

There are many examples of mediation by demonstration in SKB's overhead picture presentations. It is unavoidable that only a selection of information can be presented in overheard slides. A consequence is however that it is difficult for the viewers to judge the facts, values and reasons behind what is shown. Since a dialogue over the values, uncertainties, or decisions behind the results is never encouraged at the consultation meetings, the consultation process is characterised by downstream engagement. SKB presents around already defined problems and results from studies already completed.

SKB talks about the consultation process as opportunities for ‘dialogue’ and that all participants have the possibility to raise issues and to influence the process. When it comes to safety issues, however, the consultation process is rather characterised by demonstrations disguised as dialogue. The next chapter will describe other activities that have aimed to be more dialogue-oriented and that have been undertaken on the nuclear waste issue, but by other actors than SKB.

#### 4. The Progress of Mediation through Dialogue 1991-2008

On the 14<sup>th</sup> of March 2007, at the launching of a transparency project aiming to ‘illuminate’ important issues in dialogue with other nuclear waste actors, an official presentation of various dialogue projects that have taken place in Sweden was offered to a broad set of nuclear waste actors. The new project organized by the Swedish National Council for Nuclear Waste was presented as a continuation of a series of dialogue projects, which have been pursued since the early 1990’s (see table 1). The administrative director of the council pointed out that there had been different organizations ‘hosting’ dialogue: first it was the authorities SKI and SSI, later on the municipalities (first Oskarshamn and later Oskarshamn and Östhammar jointly) and now, the Council for Nuclear Waste intended to become the focal point for more inclusive discussions.

The dialogue project	1991-1993
RISCOM pilot project	1996-1998
RISCOM II	2000-2003
Hearing – site selection	2001
The Oskarshamn model	1994 -
ÖSOS	2004 -
The transparency programme	2007 -

Table 1. *Dialogue projects mentioned at the launching of the Nuclear Waste Council’s Transparency programme*

The study presented in this chapter is partly shaped by this official presentation of dialogue projects. We are aware that there will also be other, alternative, and perhaps equally ‘official’ presentations, but our empirical starting point is the Council’s announcement of a new dialogue

project running as an extension of previous dialogue projects<sup>1</sup>. Moreover, it is not clear what is meant by ‘continuous dialogue’, so we take the meaning of what was said above to be an open question. Similarly, it is an empirical question what the qualities of these projects are that have enabled them to be labelled ‘dialogue projects’: who has participated in the dialogue, have they been characterised by upstream or downstream engagement, and what are the actual combination of mediation by demonstration and by dialogue? We base our analysis and background descriptions of the projects on eight interviews with six key actors (the initiators, or in other respects important persons within the projects), the final reports and other official documentary material from the projects, as well as notes from observations of one of the projects (see Appendix).

In the introduction of this paper we referred to the wave of local protests that arose derailing the mediation of Swedish nuclear waste management by demonstration in the mid-1980s. The first dialogue project that we present was a reaction by state authority to this situation. SKI thought that something needed to be done, and *The Dialogue Project* was one outcome.

### ***Five Dialogue Projects***

#### *The Dialogue Project*

*The Dialogue Project* ran from 1990 until 1993. It was organized as a simulated review process of an application concerning the final disposal of nuclear waste, seeking permission to construct a final disposal system of KBS-3 type (SKI 1993a). SKI initiated and funded the project, hoping that the project could lead to a common view around the decision-making process and assist SKI in developing a credible review process in the future. A group of three people formulated the project idea. These were Kjell Andersson, theoretical physicist who worked with safety analyses at SKI, Clas-Otto Wene, nuclear physicist at Chalmers and member of the Swedish National Council for Nuclear Waste, and Staffan Westerlund, professor in Environmental Law at Uppsala University. They later formed what was termed the ‘playing group’ together with three officials from

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<sup>1</sup> We have chosen to analyse the following five projects: The Dialogue Project, RISCOM I and II, The Hearing on Method and Site Selection, The Oskarshamn’s Model and The Transparency Programme. The reason we have excluded the collaborations between Oskarshamn and Östhammar (ÖSOS, table 1) is that compared with the others it does not meet our criteria for being a project in its own right, based on some more explicated ideas about how the dialogue should be organized. The chosen projects to a greater or lesser extent fit into this loose definition of being a ‘dialogue project’.

SKI. The selection of participants was made through an open invitation to a number of organizations. Those who chose to participate were the authorities SKI, SSI and the Environmental Protection Agency, two nuclear municipalities and three environmental organizations and together they formed the 'actor group'. The organizers and the Chairman of the actor group, a former judge, were selected by SKI, otherwise, the invited organizations chose their representatives themselves.

The project was organized in two parts. The pilot study prepared for the core study, developed and tested the method, and resulted in a decision by the actor group on how to continue the project (1993b: 5). The core study consisted of a number of activities but the main activity was an extended version of a role-play pursued in the pilot study, formed as a two-day public hearing. It was framed as a court proceeding and each participant in the actor group acted according to their own understanding of the issues at hand. Since SKB chose not to participate, one of the organizers played SKB's role as the implementer. In order to review the simulated application, the participants in the actor group had received their own budgets to enable the engagement of independent experts and seminars and group projects were held to prepare the actors (SKI 1993a).

The result of *the dialogue project* was a number of joint decisions on what a real review process should look like. In the report from the actor group it was concluded that the EIA process (SKI 1993b: 3) should be characterised by openness and active participation, that actors such as municipalities, environmental organizations and local residents should be given sufficient economic funding in order to facilitate their participation in the process, that it should be considered whether another body than the implementer should be the organizer of the EIA process, and finally, that the process should start early. Among the more substantial issues that the actor group agreed upon were: the need for a continued development of alternatives to KBS-3 and the need for a systematic approach to site selection (ibid: 6f). SKB was not involved in the dialogue project and the decisions taken by the actor group were not considered by SKB when they organized the EIA process ten years after. The organizers of the dialogue project were also involved in the RISCO projects that are described below.

### *RISCOM I & II*

RISCOM is a set of principles identified in order to improve quality in decisions over complex technical and scientific matters. RISCOM also refers to two concrete projects: RISCOM I, a pilot project conducted between 1996 and 1998 and RISCOM II, an EU-funded research project that ran from 2000 to 2003. Both projects were research projects aiming to develop procedures to increase transparency in relation to nuclear waste management.

During the mid-1990s, SKI saw the need for a broader participatory consultation process. Oskarshamn municipality had called for increased support from the state authorities and SKI bore in mind the experiences from *the dialogue project* and realized that they needed a new, more open public profile (Interview, SKI). RISCOM I was thus a continuation of the work initiated in *the dialogue project* and was pursued by more or less the same people. SKI hosted and funded the project together with SSI. The project emerged out of discussions between Kjell Andersson, SKI and SSI with the needs of the authorities foremost in mind (Interview, SKI). The aim was to develop procedures to increase transparency in decision-making processes and the decision base in the nuclear waste area, making it more open to people outside the groups of experts and political decision makers (SKI 1998). The RISCOM model, as a set of principles and methodologies, was developed during the course of RISCOM I by Andersson, Wene who both were involved in *the dialogue project* and Raul Espejo, management consultant working in the field of organisational cybernetics. According to them, ‘transparency’ needs to be understood in relation to three equally important pillars: technical/scientific issues, normative issues and authenticity.<sup>2</sup> A decision has legitimacy when facts, values, and interests behind a decision are displayed in public. A central concept of the RISCOM model is “stretching”, which refers to a practice when central actors in a decision making process are gathered in front of a wider audience that challenges their claims to truth, validity and authenticity by posing questions from different perspectives.

RISCOM I and II involved a number of different activities to test procedures and involved participants from several stakeholder groups. One activity was a ‘Team Syntegrity workshop’, organized in order to compare decision processes in Sweden and the UK. The aim was to let participants contribute to the purpose and agenda in a non-hierarchical manner (SKI

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<sup>2</sup> These elements were picked up from the philosopher Jürgen Habermas’ theory of communicative action.

1998:21).<sup>3</sup> RISCUM II included a number of activities in the participating countries Sweden, UK, France, Finland and the Czech Republic. These activities were more or less testing various forms of dialogue processes and involved a wide range of stakeholders, in combination with activities such as evaluations, argumentation analysis, interviews, and focus groups (SKI 2004). One of the activities in RISCUM II was a hearing in Sweden. Since the hearing was part of a formal review process of SKB's proposed R&D programme, we describe this event separately in the next section.

### *Hearings on method and site selection*

When SKB had finished their feasibility studies in a number of Swedish municipalities they suggested in their RD&D programme 2000 to move forward with site investigations in four municipalities. SKI and SSI wanted to improve their knowledge base in order to be able to review SKB's plans and decided to arrange public hearings in these regions (SSI 2001). The authorities engaged Andersson and Wene as consultants to develop a format and method for the hearings and as a result, the hearing also became an integrated part of RISCUM II. The methodology used was based on the RISCUM model, intending to stretch facts and values held by central actors in nuclear waste management (SSI 2001). A steering group with representatives from SKI, SSI and the consultants was set up. A reference group was formed with representatives from the municipalities and SKB that discussed the practical arrangements. The hearing was targeted at politicians and civil servants in the municipalities, and was open to the general public (SSI 2001; SKI 2004).

In total, three hearings were conducted. The hearings in Hultsfred and Tierp were held over two days and concentrated on the choice of method for final disposal of nuclear waste as well as site selection. SKI, SSI and SKB held presentations, questions were formulated during group discussions, and at the hearing these were presented to the panel that consisted of SKB, SKI and SSI. The hearing in Nyköping focussed the same issues but was shorter and did not allow for any group discussions. Discussions at the hearings covered technical, legal and social aspects of

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<sup>3</sup> The RISCUM I report refers to the 'Shap Wells Report' as the place where the final statements that was agreed upon in the workshop can be found. Given that the RISCUM I report neither presents the final statements, nor gives a proper reference to the Shap Wells Report, it seems as if the aim with the workshop – the participatory element of RISCUM I – was primarily to develop the methodology and not to reach conclusions over substantial matters in nuclear waste management.

the choice of method and site. Most of the participants were in some way already involved in the question and according to an evaluation of the hearings there was scarce participation from the public (Drottz-Sjöberg 2001).

### *The Oskarshamn Model*

While RISCOS II and the hearings described above overlapped in time, *the Oskarshamn model* developed soon after *the dialogue project* had ended. The activities in Oskarshamn municipality started in 1992 when SKB presented their plan to expand the interim storage of spent fuel in Oskarshamn to also include a facility for encapsulation of spent fuel. Oskarshamn municipality was aware of the fact that SKB were soon going to ask them if they were interested in hosting a feasibility study as a step in the siting process for a KBS-3 repository (Sundqvist 2002). Therefore, the municipality sought financial assistance from the government in order to help them build up local competence for their engagement in the process. In 1994 the municipality was granted financial support from the government and the project Local Competence Building (LKO) was launched (Oskarshamn 1994).

At this point, Torsten Carlsson, who had participated in *the dialogue project*, was the chairman of the municipal board. He engaged four consultants that together with a project leader formed an expert group<sup>4</sup>. Their task was to assist Oskarshamn in building competence and to develop a decision base in relation to the site selection process. The work and activities in Oskarshamn have been influenced by the RISCOS model and are summarized in the Oskarshamn model<sup>5</sup>. The work has been organized in various working groups, involving around 50 people in total. The activities have been adjusted to what is happening in SKB's planning process and the composition and focus of the working groups have shifted throughout the years. One result of the project has been a decision base that was presented to the municipal council in 2002 that led to an affirmative decision to accept further site investigations. After 2006 the LKO project

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<sup>4</sup> Two of them left the group after a few years and the remaining two consultants were Harald Åhagen and Kjell Andersson, who at this point had left SKI and worked as a consultant. The project Leader was Krister Hallberg.

<sup>5</sup> The model includes seven principles/statements: the need for openness and participation; EIA is our platform; the municipality council is our commissioning body; the public is a resource; the environmental organizations are a resource; SKB should be put under pressure to give clear answers; and finally, the authorities are our experts.

was subject to large organizational changes, because of personnel changes and the municipality's new openly positive position to host the waste<sup>6</sup>. From 2007 and onwards the focus for the work has been to present a satisfactory decision base to the municipal council, in the event of requests from SKB to site a final disposal and encapsulation facility in the municipality (Oskarshamn 2007).

The LKO project has initiated a number of activities during the years. There have been study visits, seminars, and activities for high school pupils, forums for the general public and international conferences (Oskarshamn 1995; 1996). LKO representatives have visited large workplaces, markets and shopping centres, in order to meet people, handing out brochures, listening to people's opinions and worries. LKO has worked actively to stimulate broad engagement among local politicians, youths and people living close to the proposed sites. Environmental organizations have been invited and offered economic support but there are few active organizations in Oskarshamn (Interview, Oskarshamn).

### *The transparency programme*

At the end of 2006, The Swedish Nuclear Waste Council had finalized a plan for a 'transparency programme'. The programme was organized as a series of seminars, aiming to strengthen the competence and function of the council as advisors to the government, and to be a resource for other interested actors (Nuclear Waste Council 2007a). Again, Kjell Andersson was engaged as a consultant and the programme is based on the RISCUM model, and the idea that facts, values and potentially hidden agendas should be made visible to a wider audience (Interview, Andersson).

Andersson first conducted a preliminary study in order to identify what questions a broader set of actors involved in the nuclear waste issue believed was urgent to focus on (Interview, Nuclear Waste Council)<sup>7</sup>. At the same time as preparations were being made to develop *the transparency programme*, SKB published their safety analysis SR-Can. This yielded new material of interest for deciding how to develop and prioritize the questions. Based on Andersson's preliminary study, a

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<sup>6</sup> Torsten Carlsson stepped down as the chair of the municipal board, and the former consultants left Oskarshamn in 2006. LKO has recently engaged four new experts.

<sup>7</sup> Meetings were held with SKB, SKI, two environmental organizations (MKG and MILKAS), an association promoting renewable energy (SERO), Oskarshamn municipality, Östhammar municipality, The Region Unions in Kalmar and Uppsala and the county administration of Kalmar.



working group, composed of members of the Nuclear Waste Council, developed a proposal of questions that should be ‘made transparent’.

The programme was planned to run between 2007 and 2010 and consist of a few hearings each year, focussing on technical as well as democratic and reliability issues (Nuclear Waste Council 2007a)<sup>8</sup>. The first hearing was about deep bore holes on request from the municipalities (Interview, Nuclear Waste Council). It lasted for two days and included presentations followed by questions from the moderator and the audience. A separate panel discussion engaged seven politicians from the Swedish Parliament, which were interrogated about how their respective political parties were preparing for the decision about a final disposal of Sweden’s nuclear waste. The second day consisted of a final panel discussion with representatives from different perspectives in the panel (Nuclear Waste Council 2007b). After the hearing about deep bore holes, some changes were made in the practical arrangements to better fulfil the aim of increasing the competence of the council, changes that according to the organizers have led to higher interest among the target groups and the council themselves (Interview, Nuclear Waste Council).

### *Thematic Discussion*

The following section aim to discuss our studied dialogue projects in relation to participation, demonstration and dialogue. The chapter ends with some reflections on the projects’ connections to the nuclear waste management process as a whole.

### *Participation*

There have been participatory elements in all of the studied dialogue projects, but the target groups have differed as well as the forms for participation. The aim in most of these projects was to reach key actors and stakeholders rather than the general public. But who, and how many people, did these projects actually engage more actively? *The Dialogue Project* involved around 20 people, seven of them were selected by SKI and 13 were self-selected and represented various established organizations: SKI, SSI, The Swedish Environmental Protection Agency,

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<sup>8</sup> Hearing topics: deep bore holes; decommissioning of nuclear facilities; systems analysis; site selection; democracy and participation; acting and reliability; evaluation of the site selection; values and critical assumptions in the authorities’ directives and SKB:s safety analyses; the management of large complicated projects

two nuclear municipalities and environmental organizations. In addition, some temporarily invited experts were involved.

In RISCUM the organizers saw the need for broader engagement and involved the public and industry to a greater extent than what was done in *the Dialogue Project*. The different activities and dialogue experiments in the RISCUM projects involved a range of stakeholders: industry, the municipalities, authorities, departments, environmental organizations, researchers and citizens. The project group that framed the events in RISCUM I consisted of experts from various fields, while in RISCUM II there were people from several organizations, research institutions and one environmental organization involved in the project group.

*The hearings on method and site selection* involved local politicians, administrators, and interest groups such as a federation of labour unions, industry and environmental groups. These participants were involved already in the planning of the hearing. Representatives from SKB, SSI, SKI and six municipalities participated when the hearings took place. The general public was invited but few participated.

Ideas and strategies that have shaped *the Oskarshamn Model* have to some extent been framed by a small group of consultants, but organized to include a wide set of actors in the different working groups. LKO has tried to reach politicians, young people and citizens living close to the nuclear site through their activities, but also citizens in Oskarshamn in general.

In the initial stage of *the transparency programme*, input from a broad set of stakeholders shaped the agenda, although it was a small group of consultants and members of the National Waste Council that decided upon the final content. Hearings conducted within the programme have attracted participants such as the nuclear waste authorities, the municipalities Oskarshamn and Östhammar, NGOs, and SKB.

When the Nuclear Waste Council's *transparency programme* was initiated, 15 years after *the dialogue project*, many of the participants already knew each other well. At the hearings organized by the Nuclear Waste Council there was a notably familiar atmosphere among the participants. The moderator addressed people in the audience with their first names and during one of the hearings the panel members were not presented until someone in the public reminded the moderator to do so. The participants also shared some in-jokes (Hearing, 2008). The consultant commissioned by the Nuclear Waste Council, admits that the friendly atmosphere can be a problem and that the Swedish nuclear waste

programme is ‘almost like a community itself’, everyone is familiar and knows each other well (Interview, Andersson).

Evidently, some people have been more active than others in initiating dialogue projects. These important individuals – which we call mediators of dialogue – are no more than a handful of people. When these individuals leave one organization and project for a new task, some of our interviewees expressed how the project is drained in ways that affect the engagement in the project and to some extent its trustworthiness. This we take as evidence that these individuals *are crucial* mediators, and that they were important in bringing together fragmented elements (people, goals, ideas and activities) into a coherent whole.

In summary, the actors that have participated most frequently in the different dialogue projects are the authorities, municipalities, the industry and environmental organizations. Many activities in the dialogue projects have made efforts to reach the general public, but public participation has been limited and it is more or less the same stakeholder groups that frequently return to the projects and they share, as the consultant involved in all dialogue projects said, their own ‘community’. It is more or less the same people that have initiated these projects, and the organizers behind the dialogue projects are familiar with, but also seem content with, that this community is rather constant and in no need of being radically reformed with participation from new actors. The activities have been initiated in relation to the process run by SKB and the focus for participation can therefore be assumed to have been chosen in relation to what has been considered missing. The dialogue projects have increased the participation from many actors, but the fact that the organizers have not made further efforts to reach new groups outside this established nuclear waste community can be seen as an argument for the projects being a complement to the process run by SKB: it involves actors already active, but in a new form.

### *Demonstration and dialogue*

The dialogue projects are in many ways mediated by dialogue. All projects have enabled a broader negotiation of the nuclear waste issue and allowed alternative ways to define the truth. Even if a core group is setting out directions and taking final decisions, a number of actors have been involved in the framing of the activity agenda in different ways. The questions in the dialogue projects concerned issues characterised by

uncertainties and the projects gathered people in order to discuss these in an open way, rather than demonstrating them in a fashion capable of silencing critics. An example of a question that the industry considered squared away was the question of method: whether KBS-3 or deep boreholes are preferable in order to ensure long-term safety, a question that the organizers of the transparency programme apparently thought was a question that called for dialogue rather than demonstration.

As we have seen, there are links between the different dialogue projects and the nuclear waste process in general. One link can be found in the initial stage of *the dialogue project*. The nuclear authorities initiated the project as a response to SKB's and their own 'technocratic' failure during the mid-1980s. SKB as well as state authority had failed in communicating about fundamental issues with a wider audience and the initiator obviously saw a need for more dialogue. *The dialogue project* in a way did what SKB were still not prepared to do. Mediation by dialogue was clearly missing in relation to SKB's strong commitment to mediation by demonstration. The initiators related to the process and created what they consider had been missing, leading us to the suggestion that the dialogue projects function foremost as complements to SKB's activities rather than an alternative: they repair the process, rather than seriously question its fundamentals.

### ***Conclusions: Dialogue as Repair Work?***

Our study of the dialogue projects suggests that they are mainly mediated by dialogue, and we can find elements of upstream engagement. We have no clear evidence that issues actually move upstream though: from critical discussions amongst a small but heterogeneous group of stakeholders to the implementer SKB. Ideally, the upstream process and dialogue should take place in the real decision making process before decisions have been taken. In this case, the dialogue is often reactions to demonstrations carried out and decisions taken by SKB. However, the dialogue projects have the potential to influence the process, indirectly. The most clear example of this is probably *the Oskarshamn Model*, where the work has led to important decisions crucial for the proceedings.

The very idea that the dialogue projects have the function of being repair work to SKB's failures is of course a suggestion that even if the aims, and some of the elements in the dialogue projects are upstream and examples of mediation through dialogue, the result may be that issues are prevented

from moving too far upstream displacing the pre-eminent position of SKB's RD&D programme, and that the dialogue projects so far have actually served to insulate and protect the industry's long-standing pursuit of nuclear waste management as nuclear fuel safety (KBS) from more life threatening forms of criticism.

## **5. Concluding Discussion**

Swedish nuclear waste management has always remained primarily committed to generating knowledge and agreement over the development of policy through a process of mediation by demonstration. Although derailed for several years during the late 1980s, mediation by demonstration has never been seriously questioned, or ever come close to being abandoned, as the dominant approach to advancing nuclear waste management policy.

SKB's RD&D programme is about amassing an irrefutable body of free-standing evidence concerning an unquestionable ability to deliver nuclear fuel safety. In this context, safety analyses are literally intended to 'speak for themselves' to those with the qualified ability to understand them. Over the years various attempts have been made to make SKB's technical demonstrations and SKI's and SSI's interrogation of them more publicly transparent. If onlookers can neither comprehend SKB's safety analyses nor SKI's and SSI's evaluation of them, then how can public confidence in Swedish nuclear waste management be maintained? This problem remains most acute of course prior to the securing of an at least minimal number of communities prepared to participate in the siting of major waste facilities.

Since the early 1990s, SKI and SSI have been prepared to treat alternative patterns of mediation by dialogue rather more openly and experimentally than SKB, approaching the overall scope and relevance of dialogue as itself largely negotiable. Although, due to their original identity as the counterparts to SKB in mediation by demonstration, neither SKI nor SSI have ever gone so far as to suggest that mediation by dialogue should become the dominant mode of mediation. The SKI and SSI position has been rather that mediation by demonstration should encompass an explicit concern with mediation by dialogue acting as something like a *political safeguard* helping to guarantee the broader legitimacy of the long-term state-industry project of securing nuclear fuel safety. For SKI and SSI, and more recently the Swedish National Council for Nuclear Waste, a key concern has been to promote mediation by dialogue as a means to render

mediation by demonstration more open and transparent for the sake of its own self-protection. When mediation by demonstration becomes closed in on itself, the absence of an engaged public can even be disturbing to the leading actors as they find themselves continually playing before a more or less empty house.

After 1995, mediation by dialogue has become increasingly centred on the two crucial volunteer communities of Oskarshamn and Östhammar as the two critical local arenas for potentially finalizing the now 33 year old KBS project (Elam and Sundqvist 2009a). Through mediation by dialogue, Oskarshamn and Östhammar have both talked themselves, and been talked by others into playing the role of a stand-in ‘general public’ that maintains an interest in seeing and at least partially comprehending the nuclear fuel safety that SKB is demonstrating to state authority.

On the basis of this study we can conclude that two of SKB’s most important tools of mediation are safety analyses and public consultations and that SKB safety analyses are a clear example of mediation by demonstration. However, even the public consultations –usually framed in legislation as well as in SKB’s practical work to be about dialogue – are about demonstrations, convincing an outside audience that a KBS-3 repository is safe. SKB uses a selection of information that makes their presentations into demonstrations: arguments reinforcing their own points of view. This makes it difficult for the audience to judge the facts, values and reasons behind what is being shown, and consequently, the presentations of safety constitute an absence of transparency. Generally, the consultations are downstream engagement, consulting around already defined problems, presenting decisions already taken or studies already completed. The examples of upstream engagement that we could see in the dialogue projects initiated by the authorities in the early 1990 never amounted into anything of lasting significance for waste management policy as a whole, and as discussed above this was probably never really the intention either.

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## APPENDIX

### *Interviews, conducted by Maria Lidberg*

Andersson, Kjell, Karita-konsult, consultant for Kärnavfallsrådet and previously for Oskarshamn and SKI. Interviews were conducted at three occasions and with different focus: 20 May 2008 (The dialogue project) 29 May 2008 (RISCOM and Oskarshamn), 10 June 2008 (The Transparency Programme)

Environmental organisation, Kenneth Gunnarson, chairman of OSS (Opinionsgruppen för säker slutförvaring i Östhammar), Interview 2 June 2008

Nuclear waste council, Björn Hedberg, chief secretary at the Nuclear Waste Council, previously at SSI and involved in RISCOM, Interview 30 May 2008

Östhammar, Virpi Lindfors, leader of the final disposal project in Östhammars kommun Interview 19 May 2008

Oskarshamn, Kaj Nilsson, former project leader of the LKO project in Oskarshamn, Interview 13 May 2008

SKI, Magnus Westerlind, previously head of the nuclear waste department at SKI and involved in RISCOM I and II, now employed at SKB, Interview 27 May 2008

### *Observations, Linda Soneryd and Maria Lidberg*

Public consultation (2005) Observation. Allmänt samrådsmöte, april 2005. Inkapsling och slutförvaring i Oskarshamn, 5 april 2005, kl. 15.00-18.00, öppet hus på SKB:s platsundersökningskontor på Simpevarp, Samrådsmöte, kl. 19.00-21.00, Hägnad, Figeholm, Oskarshamns kommun

Public consultation (2006) Observation. Allmänt samrådsmöte, maj 2006, Inkapsling och slutförvaring av använt kärnbränsle. Metod, lokalisering, framtid. Presentationer kl. 16-18, Samrådsmöte kl. 19-21, 31 maj, Hägnad, Figeholm, Oskarshamns kommun

Hearing (2008) Observation. 4-5 June 2008 Utfrågning Platsval för slutförvar av kärnavfall - på vilka grunder? Hearing organized by the Nuclear Waste Council, Stockholm.



