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### **Mediation by Demonstration and Dialogue**

#### **An Evaluation of Practices**

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## 1. Two types of mediation: demonstration vs. dialogue

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, 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 – the multi-barrier technical concept presented by SKB already in 1977 (as KBS and then slightly developed into KBS-2 and KBS-3) where the spent fuel would be encapsulated in metal canisters and then finally stored in tunnels 500 metres down in the bedrock, surrounded by clay – is firstly destined to be sited in close proximity to one of the two historical 'home bases' of the Swedish nuclear industry. Areas close to the reactor sites in the municipalities of Oskarshamn and Östhammar have been investigated and compared in detail since the year 2002. However, in June 2009 SKB chose Östhammar as the site for the application to build a final repository for spent nuclear fuel, which is planned to be sent to the government in 2010.

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 (Soneryd 2002). 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).

In this paper different tools and approaches to the mediation by demonstration and dialogue of Swedish nuclear waste management will be presented and analysed. 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’ (Wilsdon and Willis 2004, Wilsdon et al. 2005). *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.

Section two discusses three of SKB’s safety analyses as historical cornerstones in the mediation of Swedish nuclear waste management by demonstration. Three safety analyses presented by SKB at critical junctures in the waste management process are scrutinized. Section three 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 section four, 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 several, 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 the two final sections 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 and we also present eight guidelines of mediation.

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

Demonstrations attempt to impress directly upon the mind’s eye of their audiences, reducing the need for further discussion and dialogue. *Mediation through demonstration* is about showing, displaying, and pointing out things. Andrew Barry (2001; see also Collins 1988; Shapin 1984; and Elam, Lidberg, Soneryd and Sundqvist 2009) talks of demonstrations as

both sights and sites of truth. Demonstrations can be events to be witnessed by smaller or larger publics; they are typically directed at, and intended to hail and bring into being a particular assenting audience. Thus, an arm's length division between demonstrator and audience is a constitutive feature of this form of public communication. This division is also 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.

The Nuclear Power Stipulation Act, passed by the Swedish Parliament in 1977, made the completion of a nuclear power programme contingent upon demonstrated progress in nuclear waste management; a field of endeavour the nuclear industry rechristened 'nuclear fuel safety' (KBS). What this 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 (SFS 1977; Sundqvist 2002: ch. 4). Thus, Swedish nuclear waste management can be viewed as a precursor of institutional arrangements which during the 1990s became known as the 'New Public Management' (Hood 1991). State control of nuclear waste management in Sweden is not direct, but indirect regulated control. Continuous progress in nuclear waste management is something ordered and overseen by state authority after 1977 and compliantly delivered by the nuclear industry itself. Therefore, the public mediation of nuclear fuel safety through demonstration corresponds to the accepted institutionalized means through which regulated progress in waste management is to be effectively evidenced by industry before government authority.

In what follows three particular SKB safety analyses evidencing progress in waste management are presented and analysed, each of them carried out at critical junctures in the Swedish nuclear waste management process. We will focus on their foundations and how they have been carried out, discussed and communicated.

The KBS safety analysis, presented in 1977 in direct response to the requirements of the Nuclear Power Stipulation Act, became a strategic tool for gaining permission to fuel nuclear reactors already under construction. It brought together around 450 scientists and technicians. The group was recruited in order to produce an irreproachable waste management solution connected to the Swedish nuclear power programme. Uncertainties, alternatives, ignorance were enemies to fight; draconian government demands for safety did not permit such things.

Safety analyses, as they have been developed in Sweden and elsewhere, are characteristically divided into three parts (cf. Swedish National Council for Nuclear Waste



2007a: 12): *Safety requirements* – norms and criteria – are specified usually following standards set by domestic and international authorities. *Descriptions* of the features of the barriers and the processes and events influencing these features are specified. Finally, *calculations* are provided offering a picture of what will happen to the waste facility over time.

In the KBS safety analysis the radiation protection criterion to be satisfied was 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 1977: 11).

The features of the different barriers are described in 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 (KBS 1977: 84-99).

The main conclusion drawn on the basis of 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 1977: 108). The last sentence in the safety analysis report concludes that ‘the proposed method for the final disposal of vitrified high-level nuclear waste is considered absolutely safe’ (KBS 1977: 109).

The safety analysis called SKB 91, was presented in 1992 when SKB formulated 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 introducing a more flexible view on the bedrock conditions.

As in the case of the KBS safety analysis, the SKB 91 analysis did not allow for any extended discussion of the processes, events, reference cases or alternatives calculated. It is not clear from the report how the reference case was selected. Moreover, the canister defects calculated for in the KBS safety analysis are very different from the ones 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> (SKB 1992b: 8). It is hard to understand how the assumptions and selection of reference case alternatives have been chosen.

In SKB 91, geological factors are only deemed of importance during the construction work, when the repository is locally adapted to the surroundings (SKB 1992a: 40). SKB explicitly objects to demands for a geologically driven site selection procedure (SKB 1992b: xvii). A more flexible view on the choice of site is argued for allowing for the adoption of a radically new site selection process for a geological repository for Sweden's spent nuclear fuel.

The safety analysis SR-Can presented by SKB in 2006 was first planned to be a safety analysis on the canister for disposal and the encapsulation plant (where the waste will be sealed in canisters), but was then expanded to include also site-specific data from the two municipalities Oskarshamn and Östhammar voluntarily participating in the SKB repository siting programme. This safety analysis is due to 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 the municipality of Östhammar, which since June 2009 is the site preferred by SKB. Hence, SR-Can can be seen as a dress rehearsal for the coming study called SR-Site.

During the million years analysed, two main variants concerning external conditions are taken into account: 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 where climate change and the effects of anthropogenic gas emissions are taken into account during 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 the million year period, but the consequences of this are 'well below the regulatory risk limit' (SKB 2006: 20). Based on the results from the SR-Can study it is argued that both the sites in Oskarshamn and Östhammar fulfil the regulatory requirements, but it is not possible to decide which one is the best.

#### *Demonstrations with National Regulators as the Target Audience*

All three safety analyses have been produced by SKB and have resulted in unequivocal claims regarding the safety of the waste solutions analysed. The main objective of the analyses has been to evidence safety for the purposes of regulatory compliance. This process of evidencing has been continually supported by an expert review process of some description. When the KBS safety analysis was completed and became part of a formal application for fuelling new nuclear reactors 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). These reviewers consisting of universities and technical authorities, gave ‘safety’ (or ‘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.

The SKB 91 analysis was reviewed, but only by the two Swedish state authorities in the field, the Nuclear Power Inspectorate (SKI) and the Radiation Protection Authority (SSI). SKI conducted a highly critical review and argued that SKB’s general conclusion that a KBS repository ‘fulfils the safety requirements suggested by the authorities with ample margin’ (SKB 1992b: 178) was 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).

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 were published. While the main report was directed to SKI and SSI, the targeted audience for the popular version was said to be politicians and citizens in the two municipalities where site investigations are being carried out. The popular summary report is not, however, intended to advance an ‘extended peer review’ of SR-Can as 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, while laypeople have to trust these experts (SKB 2007a: 96). In the main report, however, SKB argued – 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 questions of mediation and participation in its work with safety analyses. Since the beginning SKB has been in control of the safety analyses and has managed to create distance to an audience that has been narrowly defined. The role of the audience is reduced to react on ready-made analyses.

### **3. SKB and Public Consultations: Demonstrations Disguised as Dialogue?**

In contrast to mediation through demonstration, *mediation through dialogue* is about acknowledging the contingency of the facts and the realities often shown through demonstrations. 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 (Elam, Lidberg, Soneryd and Sundqvist 2009).

The Swedish Environmental Code that came into force in 1999 stipulates that an application for a permit for activities that impact on the environment must include an Environmental Impact Assessment (EIA). The EIA should provide a description of the activity’s location, design and scope as well as a description of alternatives (The Environmental Code Chap. 6, 7 §). The Code stipulates that the process should start early and that consultations should be held with those affected and the 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 degree of freedom for the developer to define who the affected people are, and how, and to what extent they, and the general public can be feasibly included in the process.

The consultation process could *potentially* support public dialogue capable of opening up standards of truth, reliability and safety for broader and more inclusive negotiation. However, this remains a question of how consultations are actually designed and framed in practice.

The way that SKB organizes the public consultation process in connection with the implementation of its KBS programme can be said to subdue rather than support broader public dialogue. One way in which this comes about is through the organization of public consultation meetings as firstly information meetings where SKB stands in front of an audience and presents its current plans and achievements. SKB sets the agenda for the discussions at the public consultation meetings and acts as facilitator as well. Meetings are also divided into ‘regional’ consultation meetings (open only to official representatives from the two municipalities hosting site investigations, the county administrators and national regulators) and ‘public’ consultation meetings (open to all).

After 2005 and 2006 the two regional consultation forums are open to the general public, including NGOs, attending as *observers*. Environmental organizations have requested to be recognized as full participants at these meetings but have been denied this right by SKB and one of the national regulators, 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 partial 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, they [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 regional consultations are thus, as the quote above illustrates, interpreted by some actors as token forms of participation. The public consultation meetings are however in principle open to everyone. SKB describes these meetings as characterised by open discussion and a forum for all the consulted parties to raise issues.

To analyse SKB’s approach to public consultation further we can turn the focus to SKB’s presentations that invariably precede comments and questions from other participants. SKB’s presentations play a significant part in framing relevant issues for consultation and confining the scope of the questions that can be posed in response. As SKB relies heavily on PowerPoint slides in their presentations, we can mention how these can serve as tools of mediation when, for example, safety analyses and the KBS repository concept are presented to a wider audience.<sup>1</sup>

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<sup>1</sup> Our analysis is based on all SKB’s PowerPoint presentations that have been made at consultation meetings or at information meetings arranged in connection to these meetings from 2003 to 2008, these are available at SKBs website ([www.skb.se](http://www.skb.se)) (see also Lidberg and Soneryd 2009). We have also notes from our participant observations from ten consultation meetings. On the basis of our analysis of this large material (over 1500 PP slides) we will illustrate our results with a few examples.

### *Demonstrations Witnessed by the General Public*

‘Safety’ is demonstrated not only through safety analyses but also to a wider audience at public consultations. However, at these meetings several other aspects of nuclear waste management are demonstrated, for example, the KBS programme as a linear and uninterrupted planning process and the expected environmental impacts resulting from implementation over longer or shorter periods of time (Lidberg and Soneryd 2009). One public consultation meeting in Östhammar municipality, on the 31<sup>st</sup> May 2007, focussed on the themes of *Safety, Radiation Protection and Long-Term Safety*. About 50 people attended the meeting and of them, about 15 were representing NGO’s or the general public. Others present included representatives from the national regulators, 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 PowerPoint slides contained text and pictures, plans and sketches of technical details, questions, and some conclusions. One example was a risk curve that presented SKB’s risk estimations of the investigated sites in case of i) corrosion of the copper canisters and ii) earthquakes, in relation to the background radiation and the risk limits set by the regulators.

The slide showed that the radiation risk incurred with a KBS repository is insignificant. One way to interpret the message of this slide was that since the risk curve for the nuclear waste repository tails off so dramatically the facility poses less of a risk than that posed by background radiation.

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 Spent Nuclear Fuel*. At this meeting one of SKB’s consultants presented the 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 the KBS repository concept was the only reasonable alternative within a time span where society’s development remained foreseeable (which the consultant argued was around 50 years) (SKB 2005-2007). Other, alternative methods, it was argued, would need more than 50 years to be developed to the same degree of maturity as KBS has reached today. The slide showed a time line over society’s future development and time lines over the development of KBS, and four alternatives to KBS i) the zero-alternative, the waste continues to be deposited in the central interim storage, ii) surveilled dry deposit, iii) deep boreholes and iv) transmutation.

The message of this slide was that the KBS method is the only method that is fully compatible with the development of society. While the possibility of implementing any of the alternative methods were presented in SKB's PowerPoint slide as stretching into an indefinite future, the time needed for implementing the KBS method and the time period that societal development were considered as foreseeable were both presented as being around 50 years. This is a clear example of mediation by demonstration: the slide speaks for itself and leaves the audience with an impression that the KBS alternative is the only choice. The same slide 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 of time lines and alternative methods was shown in connection with a list of requirements, 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 burdening future generations. The presenter from SKB said that "I stop there without doing any valuations; I think this picture is worth a thought" (SKB 2005-2007). 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 put forward. It serves as free-standing evidence of KBS as the superior method, and that it has to be built soon, before society grows unstable.

At public consultation meetings SKB often refers to legislation to reinforce the reasons behind its undertaking, for example by showing slides with quotes from the Environmental Code. The legally stipulated public consultations are expected to focus on environmental impact. How then is environmental impact mediated at these meetings?

Different kinds of environmental impact are visualised in PowerPoint slides. There are slides that on a relative high level of detail show expected increases in road transport for example. The environmental impact from road transport is illustrated with calculations of exhaust emissions for the next 65 years. Maps and tables often give the impression that there is fine precision behind the figures and that the future is calculable. Environmental impact is however restricted to what happens above ground and mainly during the construction phase, that is, the first hundred years or so. When it comes to repository performance over a 100 000 year period, this is not presented in terms of environmental impacts, but long-term safety relating back to calculations and estimates made in SKB's safety analyses. Through their PowerPoint slides SKB communicate results and ready-made facts, not the background behind them. Since a dialogue over the values, uncertainties, or decisions behind the results is never encouraged, consultation meetings are treated by SKB more as dissemination meetings

and opportunities to ‘give off’ information. SKB presents already defined problems and results from studies already completed.

SKB talks about the consultation process as providing opportunities for ‘dialogue’ and that all participants have the possibility to raise issues and to influence the process. Because of the format of these meetings and the amount of information presented by SKB that frames participants more in terms of a passive audience, we argue that the consultation process can be characterised rather as demonstrations disguised as dialogue. The next section will describe other activities that have aimed to be more dialogue-oriented and that have been initiated on the nuclear waste issue, by actors other than SKB.

#### **4. The Turn to Dialogue: Dialogue as Repair Work**

In the 1980s SKB became ensnared in a geology driven siting strategy for a KBS repository for spent fuel, where the best possible bedrock conditions were sought after, but where local people and environmental groups occupied drilling sites preventing SKB from gathering the necessary geological data to enable a comparison of sites. Local ‘rescue groups’ formed in practically every location where drillings were initiated or planned, and these different groups soon joined up to form a national network of local community groups (the so-called *Avfallskedjan*) (Lidskog 1994, Holmstrand 2001). Matters came to a head, at the end of 1985 when SKB called in the police to remove demonstrators from a drilling site and the ensuing confrontations received widespread publicity. Thereafter, the Minister for the Environment announced that SKB should refrain from using the police to allow its investigations to proceed (Anshelm 2006: 107, Holmstrand 2001: 29).

As already described the SKB 91 safety analysis became an important tool for SKB in their efforts to move beyond the impasse of a geology driven siting strategy for a KBS repository. According to SKB, the safety analysis offered scientific evidence that bedrock is of less importance for safety and therefore sites could be sought more freely. After 1992, SKB adopted what they called a voluntary siting strategy where SKB would only enter a municipality after the latter had ‘volunteered’ itself as a potential site for a KBS repository (Sundqvist 2002: 186). No municipality was excluded from participating in the KBS siting process and volunteering itself. After 1995 SKB carried out eight local ‘feasibility studies’ in potential host communities for a KBS repository. Six of these studies were carried out in communities already hosting nuclear facilities or neighbouring such established nuclear communities, while two studies were carried out in sparsely-populated, far north of the country.



To establish local connections and community trust was the main aim of SKB's 'voluntary turn' in the 1990s. Although presented in terms of a nationwide search by the nuclear industry for 'local acceptance', voluntarism effectively allowed SKB to present the two nuclear communities of Oskarshamn and Östhammar as selecting themselves as the two most feasible locations for nuclear waste facilities in the country. These two locations had already been earmarked by industry and state for the geological disposal of high-level waste in the mid-1970s, before the ill-fated search for ideal bedrock conditions had been initiated (Elam and Sundqvist 2009a). Now through the 'voluntary turn', Oskarshamn and Östhammar could be given every private and public encouragement to recognize themselves as the two most important 'local stakeholders' in the country for the solution of the national waste problem.

Even if SKB had adopted a voluntary siting process after 1992, there was still as far as they were concerned nothing to publicly discuss regarding nuclear fuel safety and a KBS repository. Volunteer communities were volunteering themselves as local audiences for SKB's demonstrations of KBS to complement the national audience of regulating bodies. However, the national regulators SKI and SSI were more prepared at the beginning of the 1990s to see local political protests as signalling the need for a more 'dialogical', as opposed to an exclusively demonstrative, approach to nuclear waste management. To this end, SKI initiated in 1990 the so-called *Dialogue Project* attempting to bring together industry, regulators, municipalities and environmental organisations to work towards a consensual approach to the formulation of waste management solutions (SKI 1993). This project running between 1990 and 1993 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 type. Although the *Dialogue Project* still sought to gain public consent to SKB's programme of nuclear fuel safety, it promised to open up the programme to new forms of public criticism as environmental organizations were directly invited into the policy process for the first time. For this reason, SKB chose not to participate confirming the identity of the project as a purely 'simulated' exercise, not a real one.

By arranging a succession of other 'dialogue projects' after this initial one the national regulators have regularly tried to make nuclear waste management a matter of broader public concern. However, it can be argued that none of the dialogue projects that has been initiated has gone beyond simulating an alternative policy process to the perennially overriding one of mediating waste management solutions through industrial demonstration. We would argue, that rather than lastingly challenging the KBS programme, alternative dialogue projects have firstly served to help safeguard it from more serious forms of public criticism. Behind the

*Dialogue Project*, the internationally well-known *Oskarshamn's Model* of local stakeholder involvement and other participatory initiatives in Sweden we find the same handful of consultants and 'experts of community' picking up on SKB's recurring failure to stimulate sufficient public discussion around the nuclear fuel safety they unrelentingly present as speaking for itself (Oskarshamn 2007).

Following this established pattern, the Swedish National Council for Nuclear Waste's *Transparency Programme* (Swedish National Council for Nuclear Waste 2007b; see also Andersson 2007) can be seen as a direct response to SKB's failure to pursue stipulated EIA discussions of alternative methods and sites of nuclear waste management other than through national and local demonstrations of KBS, and of one method and only two possible sites already chosen.

A key difference between the public consultations held through the new *Transparency Programme* and SKB's public consultation meetings, is that the former encompasses a broader range of expert commentators allowing SKB's demonstrated solutions to be to some extent publicly debated and questioned. However, other than helping SKB to publicly prosecute themselves more rigorously, and thereby better accommodate environmental legislation, the significance of the debate staged through the *Transparency Programme* is difficult to judge. In respect of the Act on Nuclear Activities from 1984, replacing the Nuclear Power Stipulation Act from 1977, Swedish nuclear waste management remains overridingly governed through elaborate industrial demonstrations of nuclear fuel safety to be witnessed and approved by state authority. How this policy process is modified by public debate and dialogue initiated in response to environmental legislation remains unclear. However, given the longer-standing legislative obligations for SKB to unfailingly demonstrate the certainty of nuclear fuel safety practically within their grasp, the chances that new occasions for public debate and dialogue can constitute anything more than simulations of how an alternative policy process might be pursued remain slim. In this way, the different 'dialogue' projects and initiatives which have been launched in parallel with SKB's KBS programme can be likened to forms of external repair work. They have served to erect a participatory façade around the KBS programme compensating for SKB's unflinching commitment to demonstrating nuclear fuel safety ready-made and fully within their grasp, and thereby beyond question.

## **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 municipalities 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.

## **6. Summary and Recommendations**

Two basic forms of mediation have been identified and analysed: the public mediation of radioactive waste management by demonstration and by dialogue. The former coincides firstly with the showing and visualizing radioactive waste management issues and solutions for public inspection and recognition. The latter, on the other hand, corresponds firstly with the establishment of different styles of public discussion, deliberation and inquiry for elaborating further on policy issues and solutions. Both forms of mediation provide the basis for the collection and collation of significant bodies of public evidence and testimony which can be used to continuously inform and guide decision-making processes.

### *Principles and Guidelines of Mediation*

1. Both mediation by demonstration and mediation by dialogue should be understood as indispensable in the formation of arenas of risk governance in radioactive waste management.
2. As the two basic forms of mediation each has its own part to play in advancing radioactive waste management solutions, neither one should be automatically privileged over the other in any policy process.

3. Both mediation by demonstration and mediation by dialogue can be expected to generate large bodies of public evidence and testimony which can be used to help inform and guide decision-making processes. Historically, evidence deriving from mediation by demonstration has been accorded greater prominence in the radioactive waste management field than evidence deriving from mediation by dialogue. For this reason, new ways of effectively combining evidence and testimony deriving from both forms of mediation should be explored in policy processes in future.
4. Because mediation by demonstration builds upon a clear division between those who demonstrate and those who are being asked to see and evaluate what is being shown, mediation by dialogue should be conceived and constructed as an opportunity to unsettle and destabilize these established roles.
5. Because mediation by dialogue serves to erase the divide between ‘demonstrators’ and the ‘inspectors/observers’ of radioactive waste management problems and solutions, mediation by demonstration should be conceived as implying the organization of ‘show trials’ attempting to publicly reaffirm the legitimacy of the division of management powers they support.
6. Neither mediation by demonstration nor mediation by dialogue should be thought of as predominantly technical or political activities. Both should be recognized and appreciated as contributing to the creation of public arenas where ‘technology’ and ‘politics’ can be brought into close and continuous contact with each other in the pursuit of exemplary radioactive waste management solutions.
7. Combining mediation by demonstration with mediation by dialogue allows for greater public recognition to be granted to the ‘hidden’ roles that both play in each other. The two basic forms of mediation always impinge on each other, and recognizing this opens the way for a significant expansion of the dialogues structuring demonstrations, as well as a broader evaluation of the demonstrations woven into dialogues.
8. Mediation by demonstration and mediation by dialogue should not be understood as alternative ways of seeking to advance radioactive waste management solutions, so

much as interdependent ways. They serve to sustain and enlarge the relevance of each other. In combination they can help to strengthen the political legitimacy and technical integrity of radioactive waste management solutions. Pursued in apparent isolation from each other, however, they may unnecessarily complicate the communication about radioactive waste management.

## References

- Andersson, K. (2007). *Genomlysning av beslutsprocess och beslutsunderlag på kärnavfallsområdet – Rapport från förstudie*. Karita research 07:01.
- Anshelm, J. (2006) *Bergsäkert eller våghalsigt? Frågan om kärnavfallens hantering i det offentliga samtalet i Sverige 1950-2002*. Lund: Arkiv förlag.
- Barry, Andrew (2001) *Political Machines: Governing a Technological Society*. London: Athlone Press.
- Collins, H. M. (1988) 'Public Experiments and Displays of Virtuosity: The Core-Set Revisited', *Social Studies of Science* 18(4): 725-748.
- DsI 1978:28 *Report on Review through Foreign Expertise of the Report Handling of Spent Nuclear Fuel and Final Storage of Vitrified High Level Reprocessing Waste*. Swedish Ministry of Industry.
- DsI 1978:29 *Yttranden över statens vattenfallsverks ansökan enligt villkorlagen om tillstånd att tillföra reaktorläggningen Ringhals 3 kärnbränsle*. Swedish Ministry of Industry.
- Elam, M., Lidberg, M., Soneryd, L. and Sundqvist, G. (2009) *Demonstration and Dialogue: Mediation in Swedish Nuclear Waste Management*. Score Working paper 2009-6. Stockholm: Stockholm Center for Organizational Research.
- Elam, M. and Sundqvist, G. (2007) *Stakeholder Involvement in Swedish Nuclear Waste Management*. SKI Report 2007: 2. Stockholm: The Swedish Nuclear Power Inspectorate.
- Elam, M. and Sundqvist, G. (2009a) 'The Swedish KBS Project: A Last Word in Nuclear Fuel Safety Prepares to Conquer the World?' *Journal of Risk Research* 12 (forthcoming).
- Elam, M. and Sundqvist, G. (2009b) 'Common Instruments of Nuclear Waste Management in the Making? The Swedish KBS Programme and the European Nuclear Renaissance', under submission to *Environmental Politics*.
- Holmstrand, O. (ed.) (2001) *Kärnkraftavfall. Avfallskedjans syn på den svenska hanteringen*. Nätverket Avfallskedjan (<http://avfallskedjan.polarsilver.com>).
- Hood, C. (1991) 'A Public Management for All Seasons', *Public Administration* 69(1): 3-19.

- Kajiser, A. (1992) 'Redirecting Power: Swedish Nuclear Power Policies in Historical Perspective', *Annual Review of Energy and Environment* 17: 437-62.
- KBS (1977) *Förglasat avfall från uppberetning. IV Säkerhetsanalys*. Stockholm: Kärnbränslesäkerhet.
- Lidberg, M. and Soneryd, L. (2009) *Representationer av tid. En studie av PowerPointbilder och slutförvar av kärnavfall*. Score Working paper. Stockholm: Stockholm Center for Organizational Research (forthcoming).
- Lidskog, R. (1994) *Radioactive and Hazardous Waste Management in Sweden: Movements, Politics and Science*. *Studia Sociologica Upsaliensia* 38.
- Lidskog, R. and Sundqvist, G. (2004) 'On the Right Track? Technology, Geology and Society in Swedish Nuclear Waste Management', *Journal of Risk Research* 7(2): 251-268.
- Oskarshamn (2007) *Verksamhetsberättelse 2007 LKO*. Oskarshamn: Oskarshamns kommun.
- SFS (Svensk Författningssamling) 1977:140 *Lag om särskilt tillstånd att tillföra kärnreaktor kärnbränsle, m.m. (Villkorlagen)*.
- Shapin, S. (1984) 'Pump and Circumstance: Robert Boyle's Literary Technology', *Social Studies of Science* 14(4): 481-520.
- SKB (1992a) *RD&D-Programme 92: Treatment and final disposal of nuclear waste. Siting of a deep repository*. September 1992. Stockholm: Swedish Nuclear Fuel and Waste Management Co.
- SKB (1992b) *SKB 91. Final disposal of spent nuclear fuel. Importance of the bedrock for safety*. May 1992. Stockholm: Swedish Nuclear Fuel and Waste Management Co.
- SKB (2005) *Angående MKG:s begäran om deltagande vid vissa samrådsmöten*, SKB, 18 October 2005.
- SKB (2005-2007) *Minutes from consultation meetings 2005 – 2007*, available at [http://www.skb.se/Templates/Standard\\_\\_\\_\\_15922.aspx](http://www.skb.se/Templates/Standard____15922.aspx), Accessed 22 September 2008.
- SKB (2006) *Long-term safety for KBS-3 repositories at Forsmark and Laxemar – a first evaluation. Main Report of the SR-Can project*. October 2006. Stockholm: Swedish Nuclear Fuel and Waste Management Co.
- SKB (2007a) *Långsiktig säkerhet för slutförvar för använt kärnbränsle vid Forsmark och Laxemar – en första värdering*. Förenklad svensk sammanfattning av säkerhetsanalysen SR-Can. April 2007. Stockholm: Swedish Nuclear Power Inspectorate.
- SKB (2007b) *Minutes from public consultation meeting, 31 May 2007*, available at <http://www.skb.se/84f0b0fc-8dbb-4df6-9471-ec46956c8cd3.fodoc>, Accessed 2008-09-22.

- SKBF (1983) *Final Storage of Spent Nuclear Fuel – KBS-3: Summary*. Stockholm: Swedish Nuclear Fuel Supply Co/Division KBS.
- SKI (1992) *Granskning av SKB 91*. SKI Technical Report 92:24. December 1992. Stockholm: Swedish Nuclear Power Inspectorate.
- SKI (1993) DIALOG-projektet – aktörsgruppens slutrapport. SKI report 1993 No 34. Stockholm: Swedish Nuclear Power Inspectorate.
- SKI (2005) *SKI:s ställningstagande till MKG:s begäran om att få observatörsstatus vid samrådsmöten mellan SKB och myndigheterna (SKI och SSI) och vissa andra möten*, SKI 2005/775, 18 October 2005.
- Soneryd, L. (2002) *Environmental Conflicts and Deliberative Solutions? A Case Study of Public Participation in EIA in Sweden*. Örebro Studies in Sociology 5: Örebro University.
- Sundqvist, G. (2002) *The Bedrock of Opinion: Science, Technology and Society in the Siting of High-Level Nuclear Waste*. Dordrecht: Kluwer Academic Publishers.
- Swedish National Council for Nuclear Waste (2007a) *Säkerhetsanalys av slutförvaring av kärnavfall – Roll, utveckling och utmaning*. Rapport 2007:2. Stockholm: Statens råd för kärnavfallsfrågor.
- Swedish National Council for Nuclear Waste (2007b) *Program för genomlysning av beslutsprocess och beslutsunderlag på kärnavfallsområdet*. Dnr 42/07. Stockholm: Statens råd för kärnavfallsfrågor.
- Turner, S. (2001) 'What's the Problem with Experts?', *Social Studies of Science* 31.
- Wilsdon, J. and Willis, R. (2004) *See-Through Science: Why Public Engagement Needs to Move Upstream*. London: Demos.
- Wilsdon, J., Wynne, B. and Stilgoe, J. (2005) *The Public Value of Science: Or How to Ensure That Science Really Matters*. London: Demos.