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The Mediation of Swedish Nuclear Waste Management Through Demonstration and Dialogue: Three Case Studies

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1. Introduction

At the beginning of the 1970s, the most important issue connected with the development of nuclear power in Sweden was how to guarantee the effective supply of nuclear fuel to a new fleet of light water reactors under construction. In this context, those directly responsible for this reactor programme joined together in 1973 to establish a new body called the Swedish Nuclear Fuel Supply Company (SKBF) tasked with, amongst other things, co-ordinating Swedish entry into the field of nuclear reprocessing. Comparatively speaking, SKBF was to be the Swedish equivalent of British Nuclear Fuels Ltd (BNFL) and a fellow pioneer in advanced nuclear fuel cycles (SOU 1976: 32). However, by the mid-1970s the issue of nuclear fuel supply came to be completely overshadowed by that of *nuclear fuel safety*. 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 energy programme would bequeath to future generations. Thus, all plans in Sweden to pursue nuclear reprocessing and radical innovations in nuclear fuel supply (KärnbränsleFörsörjning - KBF) were put on indefinite hold after 1976, as the pursuit of nuclear fuel safety (KärnbränsleSäkerhet – KBS), and key innovations in waste management received top priority (Elam and Sundqvist 2009). This privileging and prioritizing of nuclear fuel safety (KBS) over nuclear fuel supply (KBF) 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 firstly 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, demanding continuing respect and admiration for their ability to repeatedly *demonstrate* the progress required of them. Therefore, after 1984, the consolidation of nuclear fuel safety (KBS), 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 so-called FUD Programme) we find the Swedish Nuclear Fuel and Waste Management Company (SKB) who superseded SKBF as innovations in nuclear fuel safety (KBS) replaced innovations in nuclear fuel supply (KBF) as the core unifying concern for 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 Institute (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 risk 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 2008). 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

(Kajser 1992). At the heart of the 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 (lately ABB). Thus, rather than 'independent inspection', mediation by demonstration has perhaps 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 after 1980 that the pursuit of nuclear fuel safety (KBS) 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/SSI (now SSM) 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 KBS-3 repository for the final disposal of Sweden's spent nuclear fuel. In the beginning of the 1980s, SKBF becoming SKB pursued a geology-led siting strategy for a KBS-3 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). Matters came to a head at the end of 1985 when SKB started new drillings east of Uppsala at a place called Almunge. SKB called in the police to remove demonstrators blocking access to the investigation site and the ensuing confrontations received widespread publicity. Thereafter, the Minister for the Environment publicly announced that SKB should refrain from using the police to allow its investigations to proceed (Anshelm 2006: 107, Holmstrand 2001: 29).

By effectively denying SKB 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. Because SKB were left with too little geological data of too poor quality to convincingly demonstrate where waste disposal should best take place, SKI and SSI (as well as the Swedish National Board for Spent Nuclear Fuel – SKN prior to their abolition in 1992) were also left relatively empty handed with very little to inspect and adjudge; a situation immediately bringing into question their ability to effectively act as the ultimate guarantors of progress in nuclear waste management.

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 has after 1992 allowed SKB’s research, development and demonstration programme to get back on track and move forward in a slow, but nevertheless, clear and identifiable manner, 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 for the management of Swedish nuclear waste management. However, just because mediation by dialogue has allowed a range of new actors to participate in Swedish nuclear waste management it has also, to some extent, opened up for broader debate and discussion of how waste management should be best pursued where the hegemonic position of mediation by demonstration has been open to question in a way it has not been in the past (Elam and Sundqvist 2007a).

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 2009).

For SKB, mediation by dialogue in Swedish nuclear waste management is only considered of relevance to the extent that it can help advance their siting strategy for a KBS-3 repository which after 1992 is based on the principles of voluntarism and local acceptance. This revised siting strategy represents a fundamental break with a geology-led approach as local acceptance and a willingness to work together with SKB towards the final siting of KBS-3 repository are now the primary criterion for inclusion in the siting process. Political geography has replaced physical geology, as micro-variations in public opinion across the nation have become more important than micro-variations in bedrock conditions nationwide for determining community involvement in the siting of a KBS-3 repository (Elam and Sundqvist 2007b, Lidskog and Sundqvist 2004). For SKB, mediation by dialogue has always been viewed as firstly a means to a particular end, and the gaining and maintaining of access to enough Swedish bedrock to allow for the carrying out of a sufficiently credible and

convincing demonstration of where spent nuclear fuel can be finally disposed of with more or less complete safety. In this context, the turn to ‘volunteer communities’ for the siting of a KBS-3 repository has also generated a new agenda for mediation by demonstration: the demonstration of safe geological disposal in less than ideal bedrock conditions. Here the importance of demonstrating the strengths of KBS-3 as a *multi-barrier* system encompassing several engineered barriers, in addition to local bedrock comes into play buttressing a more geopolitical, as opposed to a more exclusively geo-scientific siting strategy. A key facility in this context has been the Äspö Rock Characterisation Laboratory commissioned in the volunteer community of Oskarshamn in 1995. As what SKB term a ‘dress rehearsal’ facility for an actual KBS-3 repository, the Äspö Laboratory is ideally located for demonstrating how engineered barriers can be modified and adapted to achieve a better fit with variable bedrock conditions (Elam and Sundqvist 2009).

In relative contrast to SKB, SKI and SSI have been willing to treat mediation by dialogue rather more openly and experimentally, approaching its overall scope and relevance as largely negotiable. Although, due to their long-term commitments to acting as the established 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. As will be outlined in detail in this report, the SKI and SSI position has been that the mediation by demonstration of Swedish nuclear waste management should encompass and encapsulate a 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 (SNCNW), 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 and the divide between industrial demonstrators and state inspectors is lost from public view, the risk of running into general public opposition grows once more. Therefore after 1992, SKI, SSI and lately SNCNW have supported ‘dialogue projects’ that have sought to publicly clarify and more broadly illuminate the different combinations of facts and values underlying key decision-making processes in Swedish nuclear waste management. In this way, an attempt has been made to project an image of SKI, SSI and SNCNW as public ‘guardians’ of the policy process promoting a more visibly thoroughgoing public prosecution and cross-examination of SKB’s safety case making sure that all the relevant facts guiding their pursuit

of nuclear fuel safety are brought further into broader public view, so that no ‘hidden agendas’ can be thought of as unduly influencing key decisions. As shall be discussed in this report, the role of public ‘guardian of process’ has also come to be played to a fluctuating degree by municipal authority in the two crucial volunteer communities of Oskarshamn and Östhammar which have after 1995 progressively grown into the two most important political as well as technical arenas for both publicizing and finalizing the now 32 year old KBS project in Sweden (Elam and Sundqvist 2007a). The municipalities of Oskarshamn and Östhammar, the historical ‘home bases’ of the Swedish nuclear industry, have both to some degree volunteered, and to some degree been persuaded by SKI/SSI and SKB, to play the role of the more general public inspectors of SKB’s designs for nuclear fuel safety (KBS). Through mediation by dialogue, Oskarshamn and Östhammar have both talked themselves, and been talked by others into playing the role of that engaged part or fraction of the broader Swedish public that demands to *see and comprehend* the nuclear fuel safety that SKB is demonstrating to state authority in a fashion capable of securing the measure of more general public confidence and acceptance necessary for the KBS-3 method of geological disposal to become a material fact.

This report contains six chapters. In the second chapter we shall clarify further our key notions of mediation by demonstration and mediation by dialogue in more general theoretical terms. Chapters 3 to 5 each present and analyse a particular instances and tools of mediation by demonstration and mediation by dialogue. Chapter 3 presents an analysis of several of SKB’s safety analyses as historical cornerstones in the mediation of Swedish nuclear waste management by demonstration. In Chapter 4, our attention turns to attempts to advance the mediation of Swedish nuclear waste management by dialogue initiated actors other than SKB: that is to say by SSI, SKI, and the Nuclear Waste Council, as well as the municipalities of Oskarshamn and Östhammar. We have chosen to focus on five, so-called, ‘dialogue projects’ and the chapter is based on interviews with key actors, reports and other written documentation from the projects and to some extent observations of hearings from one of the dialogue projects. The fifth chapter deals with SKB’s public consultation activities which characterise the nature of their commitment to mediation by dialogue. Here we rely on our fieldnotes and participant observations from a number of public consultation meetings. We also provide analysis of powerpoint slides used by SKB to introduce and frame particular instances of public consultation and discussion. In addition, we also make use of material gained through interviews with key actors at SKB

By presenting analyses of different instances of mediation by demonstration and mediation by dialogue we wish to point out that there are parallel processes taking place. SKB's activities, for example, can be understood as divided between processes advancing the planning and building of the different components of a nuclear waste disposal system and processes of 'social contact' ('samhällskontakt') building relations between SKB and those publics deemed crucial in enabling the deep geological disposal of Sweden's spent fuel to proceed without undue political surface interference. These processes do not necessarily have to interact too closely with each other; they can run in parallel with 'social contact' acting as a buffer or cushion somewhat similar to the bentonite clay around the KBS-3 capsules, protecting and insulating continuing progress in the siting and detailed design of a KBS-3 repository from more challenging forms of public noise and interference. It can even be asked whether or not the dialogue projects initiated by SKI, SSI and municipal actors do not also more closely resemble actions building a social buffer or cushion around SKB's KBS project, rather than actions more genuinely opening for broader public involvement and discussion of key issues in Swedish nuclear waste management engaging publics in Swedish society at large, stretching beyond those to be found in Swedish most long-established nuclear communities. In the sixth and concluding chapter we reiterate some of our findings and discuss once more the interrelations of mediation by demonstration and mediation by dialogue in Swedish nuclear waste management.

2. Mediation and Mediators – Demonstrations and Dialogues

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. Therefore, mediation is a form of communication, and mediators are communicators of a kind. 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. Mediation can be pursued through different media, and demonstrations and dialogue are two prominent media that can be drawn upon and privileged. Demonstrations and dialogue are not mutually

exclusive media, as neither can be pursued without an element of the other being present. However, each can be made clearly subordinate to 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. Ideally, demonstrations should leave the impression that things clearly speak for themselves, leaving those who contend otherwise literally speechless. 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 also typically hierarchical. Demonstrators are typically either attempting to point things out to a laity, or trying to prove something to superiors. 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 dialogue.

Mediation through dialogue on the other hand, 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.

Mediators can be both people or things, actors or actants. The term 'actant' is used in order to avoid the idea that only human beings have the ability to act 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 personal 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* are treated as key mediators. SKB's research, development and demonstration programme is about amassing an irrefutable body of evidence concerning a proven ability to deliver nuclear fuel safety. Ultimately, it is not SKB themselves who are meant to show that nuclear fuel safety is achievable, it is free-standing evidence substantiating their claims (e.g. the safety analyses) that is expected to bring KBS into view for those with the task, and the ability to see it.

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 all 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.

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. Arguably, opinions were so divided over nuclear power in Sweden during the 1970s that spectacular demonstrations were the only way of structuring communications between opponents who were otherwise disinclined to listen to each other, and not routinely prepared to take notice of what the opposing side had to say (Sundqvist 2002).

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. Clearly, attempts have been made in relation to the mediation of Swedish nuclear waste management by demonstration to make SKB’s demonstrations and SKI/SSI’s interrogation of them more

publicly transparent. If onlookers can neither comprehend SKB's safety analyses nor SKI/SSI's evaluation of them, then how can public confidence in Swedish nuclear waste management be maintained? However, enlarging, and to some extent popularizing, the theatre of mediation by demonstration to include more public onlookers and observers cannot in itself be equated with a complete rendering of Swedish nuclear waste management transparent. The authenticity of mediation by demonstration is still threatened by the deeper suspicion that industry and state authority are pursuing key negotiations off-stage and behind closed doors. Therefore, transparency is only to be valued if the question of *where* more light should be shed can also be subject to broad and inclusive discussion. Accepting that not every aspect of any policy can, and should be rendered fully-transparent, it can be considered vital that what should be illuminated, and what should be allowed to remain in the dark should be something widely debated and discussed. 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 the paper.

3. SKB's Safety analyses: The Core of Mediation Through Demonstration

Introduction: Nuclear industry obliged to demonstrate safety

From the beginning the Swedish nuclear power programme, starting already a few months after the end of WWII, was strongly state-driven. Leading national politicians took strong initiatives just a few months after the atomic bombs were dropped over Hiroshima and Nagasaki and set up a National Atomic Committee in 1946. The task for this Committee was to develop methods for the domestic use of atomic energy for peaceful ends. The Swedish Parliament decided unanimously to support the establishment of the partly state-owned Atomic Energy Co. to carry forward the implementation of a national nuclear energy programme.

In the 1950s and 1960s the Atomic Energy Co. developed and operated three R&D reactors and extracted uranium from a domestic ore mine. In 1962 the Atomic Energy Co. was given approval to start the construction work on the first full-scale reactor. When the reactor was almost completed, in the year 1970, the Government decided to cancel its finalisation. The paradigm of self-sufficiency, hitherto guiding the Swedish programme and based on domestic supplied uranium and heavy water reactor technology, was abandoned. In the late 1960s cheap

enriched uranium as well as light-water reactors, considered easier to handle, were possible to buy on an international market, that was earlier non-existing. The good arguments for self-sufficiency quickly faded away, together with the ambition of a nationally controlled nuclear fuel cycle and plans for nuclear weapons (Elam & Sundqvist 2007b: ch. 2).

The state-driven company could not manage to shift direction in this new situation, and besides private companies had grown strong also in Sweden. In 1968, when the failure of the Atomic Energy Co. was close to realisation, it was merged together with the nuclear division of the private company ASEA (today ABB) into a new partly state-owned company, ASEA ATOM Co., but this time the company became driven by private interests. It was made part of the ASEA Company, which had the deciding vote. ASEA ATOM soon became a leading producer of light-water reactors ordered by Swedish utilities at a high speed. The shift from one partly state-owned company to another was however important and meant that the State, and national politicians, lost the detailed control over nuclear technology they have had for more than twenty years. But still the State was an important supporter and funder of the nuclear energy programme, and politicians from all parties in the National Parliament stood behind the expansion of nuclear power.

However, in the beginning of the 1970s the long-standing political consensus was disappearing and a decade of intense political discussions on the future of nuclear power started. The background was a growing international critique of nuclear energy, most strongly heard in the United States, and in Sweden represented by a few prominent scientists such as the Nobel Laureate Hannes Alfvén, who earlier was one of the leading pioneers of the Swedish nuclear programme. In this situation all political parties in the National Parliament quickly presented their own profiled standpoints on the future of nuclear energy in Sweden.

In the campaign before the general election in 1976 the Centre Party made nuclear power the most important issue. The party's focus on the phase-out of nuclear power was the main reason behind the shift of government power in Sweden. For 44 years the social democrats had stayed in power, but now lost to a right-wing coalition government lead by the strongly anti-nuclear Centre Party. In the election campaign, the leader of the Centre Party, Thorbjörn Fälldin, committed himself to not be part of a government fuelling more reactors. His vision was a decentralised society in harmony with nature and without producing atomic risks and radioactive waste.

The two other coalition parties in the new government, the liberal party and the conservative party, did not support a phase-out programme, but wanted an expansion, while they considered the dependency on foreign oil supply and acid rain more challenging than nuclear power. The Centre Party did not succeed to get a political majority for the vision of Sweden as a nuclear free zone. To solve their internal problems the Government made a strategic manoeuvre, and shifted the focus from politics to science, technology and legal regulation. After long discussions the divided parties in the government agreed on stronger safety requirements for nuclear power and nuclear waste.

In the spring of 1977 the National Parliament decided on new legislation, i.e. a law called the Nuclear Power Stipulation Act ruling that no further nuclear reactors would be fuelled until the owners of these reactors had come up with a programme for managing the high-level waste resulting from nuclear power generation with *absolute safety* (Sundqvist 2002: ch. 4). The expectation on the part of the Centre Party was that the nuclear industry was destined to fail to come up with a credible recipe for total safety, while the other two parties in government remained confident that the reactor owners would succeed in meeting the exceptionally stringent safety demands being made upon them.

The Nuclear Power Stipulation Act transformed nuclear power to an expert issue on safe handling of nuclear waste, and this challenge was handed over to the nuclear industry. From being an issue on political visions of a future society, the expansion or phase-out of nuclear power became a technical challenge for experts from the nuclear industry to handle.

Despite the fact that the Swedish nuclear industry was to a significant degree state-owned, the leading party of the Government, the Centre Party, was intent on trying to achieve a relative disentanglement of state and industry. The latter were to assume sole responsibility for demonstrating absolute safety in high-level nuclear waste management, while the former were to cultivate the free-standing authority necessary to pass independent expert judgement on the achievement of the most stringent safety standards. This resulted in a clear conception of political roles, with the industry showing – demonstrating – safety, and the government performing an oversight role (legislation and the review of proposals). In sum, the two important consequences of the Nuclear Power Stipulation were the delegation to the nuclear industry and the stated requirements of showing absolute safety.

The Swedish reactor owners rose to the challenge posed by an adversarial new Prime Minister by establishing a research, development and demonstration project called Nuclear Fuel Safety/Kärnbränslesäkerhet (KBS) at the end of 1976. To start with, this project was organised as an independent initiative within the Swedish Nuclear Fuel Supply Company (SKBF) – in 1984 renamed Swedish Nuclear Fuel and Waste Management Company (SKB) – which since its inception in 1973 had concentrated on the international acquisition of fuel for Swedish reactors and the negotiation of reprocessing contracts (KBS 1977a: 16). Already by the end of 1977, the KBS project had given rise to 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). As soon will be described the conclusion from the nuclear industry was that the KBS concept showed that nuclear waste could be disposed of with absolute safety.

In this chapter the central role given to safety analysis, based on the requirements of the new legislation, is described. Three safety analyses are discussed, all of them carried out in critical situations where nuclear power or the waste programme have been at stake. The first is the safety analysis presented in 1977 as part of the original KBS project, as a response to the requirements of the Nuclear Power Stipulation Act to show that nuclear waste could be taken care of with absolute safety. This analysis became a strategic tool for getting 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 dialogue and voluntarism after the company had met strong local 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 a strategic tool for the change of the siting strategy to a more flexible view on the bedrock conditions (the natural barrier within the KBS multi-barrier-system). 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 and the encapsulation plant but was expanded to include also site-specific data. This analysis will be further developed and will become an important part of the application, planned to be sent to the Government in the year 2010, for building a final repository for spent nuclear fuel in one of the municipalities of Oskarshamn or Östhammar. In this case the safety analysis will become a strategic tool in order to get permission to start the construction of a final repository for spent nuclear fuel.

In these three descriptions we will focus on what constitutes the basis of the safety analysis and how it is performed, discussed and communicated. Is there a dialogue about the basic content of the safety analysis, or is safety analysis a task only for SKB's technical experts? Is any kind of upstream engagement taking place? And what about downstream engagement: what happens when SKB presents the safety analysis? We will shortly describe the review processes and who is considered competent to be a reviewer. The third and last safety analysis is part of the site investigations taking place in the two municipalities of Oskarshamn and Östhammar, where local municipal organisations are working and many citizens are interested in whether the repository will be located in their municipality. Are the results of the safety analysis discussed with local citizens? Are the municipalities interested in engaging in the work of safety analysis? In a final section we draw some overall conclusions of the character of the SKB safety analyses in relation to the two kinds of mediation: *demonstration* and *dialogue*. Do we find continuity or disruptions in SKB's work on how to carry out safety analyses during the 30 years covered by the three chosen analyses? Are they dominated by 'demonstration' or by 'dialogue'? Are there alternative ways of doing safety analysis? Finally, we make a short comparison to the Canadian kind of safety analysis, based on the concept of social safety.

The KBS Safety Analysis

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 the situation when the nuclear power programme was at stake. Four nuclear reactors were almost finished and waiting to be fuelled, which motivated

the strong efforts and big resources behind the KBS project. The result of the project was a multi-barrier technical concept where the spent fuel would be reprocessed, vitrified, encapsulated in steel, lead and titanium, and stored in tunnels 500 meter down in the bedrock, surrounded by sand and bentonite (KBS 1977a). However, according to the Nuclear Power Stipulation Act it was not satisfying to just present an ambitious technical concept, convincingly showing that this kind of repository is possible to construct. What remained to be done was to demonstrate that this construction implied that reprocessed spent fuel is taken

care of with absolute safety, and the means to do this, according to the KBS project, was to carry out a safety analysis.

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 (KASAM 2007: 13). A safety analysis is based on three parts (cf. KASAM 2007: 12). First *safety requirements* – norms and criteria – which usually are set by authorities. In the case of the KBS safety analysis it relied on the criteria set by the National Radiation Protection Institute (SSI). Secondly, *descriptions* of the features of the barriers and the processes and events that influence these features. In the KBS safety analysis the features are the vitrified waste, the canisters, the buffer surrounding the canisters, and finally the bedrock. Thirdly, *calculations* that lead to results that give a picture of what will happen with the repository in the future.

In the KBS safety analysis the radiation protection criterion to satisfy was set to a maximum dose rate for the most exposed group of people and it was stated that ‘in the most unfavourable case the maximum dose rate would be 10 millirem per person per year for a group of people taking their drinking water from a well near the repository’ (DsI 1978:29, cited from the PRAV review, p. 6, 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 on the features of this barrier: i) initial damage on one canister – counted as total lack of capsulation – and ii) encapsulation break through after 1.000 years in all canisters. The transportation of groundwater from the deep of the repository to the biosphere is set to 400 years, and retardations factor for different nuclides are specified. Three cases of catchment areas are also calculated: a well, a lake and the Baltic Sea (KBS 1977b: 84-99).

Five main conclusions are drawn from the calculations (KBS 1977b: 98):

1. no radiation doses to nearby residents the first thousand years
2. maximum radiation dose to nearby residents will not exceed 0.4 rem in 30 years
3. maximum radiation dose to nearby residents is occurring not before 200 000 years
4. initial damage on single canisters gives non-measureable doses

5. the collective dose to all living people during the exposed 500 years of time gives less than 0,01 manrem/MWe/year

In addition to these calculations some cases of 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 taking place the consequences are considered of less magnitude than the cases discussed above, i.e. the reference case based on slow breaking down of canisters.

The main conclusion drawn, after made 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 final dispose of vitrified high-level nuclear waste is considered absolutely safe (KBS 1977b: 109).

But how were all these assumptions established, 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 ‘most realistic case’ and ‘low probability’ and a mix of literature survey (studies in Canada and USA are mentioned) and common sense reasoning seems to be the guiding principle.

The processes and events are of course just ‘assumptions’, well suited for broader discussions with different kinds of groups. But this never happened as part of the developing of the KBS technical concept or the safety analysis. No groups were invited to take part in upstream work on how to carry out the KBS project proposal or the safety analysis. The KBS group was working in isolation, taking advantage of previous work. 450 researchers and technicians were enrolled to the project, but all of them recruited to reach the same end: to demonstrate safety that could fulfil the strong requirements of the Nuclear Power Stipulation law. Even if this meant that 500 experts were engaged in upstream work, i.e. to together design the KBS proposal and safety analysis, this is not what we usually mean by upstream engagement. No ‘outsiders’ were invited to contribute, and of course no lay people. The aim was to produce a well-integrated package of true knowledge that could convincingly demonstrate absolute safety. Uncertainties, alternatives, lack of knowledge and so on were enemies to fight; absolute safety is not allowing these kind of 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.

However, the Swedish nuclear industry rose to the challenge and succeeded in making the issue of nuclear fuel safety their own, winning both national support and growing international recognition for successive versions of their multi-barrier KBS concept. An important part of this was the safety analysis, clearly demonstrating that absolute safety could be achieved by the KBS concept. A result of this was an international standard for doing safety analysis on geological disposal of nuclear waste.

The Review Process

On December 6, 1977, the Government received an application from the State Power Board concerning the fuelling of the Ringhals 3 reactor. Attached were the KBS report, including the safety analysis, and the contract with Cogema. The nine months of work by 450 scientists and technicians and the sixty technical reports were summarized in the final KBS report. In the application the State Power Board (aka Vattenfall) claimed that this satisfied the requirements of the Stipulation Act: the KBS report showed how and where the fuel could be finally stored with absolute safety (KBS 1977: 109).

In January 1978 the Government sent the KBS report for review to 24 Swedish and, in March, to 23 foreign authorities and organizations (DsI 1978:28, 29). The reviewers had to finish their work by June, while the Government intended to summarize and assess the opinions of the reviewers during the summer and reach its decision in September. This could be understood as a downstream engagement process, to engage reviewers after the analysis had been finished, but who should be engaged in such enterprise in relation to the KBS safety analysis?

In Sweden it is usual, as part of the Government's preparation for important decisions, to use a review procedure, which is called a 'remiss'. In this process a wide spectrum of organizations, private organizations as well as public authorities, universities, labour organizations and other groups are asked to give their comments. The public is also allowed to give comments as individual citizens. The remiss 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 remiss was not intended to be about the acceptability of the whole project. The selection of international reviewers showed that this was not a traditional remiss, but a technical review. And in this respect the remiss deviated from the intentions of the Swedish remiss system. This impression was strengthened by the fact that the reviewers often stuck to their narrow competence areas, clearly indicating which fields they were competent in and where they lacked competence. Therefore, many of the reviewers hesitated to make an overall statement about the safety of the KBS concept according to the Stipulation Act. If the intention of the remiss process was to evaluate policy, the reviewers should have included an overall statement.

The most important of the Swedish reviewers, the four government authorities, the Nuclear Power Inspectorate (SKI), the Radiation Protection Institute (SSI), the Program Committee for Radioactive Waste (PRAV) and the Swedish Geological Survey (SGU), all approved the application. Among the many other reviewers, however, there were those who rejected it, and many critical comments were voiced. Most of the reviewers – indeed, the majority of the foreign reviewers – argued that the KBS method contributed significantly to the development of nuclear waste management but were not willing to take a stand on the thornier issue of 'absolute safety' (See DsI 1978:28 and DsI 1978:29).

Many of the reviewers used this technical interpretation and based their interpretations of safety on the newly issued instructions for limitation of releases from nuclear power plants made by the Swedish Radiation Protection Institute (SSI). Most of the reviewers, therefore, assumed that final storage of nuclear waste would be absolutely safe if the radiation dosages to which any individual or group could be exposed did not exceed these standards, as was also what the KBS safety analysis based its calculations on.

The standards set by SSI set the maximum dose rate for the most exposed group of people to 10 millirem per person per year from the nuclear power programme (see SSI review p. 15 in DsI 1978:29). As already mentioned this standard was also used in the KBS report.

There were, however, those among the reviewers who discussed a more 'draconian' interpretation of the Act, arguing that no social activity can be absolutely safe. The Royal

Institute of Technology in Stockholm rhetorically asked if they were supposed to review ‘an application rejected by definition already in advance’ (DsI 1978:29). Many of the reviewers noted the strange situation of estimating degrees of *absolute safety*, but only a few argued for rejection because of the wording of the law. One of them, Umeå University (Forum), argued that an approval of the KBS application would mean legitimating a method for the final disposal of nuclear waste which would be uniquely pretentious, telling the world that all security problems had been solved (DsI 1978:29).

A technical interpretation of the Act became dominant among the reviewers. ‘Absolute safety’ was given an operational definition, implying that the review was about to assess whether the KBS report could demonstrate a technical method which, under presumably realistic conditions, could lead to a storage system meeting specific radiation protection standards. If the requirement would be to ‘show’ that the repository, under all imaginable conditions, would not release any kind of radiation to the biosphere, of course none of the reviewers could approve the application. But most of the reviewers were never discussing such a ‘draconian’ interpretation. The reviewers, following a technical definition of safety, focused on which conditions – scenarios – were the relevant ones, whether the amount and quality of data from the KBS project enabled sufficient calculations of safety, and whether the safety analysis had been made in a proper way.

The SKB 91 Safety Analysis

In the 1992 R&D Programme SKB claimed that from the geological investigations carried out so far it was not possible to conclude that the search for suitable sites should be focused on specified regions or kinds of rock. It was argued ‘that suitable or less suitable areas cannot be associated with any particular part of the country or any particular geological environment’ (SKB 1992a: 70). Moreover, it was asserted 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. Some sites could be harder than others to prognosticate (to predict the conditions at the depth of 500 metres) and also to

carry out the construction work at (higher risks of collapse-prone rock volumes and major water leakage) (SKB 1992b: 40). A systematic selection procedure, based on geological factors focusing on regions and kinds of rock, is, therefore, according to SKB, both inappropriate and wrong with regards to safety considerations. SKB explicitly objected to the requests by the reviewers for a geologically driven selection procedure pushed forward on a more detailed scale. SKB claimed the opposite standpoint, that the rock as a safety barrier was suitable at most of the investigated sites (SKB 1992c: xvii). Consequently, suitable sites may be found almost everywhere. In advance and on general geological criteria, no region or site should be excluded. Questions regarding constructability could only be decided after more detailed studies, which meant drillings in the bedrock. Therefore, comparisons between different sites, on a national or regional scale, will be of no value in the site selection process. According to SKB, these theses were now proven 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 initiatives, display an interest in having a closer examination made of the potential for a deep repository’ (SKB 1992a: 66).

So what was more precisely said in the SKB 91 safety analysis motivating a totally new siting strategy, where the former was focussing on best bedrock conditions and the latter was based on the assessment that good enough bedrock could be found at many different places?

It was stated that during the last years there has been international cooperation on the development of methods for safety assessments of final disposal of nuclear waste coordinated by the OECD/NEA. A collective opinion among IAEA and OECD/NEA, that a satisfactory methodology to evaluate long-term safety for geological disposal of nuclear waste now existed, was referred to (SKB 1992c: 5).

It was said that specific guidelines for safety have not yet been established but safety authorities in the Nordic countries have recently published a proposal that seems to be in agreement with the work done within the IAEA. This proposal, that was expected to be decided on soon, was what the SKB 91 safety analysis based its work upon (SKB 1992c: 10). Among others these safety requirements stated that the individual radiation dose is to be less

than 0.1 mSv/year. Extreme events, 'unlikely disruptive events', were not included in the calculations but were discussed qualitatively (SKB 1992c: 11).

The barriers constituting the KBS 3 technical system were slightly changed compared to the KBS system. The waste is now non-reprocessed spent fuel and is placed in copper canisters, which are filled with lead. A buffer material of bentonite clay is used, and the canisters are placed one by one in holes in crystalline rock at a depth between 300 and 700 meter. Site specific data were chosen from the Finnsjö area, not far away from the Forsmark nuclear power plant, where SKB in the middle of the 1980s carried out an extended site investigation.

A reference scenario was chosen, and from this variations in relation to 13 factors were evaluated (SKB 1992c: 8). In the reference scenario, which was not considered to be the most likely, the probability of a canister to be initially defected, due to manufacturing defects, was set to 0.1%. This was calculated as five or six canisters having a hole of 5 mm² in their welded joint (SKB 1992c: 8). Moreover, it was assumed that the defected canister is isolated from groundwater the first 1000 years and that corrosion or rock movements during the first million years does not affect the defected canister, or all the other canisters.

The reason for choosing this scenario as the reference case was that the aim of the SKB 91 safety analysis was to calculate the importance of the natural barrier (bedrock conditions) for safety. And to be able to calculate the importance there must be a leakage from the repository. It was however argued that the most likely scenario was that all canisters are 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). If an initial leakage is assumed it is easier to calculate the importance of the natural barrier for safety and how variations in the 13 factors affect safety. It was concluded that the factor most readily summarising the importance of bedrock for safety is the groundwater travel time from canister to surface (SKB 1992c: 174). The results of the calculations show that changes in groundwater travel time for water from repository to biosphere are relatively small by most of the variations of the different characteristics of the 13 factors that have been performed. However, one exception is 'flattening, highly conductive zones', which cause significant changes, but neither these are leading to the exceeding of dose limits (SKB 1992c: 175).

Calculations did show that the leaking radionuclides from an initially defected canister travel directly up to the biosphere, without being retarded or absorbed during the travel, 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 drew from the SKB 91 safety analysis was that variations in bedrock conditions only to a small extent influence safety. The importance of the natural barrier is to provide long-term stable mechanical and chemical conditions to give protection to the technical barriers. The safety of the repository is to a very low extent dependent on the bedrock and its capacity to retard and absorb leaking radionuclides. These general requirements of the bedrock could be met at most sites that SKB has investigated, it is argued. And finally it was stated that the SKB 91 safety analysis has shown that a multi-barrier KBS 3 repository ‘fulfils the safety requirements suggested by the authorities with ample margin’ (SKB 1992c: 178).

The review of SKB 91

In the review of the 1992 RD&D (Research, development and demonstration) Programme the authorities argued for a more systematic and scientifically based site selection process. The Nuclear Power Inspectorate (SKI) claimed that the safety analysis of the importance of the bedrock, presented by SKB in the report SKB 91...

... *has not shown* that all necessary issues have been resolved or that a large number of sites would fulfill the requirements, which is also a point made in SKI’s review of SKB 91. These issues were not studied in SKB 91 and SKI *strongly objects* to SKB describing SKB 91 in this way... In SKI’s view, it is not possible, at this stage, to make the claim that suitable sites for hosting a deep repository can be found in most areas in Sweden. On the contrary, it is likely that certain sites will possess clearly unsuitable characteristics, such as poor constructibility, high groundwater flow, high anomalous stresses, etc... In general, SKI believes that important safety-related factors can be defined to a much more detailed and quantitative extent than SKB has managed... (SKI 1993: 63-64; italics in the original).

In the more detailed evaluation of the SKB 91 safety analysis, SKI 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. It is, however, almost self-evident according to the SKI

review, that under less favourable conditions the natural barrier could be of greater importance. SKI also argued that the assumptions made in the SKB 91 is violating the multi-barrier safety principle, saying that if one barrier fails the total safety should not fail; the safety of each barrier should be assessed independently of the others. The SKI review underlined the necessity of analysing the natural barrier also for less probable scenarios (SKI 1992: 5).

As stated also in the SKI review of the SKB 1992 RD&D Programme, the SKI review of SKB 91 is also highly critical against the general conclusion drawn from the safety analysis, which is explicitly limited in its scope only focussing on the bedrock from a few assumptions of the stability of the technical barriers. The general conclusion saying 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. The SKB conclusion, according to the SKI review, that the importance of the natural barrier is to provide long-term stable mechanical and chemical conditions to give protection to the technical barriers seems to be like arguing in a circle (SKI 1992: 40). To be useful as a safety analysis concerning bedrock conditions less favourable cases should be analysed to make it possible to assess the natural barrier independently of other barriers and thereby be able to discriminate between different sites (SKI 1992: 40-41).

SKI also asked a group of safety analysis experts from the consultant company Intera, United Kingdom, to review the SKB 91 analysis as well as the SKB 1992 RD&D Programme and the connection between the two reports. In this review it is argued that the new siting strategy ‘is clearly based very heavily on the findings of... the SKB-91 assessment of the safety of high-level waste (spent-fuel) disposal...’ (Chapman et al. 1993). According to the Intera report the conclusion that ‘the safety of such a repository is only slightly dependent on the ability of the surrounding rock...’ has the implications ‘that the copper container is providing almost all of the containment, that an adequate site is going to be easy to find and that the details of site properties are largely irrelevant, and that the future natural development of the site is unlikely significantly to affect a safety case’ (Chapman et al. 1993: 3-4). The task for the reviewing authorities, according to Intera, ‘must be to examine in detail what are effectively a series of ‘short-cuts’ in order to see whether they are justified and acceptable’ (Chapman et al. 1993: 4). The Intera group is also stating that the SKB 91 safety analysis is not based on scenarios

but on variants of a central case, which make it incomplete as a safety analysis. Moreover, the chosen case that a 0.1% of the canisters being defected is not motivated. Why is this number chosen? And why is this mentioned as a conservative one (Chapman et al. 1993: 7)? The whole analysis is based on the assumption of a long-term safe performance of the copper canisters, but this is not supported by research (Chapman et al. 1993: 24).

As in the case of the KBS safety analysis SKB did not take advantage of a broad discussion on the description of the processes, events, and the selection of the reference case and the different variations calculated. An earlier joint SKI/SKB scenario development project is referred to but it is not clear from the SKB 91 report how the reference case was selected. Compared to the case calculated in the KBS safety analysis on canister defects this is very different. In the KBS analysis the defect is assumed to mean a total lack of capsulation, while in the SKB 91 safety analysis the assumption is a hole of 5 mm². Why are these assumptions made, and why do they differ significantly? SKB 91 was carried out by safety analysis experts within the SKB Company and no outside groups were consulted. As in the case of KBS safety analysis it is hard to understand from reading the report how the assumptions and selection of reference case and its variations were carried out; these are not reflected upon in a way that make them transparent to an outside reader.

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. The first was to be called SR-Can and the other 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 is using 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 was to get a review from the state authorities on the used methodology and the interpretations made on the safety requirements. Already in 2004 a preliminary report from SR-Can was published and reviewed by the state authorities. Since this time the authorities have been reviewing the safety reports and this will continue until the final SR-Site will be presented, as is expected to take place in the year 2010. SR-Site will then be an important part, the main argument, of the SKB

application to construct a final repository for spent nuclear fuel. SR-Can is not part of any formal licensing process.

Half a year 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 to be 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 carried out, Oskarshamn and Östhammar. This report signalizes a clear ambition of downstream engagement with a local audience.

The safety requirements for SR-Can are set by the authorities, and the fundamental criterion is found in a regulation released by the Swedish National Radiation Protection Authority (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’ (quoted in 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. The Authority is also requiring a more detailed assessment concerning the first thousand years, while the time scale for the safety assessment should be one million year after closure. Furthermore, the consequences of human intrusion should be described as well as the protective capability of the repository concerning such events (SKB 2006: 46).

The descriptions of the different barriers are presented as the initial state of the repository system, as it is before excavation, i.e. based on the data from the site investigations (SKB 2006: 77). The primary function of the barriers is to isolate the spent fuel and in case of leakage retard the release of radionuclides. Isolation and retardation are the two key words for safety performance. 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 still called 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).

In the SR-Can report it is mentioned that the safety analysis methodology is inspired and influenced by other safety analyses performed recently in other countries, for instance in

Belgium, Canada, Finland, France, Japan and the United States, as well as by the international cooperative work organized by the OECD/NEA, but nothing is said about this work and how the methodology as well as the way to carry out the safety analysis used in SR-Can differ from what has been done by others (SKB 2006: 49).

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 was established. The first half of the 10 steps describes the initial state, relevant processes based on FEP screening as well as external conditions. The second half is organized around a reference evolution and 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 the one million years, but the consequences of these 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 green house scenario, it is argued, is favourable for safety, because most of the risks are connected to glacial conditions.

The reference evolution became the basis for what is called the main scenario. In addition, six specified scenarios are developed. Since the primary function of the repository is isolation, 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). These are about, ‘buffer advection’, ‘buffer freezing’, ‘buffer transformation’, and canister failures due to ‘corrosion’, ‘isostatic load’ and ‘shear load’. The first question to answer is if the specific scenario could happen. If this is the case the scenario is classified as ‘less likely’ and will be part of the risk summation, if this is not the case it is classified as ‘residual’ and will not be part of the risk summation (SKB 2006: 462). Residual scenarios are however important, while they can be used to illustrate the importance of a specific safety barrier.

The conclusion of the calculations in relation to the main scenario and the additional scenarios are that canister failures can occur due to advection and corrosion. Freezing and transformation of buffer and canister failures due to isostatic load were assessed as residual scenarios and were not made part of the risk summation (SKB 2006: 526-527). The analyses of the scenarios showed that two of them could lead to canister failures – the advection/corrosion case and the case of large earthquakes – which together made up the risk summation.

In requirements from the SSI it is stated that consequences of future human actions (FHA scenarios) should be analysed separately and not be included in the risk summation (SKB 2006: 514). 23 cases of human intrusion, described in 4 categories, were analysed. Only one of this, ‘drill in the rock’, was assessed as plausible, technical feasible and leading to canister failure (SKB 2006: 518).

Finally a few ‘bounding cases’ were analysed, such as ‘a completely fictitious loss of barrier functions’. In the calculation of the most pessimistic of these – an initial total loss of the canister and buffer in all deposition holes at the Forsmark site – yields doses ‘that are comparable to those caused by the background radiation’ (SKB 2006: 542).

It is not possible to distinguish between the two sites of Forsmark and Laxemar with the help of the results from the SR-Can safety analysis, much due to the fact that the site investigation at Laxemar was in its early phase when the SR-Can safety analysis was performed. But based on the results from the SR-Can study both sites were assessed as fulfilling the SSI risk criterion.

The Review Process

The two state authorities, the Nuclear Power Inspectorate (SKI) and the Radiation Protection Authority (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 had 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 organisations and tried to take advantage

of their opinions, which are also referred to in the report. This is an example of upstream work between authorities, municipalities and environmental organisations, however strongly coordinated by the authorities. Also the close interaction between SKB and SKI/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. The demarcation line between the industry (SKB) and the state (SKI/SSI) is still strong in a formal sense. SKB has to demonstrate safety, and this is done in reports with a clear sender, and these reports are then, at a later stage, formally reviewed in reports from the state authorities. But informally a lot of contacts are taken and the many comments stated formally could be said to be part of an upstream engagement process between the industry and the state. It will for instance be hard for the state authorities, timely (before the final application from SKB will arrive) unified in a common state authority (the Swedish Radiation Safety Authority – SSM) in July 2008, to have completely new and more critical comments on the SR-Site safety analysis, when they are quite satisfied with the safety methodology as well as the main conclusions of the SR-Can safety analysis. The two authorities sum up their arguments to the SR-Can analysis by saying that ‘SKB’s safety assessment methodology is overall in accordance with applicable regulations, but part of the methodology needs to be further developed for the license application’ (SKI 2008/SSI 2008).

The SKB view on broader upstream engagement processes is still negative. A final remark in the popular summary report in Swedish of the SR-Can safety analysis it is stated that it is hard for lay people, lacking specialist knowledge, to understand the correctness of the calculations and thereby the result of the safety analysis. This has to be done by experts, foremost by experts from the state authorities, and laypeople have to trust these experts (SKB 2007: 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). Why not take this statement seriously, connect it to the earlier stated view on laypeople’s (lack of) competence, and ask what kind of subjectivity is needed for discussing and selecting relevant scenarios.

Conclusions: Narrow technical analysis or upstream work on social safety?

In 1977, the first SKB safety analysis was presented. The objective was to give a clear response to the requirements of the Nuclear Power Stipulation Act: to demonstrate absolute safety. Since this time the safety analysis has been the most prominent tool to answer questions about safety, and questions about safety have been what the nuclear waste discussion has been primarily about. Thereby SKB's safety analyses, presented at several important occasions in the history of nuclear power and nuclear waste management in Sweden, have been made cornerstones in the mediation of nuclear waste management. The way this has been carried out has been through demonstrations: SKB *showing* and *representing* safety to an outside audience.

Among the parties in this outside audience, the state authorities have taken the most prominent role. To a great extent the safety analyses have been presented by SKB to 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, or what constitutes nuclear waste as opposed to nuclear resources for that matter.

What was once was constructed as an attempted strong demarcation between industry demonstrating versus state authorities reviewing – even if this organizing principle has always had its limitations due to the strong connections between the two formally independent parties – has during the last years becoming less and less convincing as demonstrators and inspectors appear more and more dedicated to the realization of a joint project. The comments given by the authorities to the preparatory safety analyses have been built into the SKB work. When SKB now is preparing the final 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 is responded to judgements already fed back to them*. Once again, a rather closed stepwise process of mutual adjustment is taking place between demonstrator and inspector as the siting of a KBS-3 repository appears to be drawing to a conclusion.

It could be expected that more groups will be interested in the SR-Site safety analysis when the time comes closer to the final decision, and as we know this safety analysis will be an

important part of the application to build a final repository, either in Oskarshamn or Östhammar. This analysis will give the answer to questions about safety at the two sites, 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. As we have seen SKB's view is 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 as the only ones in a position to really know when safety has been secured or not.

But why has this way of doing safety analyses – as demonstrations – remained so dominant in Sweden? As we already have seen a lot relates to history: the strong requirements early given to SKB about demonstrating (absolute) safety. But SKB has also 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. However, there are alternatives ways of carrying out safety analyses. We will just mention one example of this: the work in Canada based on the concept of social safety.

In the report from the Seaborn Panel published in 1998 the concept of social safety was introduced (NWMO 2005). The panel was set up after that a public inquiry in 1996-97 concluded that a narrow technical concept of safety lacked social acceptability. Since then, social safety has become a foundation for Canadian safety assessments. Social safety means there is something called *technically safe*, and something called *socially acceptable safety*. The latter determines the boundaries of the former, while social acceptance is meant to be something arrived at through public consultations. The Seaborn Panel showed that the way of doing safety analyses is and must be open to discussion, which in some important respects involves upstream issues being opened up for debate. The concept of social safety suggests that upstream issues must be explored in order to define what safety should mean and encompass. This way of understanding safety is very different to the one held in Sweden. Why is this the case?

4. The Progress of Mediation Through Dialogue 1991-2008

On the 14th 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 been taking 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). At the March meeting, the administrative director of the Council for Nuclear Waste pointed out that there had been different organizations 'hosting' dialogue: first it was SKI and SSI; later on the municipality of Oskarshamn; after that Oskarshamn and Östhammar had jointly hosted nuclear waste 'dialogue' and now; the Council for Nuclear Waste intended to become the focal point for more inclusive discussions.

The study presented in this report 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. Moreover, it is not clear what is meant by 'continuous dialogue'. The official at the Council for Nuclear Waste perhaps referred to the projects themselves, or to Swedish history of nuclear waste management in general. We do not know. 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', that is, whether they have been characterised by upstream or downstream engagement, and what actual combination of mediation by demonstration and by dialogue. Another open question, which we aim to investigate, is the links between these activities and SKB's activities. Are there any links, or are the activities organised by SKB and the activities in the dialogue projects largely divorced from each other running in parallel with little or no impact on each other?

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*.¹ We base our analysis and background descriptions of the projects on interviews with key actors (the initiators, or in other respects important persons within the projects), the final reports of the projects, and other official documentary material from the

¹ 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 understood as 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'.

projects such as goal descriptions and plans. In addition we base our analysis on notes from observations of one of the projects. The interviews have been tape recorded and transcribed. In total, we conducted eight interviews with six persons and observations of two activities from *The Transparency Programme* (see Appendix, list of empirical material).

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*

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 will present was a reaction by state authority to this situation. SKI thought that something needed to be done, and *The Dialogue Project* that ran between 1991 and 1993 was one outcome.

The Dialogue Project

The Dialogue Project ran from 1990 until 1993 and it was organised as a simulated review process of an application concerning the final disposal of nuclear waste. The project involved state authorities, municipalities and environmental organisations. It was the Swedish Nuclear Power Inspectorate (SKI) who initiated and funded the project and a small group of three people formulated the project idea. These key individuals were Kjell Andersson, a theoretical physicist who had worked with safety analyses at SKI, Clas-Otto Wene, a nuclear physicist from Chalmers University of Technology and a member of the Swedish National Council for Nuclear Waste, and Staffan Westerlund, a Professor of Environmental Law at Uppsala University. Together with three officials from SKI, these individuals formed what was termed the 'playing group'. They organised the subsequent events; sent out invitations and a preliminary project plan. The selection of participants was made through an open invitation to a number of organizations.

The invited organizations that chose to participate were the authorities SKI, SSI and the Environmental Protection Agency (Naturvårdsverket), two nuclear municipalities

(Oskarshamn and Varberg) and three environmental organisations.² These formed an ‘actor group’. The organizers and the Chairman of the actor group, the former judge Lennart af Klintberg, were selected by SKI, otherwise, the invited organisations chose their representatives themselves. Among those organizations that had been invited but chose not to participate were SKB.

The process was organized as a role-playing exercise where the actor group was expected to review a simulated application seeking permission to construct a final disposal system of KBS-3 type. The key question was: How can we make technically valid and politically legitimate decisions about the final disposal of spent nuclear fuel? (SKI 1993a). SKI wanted to see if discussions within the actor group could lead to a common view around the decision-making process and assist SKI in developing a credible review process in the future.

During a pilot study, conducted in 1991, preparations were made for the core study. Andersson who was part of the playing group, formulated the simulated application, a 70 page long document including a preliminary safety analysis (SKI 1993a). In addition, the application included two fictional locations with different characteristics, one in the southeast and one in the north of Sweden, and a zero alternative leaving the waste in interim storage. The northern alternative appeared as more geologically appealing, but the southeastern alternative was given other advantages, such as a more accessible location, to make the review process more challenging.³ A simulated hearing was conducted and each participant in the actor group acted according to their own understanding of the issues at hand. At the end of the pilot study the actor group decided to continue the project and contributed with ideas of their own concerning how the core study should be conducted. One of the ideas from the actor group was that the hearing should be open to the public, even if Swedish legislation did not require this at this point (1993b: 5).

The core study consisted of a number of activities but the main activity was an extended version of the role playing pursued in the pilot study. The public hearing was conducted in 1993 and it lasted for two days. The hearing was framed as a court proceeding and the actors played themselves. Since SKB did not participate, Andersson played their role as the implementer. In order to review the simulated application, the participants in the actor group

² These were the Swedish Anti-Nuclear Movement (Folkkampanjen mot kärnkraft-kärnvapen), The Waste Network (Avfallskedjan) and the Swedish Society for the Conservation of Nature.

³ Interview, Andersson, Kjell

had received their own budgets to enable the engagement of independent experts (SKI 1993a). Before the hearing took place, seminars, discussions and group projects had been arranged, to prepare the actors for the simulated review. The seminars had highlighted topics that the actor group had identified as important issues in the pilot study, such as economic safety, responsibility, societal effects and safety during construction and operation (SKI 1993a).

No simulated decisions on the legitimacy of the planned nuclear waste storage were taken during the hearing (SKI 1993c). 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 by others than the applicant; that other actors such as municipalities, environmental organisations and local residents should be given sufficient economic funding in order to facilitate their participation in the process, for instance by commissioning their own experts; it should be considered whether another body than the applicant/implementer should be the organiser of the EIA; and finally, 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).

The project was documented in three separate reports, a report by the player group, one by the actor group, and an evaluation report by the sociologist Göran Sundqvist, Göteborg University, who had not participated in the project.

RISCOM I & II

RISCOM is a set of principles identified in order to improve quality in decisions over complex technical/scientific matters. RISCOM also refers to two concrete projects: RISCOM I was a pilot project conducted between 1996 and 1998, concerned with making nuclear waste management more transparent and open to people outside the groups of experts and political decision-makers. SKI took the initiative to conduct the project and hosted and funded the project together with SSI. The RISCOM model, as a set of principles and methodologies, was developed during the course of RISCOM I by Kjell Andersson and Clas-Otto Wene, who were involved in organizing *the dialogue project*, and Raul Espejo, a management consultant working in the field of organisational cybernetics. RISCOM II was an EU-funded research project that ran from 2000 to 2003. RISCOM I and II were research projects aiming to

develop procedures in relation to nuclear waste management, involving first and foremost the authorities SKI and SSI and the above-mentioned consultants. However, they also contained participatory elements and engaged people from environmental organizations, and other authorities in Sweden as well as other countries.

During the mid-1990s, SKI thought that a broader participatory consultation process was needed. 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.⁴ RISCOP I was thus to a great extent a continuation of the work initiated in *the dialogue project* and was pursued by more or less the same people. The project emerged out of discussions between Kjell Andersson, SKI and SSI with the needs of the authorities foremost in mind.⁵ The project was organized by a group of 6 people with various competences (apart from Andersson and Wene who had previous experiences from *the dialogue project*, the group consisted of people with competence in EIA, Environmental Law and organisational theory). The aim was to develop procedures to increase transparency in decision-making processes and the decision base in the nuclear waste area (SKI 1998).

Transparency, as defined by Kjell Andersson, Clas-Otto Wene and Raol Espejo, has been understood in relation to three equally important pillars: technical/scientific issues, normative issues and authenticity.⁶ The inventors of the RISCOP model argue that there are true facts that can be determined through scientific methods and that values in society also influence decisions. When facts and values behind a decision are plain for all to see, the decision has legitimacy. If the question is scientifically complicated, the authenticity, i.e. if you can trust the experts and evaluate their claims, becomes crucial. To put it briefly, to clarify facts, values, and authenticity is the core of the RISCOP model and its concept of transparency. Through “stretching”, which is another central concept in the RISCOP model, all the three pillars should be made more transparent to a wider audience. Stretching refers to the practice when central actors and their claims to truth, validity and authenticity, are challenged by questions from different perspectives.

⁴ Interview Westerlind, Magnus

⁵ Interview Westerlind, Magnus

⁶ These elements were picked up from the philosopher Jürgen Habermas’ theory of communicative action.

During RISCOM I, a ‘Team Syntegrity workshop’ was organized in order to compare decision processes in Sweden and the UK. The workshop was based on the principles that all participants should contribute to the purpose and agenda of the workshop and that all should be able to express personal experiences in a non-hierarchical manner. The workshop participants were representatives of public authorities in the UK and Sweden, Nirex,⁷ Cumbria County Council, Oskarshamn municipality, and Friends of the Earth. The agenda was set by letting all participants contribute with ‘statements of importance’ and step by step reducing the number of statements into what became 12 ‘consolidated statements of importance’, which provided with the agenda for the remainder of the workshop (SKI 1998:21). When the agenda was set, participants were organized into 12 teams focusing on the issues set out as the agenda. Each participant was a ‘member’ of two teams and ‘critics’ of two teams. ‘Members’ were expected to work out the ‘final statements of importance’, while ‘critics’ were expected to play the role of the ‘devil’s advocates’ (ibid).⁸

RISCOM II was organized as an EU project under the Euratom 5th Framework Programme and coordinated by Magnus Westerlind, at that time, head of the nuclear waste department at SKI. It aimed to ‘support transparency of decision-making processes in the radioactive waste programmes of the participating organisations, and also of the European Union, by means of a greater degree of public participation’ (SKI 2004, Foreword). RISCOM II included a number of activities in the participating countries Sweden, UK, France, Finland and Czech Republic. These activities were more or less testing various forms of dialogue processes involving a wide range of stakeholders, in combination with activities such as evaluations, argumentation analysis, interviews, and focus groups (SKI 2004).

A Team Syntegrity workshop, with a similar format as the one held in RISCOM I, was conducted within the framework of RISCOM II. The workshop was held in Belgium in 2002, involving participants from many different fields: experts, researchers, citizens and NGOs (SKI 2004). RISCOM II also included a hearing in Sweden. Since the hearing was part of a

⁷ Nirex was the nuclear waste company in the UK, until it was been replaced by...

⁸ The RISCOM 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 RISCOM I report neither presents the final statements, nor gives a proper reference to the Shap Wells Report, it is seems as if the aim with the workshop – the participatory element of RISCOM I – was primarily to develop the methodology and not to reach conclusions over substantial matters in nuclear waste management.

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 research, development and demonstration programme 2000 to move forward with site investigations in four municipalities (Oskarshamn, Forsmark, Tierp and Nyköping). SKI and SSI wanted to improve their knowledge base in relation to their review of SKB's plans and decided to arrange public hearings in these regions (SSI 2001).

As SKI and SSI engaged Kjell Andersson and Clas-Otto Wene as consultants to develop a format and method for the public hearings, they also became an integrated part of the RISCOS II project. The methodology used was based on the model developed earlier in the RISCOS pilot study. According to the organizers and their consultants, the facts and values held by central actors in nuclear waste management (primarily SKB whose RD&D programme was under review) as well as these actors' trustworthiness, should be subject to stretching activities (SSI 2001).

A steering group with representatives from SKI, SSI and the consultants was set up. Since this was an activity, taking place in 'the real' as opposed to a simulated site selection process, the organizers realized the need for a reference group that included representatives from the municipalities and SKB. The reference group met a year in advance of the hearings in order to discuss the arrangements: when to hold the hearings, who to focus on, invitations and so on.⁹ The reference group decided to focus on politicians and civil servants in the municipalities. The public were also welcome to participate, and the panel debates were to be held in the evening to encourage this (SSI 2001; SKI 2004).

In total three hearings were conducted. Two of the hearings (held in Hultsfred and Tierp) lasted for 2 days and followed similar schedules. The first day concentrated on the choice of method for final disposal of nuclear waste. 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 second day dealt with the site selection. SKB

⁹ Magnus Westerlind, interview

presented their plan, and then the hearing continued. The hearing in Nyköping was more compact and lasted for only one afternoon and evening. There was no time for group discussions, but there were short presentations and both method and site were dealt with. Anna Schytt, geologist and science journalist, was the moderator at all three hearings. The discussions focussed on choice of method and site and covered technical, legal and social aspects. Questions like alternatives, leakages, the connection between method and site and the time perspective were discussed as well as how priorities between the remaining municipalities were going to be made (SKI 2001). The public were invited to the meetings, but most of those who attended were in some way already involved in the question. The evaluation showed that many participants had noted the scarce participation from the public (Ibid).

The Oskarshamn Model

While RISCUM II and the hearings described above overlapped in time, *the Oskarshamn model*, started to develop 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 at CLAB, in Oskarshamn to also include a facility for encapsulation of the spent fuel.¹⁰ Oskarshamn municipality were 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 for all municipalities participating in feasibility studies in order to help them build up a local competence to engage and participate in nuclear waste management and to their own expert consultants. In 1994 such government support was won and the project, Local Competence Building (LKO) was launched in Oskarshamn (Oskarshamn 1994).

At this point, Torsten Carlsson, who had participated in *the dialogue project*, was the local mayor and chairman of the municipal board. He engaged four consultants that together with the project leader Krister Hallberg formed an expert group. Two of them left the group after a few years and the remaining experts were Kjell Andersson, who at this point had left SKI and had worked as a consultant since 1992, and Harald Åhagen. Their mission was to represent and assist Oskarshamn in building competence and developing a decision base in relation to

¹⁰ FUD-program 1992

the site selection process. In this work, they discussed questions of principle and strategies, arranged seminars and hearings, examined documents and wrote position papers.

The work and activities in Oskarshamn have been influenced by the RISCUM model and are summarized in the Oskarshamn model.¹¹ 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 (Oskarshamn 2007).

The work has been arranged in different working groups, involving around 50 people in total. The activities have been adjusted to what is happening in ‘the real’ process (i.e. adjusted to SKB’s planning process) and the engagement and composition in the working groups has shifted throughout the years. During SKB’s feasibility studies in Oskarshamn, the municipality organized about six different working groups, working on different levels with various focuses like transport, safety, society, regional development and so on. After 2000 when Oskarshamn was selected by SKB for more detailed site investigations, the organisation was reformed to consist of four working groups and the work concentrated around a yes or no to the inquiry. This meant a lot of communication with citizens and politicians and it resulted in a decision base to the municipal council in 2002 that led to an affirmative decision. LKO has worked actively to get broad engagement and the local politicians, youths and people living close to the proposed site have been the main focus. Environmental organizations have been invited and offered economic support but there are few active in Oskarshamn.¹² There have also been efforts made to attract media attention to the activities and articles have been published in the local paper.¹³

Already during the first years of the LKO project, there were many activities, such as study visits, tours, activities for high school pupils, forums for the general public, international conferences (Oskarshamn 1995; 1996). LKO representatives visited large workplaces, markets and shopping centres, in order to meet people, handing out brochures, listening to people’s opinions and worries. For youths, there has been a conference called ‘Beneath the

¹¹ (Kaj Nilsson, interview; Kjell Andersson, interview).

¹² (Kaj Nilsson, interview)

¹³ (Kjell Andersson, interview).

surface' (Under ytan) arranged the last three years.¹⁴ In addition, seminars are arranged, focusing on different topics.

The LKO project faced some difficulties when the municipality started to see advantages with being chosen as the final disposal site. It was not seen as legitimate to be working with both the socio-economic advantages and preparing to get the final repository in the future, and at the same time claiming to be concerned with a critical interrogation of SKB's proposals. It became more difficult for the local expert group to maintain their neutral profile. When Torsten Carlsson stepped down as the local mayor, the confidence-building activities decreased which made the problem even more urgent.¹⁵ However, according to the former project leader of LKO, Kaj Nilsson, the dilemma became a starting point for a constructive discussion and they learned how to combine the two perspectives. This was enabled by an organizational change in 2006 where distinctions between the functions and tasks in the working groups were made and the societal and future questions were separated from the critical review work. Around 2006, the consultants Andersson and Åhagen left Oskarshamn.¹⁶ LKO has recently engaged four new experts, and there is a planned hearing on safety issues coming up and the intention is to present a satisfactory decision base to the municipal council, in relation to any request for siting a final disposal and/or encapsulation facility in the municipality (Oskarshamn 2007).

The transparency programme

At the end of 2006, The Swedish Nuclear Waste Council had finalized a plan for its *transparency programme*. The programme is 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 2007). Again, Kjell Andersson was engaged as a consultant and the programme is based on ideas stemming from the RISCO model; that facts, values and potentially hidden agendas should be made visible to a wider audience.¹⁷

The administrative director of the Nuclear Waste Council, Björn Hedberg, initially engaged Andersson as a consultant and tasked him with conducting a preliminary study. The aim was

¹⁴ (Kaj Nilsson, interview).

¹⁵ (Kaj Nilsson, interview; Kjell Andersson, interview).

¹⁶ (Kaj Nilsson, interview).

¹⁷ (Kjell Andersson, interview)

to identify questions that should be made transparent and to offer suggestions about how this might be achieved.¹⁸ In order to identify the most urgent questions as well as to get input regarding an appropriate format, Andersson contacted a range of stakeholders. Meetings were held with SKB, SKI, two environmental organisations (MKG and MILKAS) and an association promoting renewable energy (SERO), Oskarshamn municipality, Östhammar municipality, The Region Unions in Kalmar and Uppsala and the county administration of Kalmar.

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 questions in the transparency programme. Based on Andersson's preliminary study, a working group (composed of members of the Nuclear Waste Council) developed a proposal of questions that should be 'made transparent'. Finally the council developed the programme with a few changes from the proposal in the pre-study.

The programme consists of a few activities per year, limited partly because of the capacity in the council, partly because there is a limit on how many meetings people can engage in. The council and its consultant judged two or three hearings per year, as being a reasonable number of activities.¹⁹ The programme is planned to run during four years (between 2007 and 2010) and to arrange hearings on the following 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; and finally one about the management of large complicated projects (Nuclear Waste Council 2007).

The first hearing illuminated deep bore holes as a method for final disposal of spent nuclear fuel. Initially, this was not a topic of high interest for The Nuclear Waste Council, but after media focus and a call from several actors, especially Östhammar and Oskarshamn, wanting the council to focus on this question, they did.²⁰ The hearing lasted for two days. Presentations were held, followed by questions from the moderator, the journalist Göran Skytte, and from the audience. A separate panel discussion was held the first evening with

¹⁸ (Björn Hedberg, interview),

¹⁹ (Kjell Andersson, interview).

²⁰ (Björn Hedberg, interview).

seven politicians from the Swedish Parliament, about how their parties are preparing for the decision about the final disposal of Sweden's nuclear waste. The discussions concerned a recent public opinion survey about the public preferring deep bore holes, responsibility for information about alternative methods, their views on retrieval of the waste and foreign waste potentially coming to Sweden. The second day consisted of a final panel discussion with representatives from SKI, SSI, SKB, MKG, Östhammar and one expert on drilling techniques in the panel. They discussed technical considerations, cost, use and responsibility for trial drillings as well as how to investigate deep bore holes further. The suspicion of hidden agendas, multinational storages and if it is possible to wait until there is more knowledge and better techniques available were also discussed (Djupa borrhål 2007).

After the hearing about deep bore holes, some changes were made in the staging of seminars to better fulfil the aim of increasing the competence of the council. The Council chose to moderate the future activities themselves to gain better control of the hearings and they also increased the time for questions from the panel. This has led to higher interest among the target groups and the council themselves. There has also been an expectation from many parts that the hearings should be "fair" in that sense that everyone should be able to make their voices heard and have equal opportunity which is not the objective of the hearings.²¹

A science journalist has helped with the documentation. To be able to deliver a readable document suitable for politicians and decision makers, the exact formulations of what has been said have been edited in favour of making the proceedings more readable. This has also led to more openness, according to the administrative director of the council, since the participants do not have to worry about being quoted strictly when raising an opinion.²²

Thematic discussion

The following sections aim to discuss our studied dialogue projects along five cross-cutting themes: transparency, participation, upstream and downstream engagement, the role of mediators and the relation between the activities and issues discussed in the dialogue projects and activities organised by SKB.

²¹ (Björn Hedberg, interview).

²² (Björn Hedberg, interview).

Transparency

Transparency is often seen as something intrinsically good. This does not mean that there is a unified meaning of transparency, accepted by all. On the contrary, it is an open and vague term that can be filled with more or less substantiated ideas. Transparency has explicitly been advocated as an important principle in the RISCUM model. Since the principles of RISCUM have underpinned many of our studied dialogue projects, it is interesting to see how key actors in these projects reflect upon the meaning of transparency. Some of our interviewees expressed that transparency is about making ‘roles’ and ‘role expectations’ clearer:

[RISCUM I och II] bidrog till en ökad transparens på det sättet att varje part fick en så att säga tydligare identitet så att vi lärde oss mycket på hur viktigt det är att så att säga verkligen definiera att dom här grupperingarna gör detta, vi ansvarar för det och någon annan för det tredje, och rollspelet, eller rollfördelningen, ansvarsfördelningen blir tydligare. (Interview Westerlind)

Transparency can also be connected to better insights into the issues discussed, not necessarily a detailed insight into technical issues, but that people are informed about ‘what kinds of issues are discussed’ and ‘what questions are the most important’ (Interview Lindfors). Further, transparency is connected to ‘knowing the underlying arguments’, ‘why certain positions have been taken’ and ‘what the aims are’ (Interview Gunnarsson).

The actors involved in the various dialogue projects also express that transparency has its limitations. For instance, our interviewees state that transparency can be ‘counterproductive’ and that one may choose to not ‘say things that may appear in writing’; that there is a need for ‘discussing ideas that are not thought-through’ in more closed rooms, or that transparency is only applied to ‘the available information’ but never to the ‘underlying’ assumptions and aims, i.e. the reason to why certain things are done or not.

According to one of the consultants that has been involved in all of the dialogue projects, in the currently running *Transparency programme*, it is the organisers that select the issues that are ‘made transparent’ in advance and that one important criteria is that an interrogation into the chosen topics is ‘useful’ in the decision-making process:

Ja, det är ju de frågeställningar som vi väljer ut. Platsvalet kan förhoppningsvis bli mer transparent nu efter det här; hur SKB hanterar djupa borrhål ska vara mera transparent ju mer man sätter ljuset på just den frågan. Det blir ju de specifika frågeställningar då som rådet väljer ut och sen gäller det ju då liksom att man väljer rätt, eller rätt, hur ska jag säga, rätt frågor strategiskt – så att det kommer till nytta för beslutsfattandet. (Interview Andersson)

Transparency is however not only restricted to substantial issues like ‘deep boreholes’ and ‘site selection’. For the interviewee who is also one of the founders of the RISCUM model, transparency is connected with the ‘authenticity’ of the people and organizations that one confronts in the dialogue projects. When you meet face-to-face you get the impression that:

...den här människan som står här nu, döljer han något nu eller gör han det inte? Försöker han framställa resultaten mer värda än vad de är eller är han öppen och här finns osäkerheter och vissa fall kan ge stora doser och allting sånt och svarar ärligt på frågor, att det framgår. Och då ligger det på något sätt i modellen, det förtroendet som man får eller inte får så att säga för de experter som gör det här. Har man förtroende för dem så reducerar det behovet av att förstå vad de gör i detalj. Det kommer man aldrig att kunna göra. (Interview Andersson)

‘Transparency’ evokes not only the question of *what* is made transparent but also to *whom*. Our interviewees express that the target groups are politicians and the general public, but also themselves. By ‘listening to others’, others’ needs, and the issues important to them, become more clear for the authorities (Interview Westerlind). Even though the target group for some of the projects has been the general public, participation has in practice been restricted to relatively few people, which is the theme for the next section.

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. Even though the aim was in most of the projects to reach key actors and stakeholders rather than the general public, it may be interesting to know how many people the projects have actually engaged more actively.

The Dialogue Project involved around 20 people, 7 of them elected by SKI and 13 participated as representatives from different established organisations: SKI, SSI, The Swedish Environmental Protection Agency, two nuclear municipalities and environmental organisations. It also involved some temporarily invited experts (SKI rapport 93:35).

In RISCUM the organizers saw a need for broader engagement and involved the public and industry to a greater extent than what was done in *the Dialogue Project* (Interview Westerlind). The first Team Syntegrity workshop involved the industry, the municipalities, authorities and departments and environmental organisations, the second one had a broader representation with also researchers from different fields and citizens. In RISCUM II there were several dialogue experiments that involved experts, citizens and stakeholders in various combinations (SKI 2004). The project group that framed the events in RISCUM I consisted of experts from various fields (SKI 1998) while in RISCUM II there were people from several organisations, research institutions and one environmental organisation involved in the project group (SKI 2004).

The hearings on method and site selection conducted as part of the review process of SKB's R&D programme, involved local politicians and administrators as well as interest groups like a federation of labour unions, industry and environmental groups in the planning (SKI 2004). A reference group with stakeholders decided upon the agenda for the hearings. Representatives from SKB, SSI, SKI, six municipalities (Östhammar, Tierp, Älvkarleby, Oskarshamn, Hultsfred and Nyköping) participated when the hearings took place. The general public were invited but few participated (SKI 2001). The hearings were held during the evening to enable the public to participate, but those who attended did not get a chance to participate in the group discussions where the questions for the panel were formulated.

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 wider set of actors in different working groups. At the end of 2007 the work was organized in four groups: 1) Misterhultsgruppen involving citizens in the neighbouring area close to the site, mainly politicians and representatives from local organisations like sport associations and nature protection agencies. 2) The future group consisted of politicians, administrators and managers from the municipality, industry, a business centre, a university college centre, a housing office, the Regional Council and the Royal Institute of Technology. 3) Half of the safety

group were politicians. The other half consisted of one teacher, and representatives from the nature conservation agency, a battery company and the local board (Oskarshamn 2007). Over the years, LKO has tried to reach especially politicians, young people and citizens living close to the nuclear site through their activities, but also citizens in Oskarshamn in general (Kaj Nilsson, interview).

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 from the nuclear waste authorities, municipalities Oskarshamn and Östhammar, environmental organisations, and SKB, and others. Observations from the third and fourth hearings conducted within *the transparency programme* showed a notably familiar atmosphere among those present. The moderator Björn Hedberg often addressed people in the audience with their first names and during the hearing about site selection he did not present the panel members until someone in the public reminded him. The participants also shared some in-jokes that for a newcomer gave a closed impression (Observation, June 2008). The consultant involved in *the transparency programme* also recognizes that the friendly atmosphere can be a problem:

Just den delen kan ju vara lättare för någon som kommer utifrån för att det är ändå svenska kärnavfallsprogrammet, det är ett ganska begränsat, det är ett samhälle nästan, alla känner alla och jag har varit på flera ställen också, SKI och Oskarshamn och så, inte SKB dock någonsin, men det blir ändå att man känner dom så väl och dom blir ju lite av ens kompisar på ett sätt och plötsligt ska man då vara lite skarp och jag tror vi behöver liksom, det blir bättre med tiden. (Kjell Andersson, interview)

According to the assumptions in the RISCUM model the ability to evaluate any claims for ‘authenticity’ (the sincerity and trustworthiness of the speaker) is dependent on participation and face-to-face interaction. This means that it is only those attending the actual events that have a chance to make a judgement of the trustworthiness of the actors. The consultant and one of the founders of the RISCUM model argues that the target groups of *the transparency programme* are politicians and citizens in the municipalities, groups that only partly are attending (Interview Andersson). The majority is therefore dependent on the small group of participants to spread the message further, but they are without the ability of judging the

authenticity. For the Nuclear Waste Council, however, the main target group of the programme is the Council itself, in that it will assist the Council in fulfilling its task to be an adviser to the Government (Interview Hedberg).

The participatory aspects of the dialogue projects does not only concern how many people that are reached but also how issues and agendas are framed, and how open this is to others than a small group of organizers or consultants. The expert group that worked with the *Oskarshamn Model* was not seen as entirely transparent from the outside, one of the consultants that was part of the group says:

Ja, det, så var det väl att vi gjorde Harald och jag, alltså det var ganska, vad ska jag säga, väl sammansvetsad grupp det där, Torsten och Krister och Harald och jag [...] Det fanns nog dom som tyckte att vi var en alltför sluten grupp [...] Och det kanske fanns en föreställning om att det i den här gruppen pågick saker och fattades beslut mycket mer än vad det egentligen gjorde. Det var ju ganska mycket så att säga brainstorming i den här gruppen och det bollades idéer fram och tillbaka, det var ju inte så att vi satt och bestämde. (Interview Andersson)

The framing of issues and agendas is one important aspect that distinguishes upstream engagement from downstream engagement.

Upstream and downstream engagement

To some extent, advocates for the RISCUM model argue, the quality of the dialogue compensates for the lack of broad representation. The most important aspect of RISCUM is its 'stretching capacity'. The idea that arguments and underlying values should be challenged and discussed resembles the idea that public engagement should be characterised by upstream engagement, that is, processes that problematize how problems are framed in the first place. This is distinguished from downstream engagement that typically is about experts informing people about decisions already taken. Our study of the dialogue projects suggests that there are both elements of upstream and downstream engagement involved.

Men sen ska man inte glömma bort, och det är kanske då det viktigaste i alltihopa, i modellen finns ju då det här stretchingbegreppet och det är ju de som utmanas som stretchas och då i första hand naturligtvis SKB men också myndigheterna och till viss

del också kommunerna själva så att förhoppningsvis då, jag menar, funkar det på det sättet att dom vid dom här tillfällena får signaler om vad det är som man vill och också signaler om vad det är som kanske är svagt i deras egen argumentation så att det faktiskt också påverkar dom inklusive SKB i hur dom betar sig och, så att det bör kunna ha en påverkan på deras program och även hur dom argumenterar för sitt program. (Interview Andersson)

The quote above suggests that issues can move upstream: from critical discussions amongst a small but heterogeneous group of stakeholders to the implementer SKB. It is pointed out as the core idea within the RISCUM model.

In order to discuss upstream/downstream engagement and mediation through dialogue and/or demonstration, we will include an analysis of our observations at the seminar on Deep Boreholes. Most of SKB's activities are about demonstrating the safety of the KBS-3 method. The organizers of the transparency programme apparently thought the question whether KBS-3 or deep boreholes are preferable in order to ensure long-term safety is an issue that calls for dialogue rather than demonstration.

The question is how the links look like between the activities in the dialogue projects conducted by the authorities and RISCUM consultants and the activities and core issues at SKB. First however, we will discuss the role of mediators – the consultants, their models and core conceptions – that assists in gathering people in order to have an open dialogue (or to witness demonstrations) on nuclear waste management.

The role of mediators

Evidently, some people have been more active than others in initiating new projects, gathering people, and setting the stage for discussions on nuclear waste management. Some of these actors have been moving around from organization to organization, and been engaged as consultants by SKI, SSI, the Nuclear waste Council and Oskarshamn municipality. They manage to engage others in activities that would not have come about with out them. These important individuals – which we call mediators of dialogue – are probably 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. The interviewees expressed that there are a few people in Swedish nuclear waste management that are considered as extra important and that some persons leaving their organisations has meant big losses:

Det slutade alltså nyckelpersoner. Till syende och sist så faller det på enskilda individer hur det fungerade va, även om man inte tror det, att det är en myndighet, som är som en grå massa det där va, men det sitter vissa huvuden som sticker upp i den där massan, och försvinner de så blir det bara en massa kvar va. (Interview Nilsson)

In a similar sense, the RISCUM model, has also functioned as a mediator, in that it has gathered the various activities and issues raised into a more or less coherent framework and generalized approach about how to pursue a legitimate decision-making process:

[Kärnavfallsrådet] har så pass tungt etablerat genomlysningsprogrammet, tydligt baserat på RISCUM modellen så är det ju klart att det nu är rådet som liksom identifieras med den rollen och, men det betyder ju inte att, jag skulle inte säga att det utesluter att kommunerna också kan, jag menar, skulle kunna stå för aktiviteter som har det här som utgångspunkt. [...] SKI, genom ARGONA-projektet, engagerar sig ju fortfarande i RISCUM och det är ju rätt tydligt att dom, eller det var ju tydligt uttalat att det var ju så att säga deras intresse av projektet var ju att hjälpa till så att RISCUM fortsätter att utvecklas. (Interview Andersson)

Apart from being shaped by the RISCUM model, the dialogue projects were all in some way conducted with a future or ongoing EIA process in mind. The EIA requirements are fundamentally about establishing a process that can ensure that environmental impacts of planned projects are considered from multiple perspectives and viewpoints. The EIA requirements, as formulated in Swedish law, international conventions and good EIA practice, have provided an incentive and thereby acted as a mediator, motivating *why* the dialogue projects were conducted and *how* (with broad representation of stakeholders expressing their various viewpoints).

When mediating actors, such as particularly engaged local officials or engaged consultants moved on to the next organization, the mediating actants, such as the EIA requirements and the RISCUM model, to some extent remain calling for something to be done to maintain and uphold a commitment to mediation by dialogue. In particular, once environmental legislation has been put in place, it exists in the same way nuclear waste exists, it cannot be simply wished away requiring mediation by dialogue of some description to be enacted.

Relation to SKB activities

SKB's main activity is to plan and build a demonstrably safe final repository for nuclear waste. The RD&D process and the EIA process are both led by SKB. The dialogue projects have related to these two processes in different ways. *The Dialogue Project* and RISCUM I and II were ultimately projects that aimed to test methods for creating a dialogue between stakeholders that could be useful in a subsequent upcoming EIA process. In RISCUM I it was concluded that the EIA process could be the umbrella under which stretching activities in relation to nuclear waste management could take place.

The idea was thus that the methods could be used again, but not necessarily the substantial questions that the participants in these projects had agreed upon. Some actors involved in the EIA process refer back to issues that were agreed upon in the Dialogue Project. One representative of the environmental organization MILKAS reasserted the conclusions from the actor group in the Dialogue Project, at a seminar in 2005:

The environmental organisations, the authorities and the municipalities involved in the Dialogue Project agreed that the EIA process should take the issues of method and site as open questions; other parties than the implementer should be active, and given economic resources; EIA should be organized by another body than the implementer. That nuclear waste is a national issue that is a concern for the whole country. That other methods than KBS-3 should be tested and that site selection should be made in a systematic way and after the method has been presented. Now SKB decides upon the agenda and alternative methods are not discussed to the extent we would like to see.
(Observation November 2005)

The quote above suggests that SKB has not been affected at all by the discussions that have taken place in *the Dialogue Project*. Some of our interviewees offer another view on this. The

Administrative Director of the Nuclear Waste Council argues that their critical hearings and the environmental organisations critical reports help SKB accumulate a better decision base and one of the consultants argues that the stretching function in the RISCUM model hopefully can contribute to SKB and other actors getting signals of what is needed and what is weak in their own argumentation so that changes can be introduced repairing the situation. Others stress that SKB are always likely to go their own way anyway:

SKB var tvungna att välja, antingen vara med i dialogprojektet eller välja en egen väg och man valde en egen väg. Men SKB styr precis till det håll, man har fått det dit precis dit man har velat, det är man inte oblyg att säga att man gjort. Processen är precis där de vill att den ska befinna sig, vi har två bra kommuner och nu ska vi gå till val. Dit har man ju styrt hela tiden, man säger det har följt en rak linje men det har det inte, man har ju anpassat den här processen hela tiden efter motståndet. Det var därför man avstod dialogprojektet, det var därför man avstod från att gå ut i fler kommuner efter Malå och Storuman sagt nej så valde man kärnkraftkommuner istället så man har ju hela tiden anpassat sig. (Interview Gunnarsson)

If SKB is not affected by what happens in the dialogue projects, and if SKB is not initiating participatory and open processes themselves, we suggest that the dialogue projects can be discussed as a form of repair work protecting SKB, KBS-3 and a siting in less than ideal conditions from a hubristic over-commitment to mediation by demonstration as a guaranteed recipe for techno-political success.

Conclusions

The nuclear authorities initiated the first dialogue projects as responses 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 when this was apparent, *the dialogue project* initiated by SKI and SSI in a way did what SKB were still not prepared to do. SKB also recognized the technocratic failure and they did respond to it by changing their strategy (to emphasize voluntarism and local acceptance) and their public relations campaigning (this we will discuss in section 5 below) what they did not do was to initiate processes characterised by dialogue. We argue that the dialogue projects that we have studied encompass a commitment to mediation by dialogue that SKB are still reluctant to condone despite the demands existing for a such commitment inscribed in Swedish law in the

Environmental Code. 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.

To a large extent the dialogue projects were organised as upstream processes, perhaps especially the Dialogue Project and the team synteegrity workshops within RISCUM I and II, in that a heterogeneous group composed of different stakeholders could offer input to the agenda and how issues should be framed.

At the same time, the dialogue projects contained elements of downstream engagement and demonstrations. Especially when they are seen in relation to Swedish nuclear waste management and not isolated events. 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 preeminent position of SKB's FUD 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. SKB and Public Consultations

From the dialogue projects, we will now turn back to SKB and focus on their public consultation activities. As presented in chapter two, mediating can be made through demonstration or dialogue and often by a mix of the two. SKB is a mediator when gathering and interacting with different actors in the consultation process. This chapter analyses the ways in which SKB is mediating and attempting to maintain its position as the most central actor in Swedish nuclear waste management codified as a world of nuclear fuel safety (KBS). Can we find examples of both mediating through demonstration and mediation through dialogue in SKBs consultation activities? A background to EIA legislation and SKB's consultation activities is presented below. After this a few selected public consultation meetings will be analysed with a specific focus on the overhead slides that SKB use during public consultation meetings or information meetings in connection to the consultation

meetings. We have selected overhead slides that either aim to present safety issues or issues related to alternative methods. In addition, the empirical material used in this chapter consists of notes from observations from a number of consultation meetings and SKB's minutes from the same meetings. In order to discuss the different approaches to mediation at SKB's consultation meetings compared with other events arranged within the dialogue projects we include a hearing on deep boreholes arranged within the Transparency programme. Slides from the hearing about deep boreholes showed both by SKB and other actors at the hearing will also be examined. To some extent interviews with key actors will also be used (for an overview of the empirical data see appendix).

EIA legislation

Environmental impact assessment, EIA, is a preventive and participatory environmental management tool that is used to evaluate the effects on the human- and natural environment that may occur in connection with major projects or other activities. It is a systematic and integrative process that originates from the USA in the late 1960's, intended to lead to well-informed decisions (Wood, p. 1-2). EIA is a process as well as a report, the latter sometimes called an Environmental Impact Statement, EIS. The EIS is central to the EIA process, documenting the findings regarding environmental impacts and used as a basis for decision (Wood, p. 176). Consultations and participation are essential parts of the EIA process as well as the consideration of alternatives. The latter are sometimes described as one of the most important stages of the process and the quality of alternatives from which to choose from is crucial to the quality of the final decision (Wood, p. 125 and 275).

The concept of EIA was introduced into the Swedish legislation for the first time in 1987 (SOU, p. 123) and in the two most important Acts regulating the final disposal of nuclear waste in 1991 and 1992²³ (SSI, p. 1-2). When the Swedish Environmental Code came into force in 1999, all environmental legislation were merged together. The Code prescribes that an application for a permit for activities that has an impact on the environment must include an EIS, giving a comprehensive overview of the impacts on the environment, human health and natural resources (Sundqvist 2002: 184). According to the Code, a description of the activity's location, design and range must be included as well as of alternatives to the proposed location, if possible, and alternative designs together with a motivation why one

²³ EIA was introduced in the Nature Resource Act in 1991 and in the Nuclear Technology Act (?) in 1992

alternative has been chosen. A description of the consequences if the activity doesn't come about, called the zero-alternative, must also be included (MB 6 kap 7 §). The Code stipulates the process to start early, requiring consultation with those affected and obliging preliminary as well as extended consultations for this type of project. There is a high level of freedom for the applicant in how to carry out the process and the consultations, it is for example up to the applicant to decide to what extent, and also who the affected people are and in what way they should be included in the process. The County administration functions as the coordinators of the consultations and is also responsible for part of the consultations (Sundqvist 184-185).

Even if there is no clear regulation around how the applicant should carry out the consultations, there are principles of EIA best practice developed²⁴ and criteria for good EIA- or consultation quality in particular. An EIA process is ideally flexible and open-ended with not a fixed set of activities or participants. This means that neither the forms for consultation, nor who the consulted parties are can be decided once and for all, this may change during the process. For example, all contributions (comments, proposals and/or questions that are posed orally or in writing) that can be of relevance for the planning process that reach the applicant until the EIA process is finalised can be referred to the consultation and should be dealt with by the applicant (Soneryd, p. 20-21).

SKB and EIA: A historic review

In 1992, the same year as the concept of EIA was introduced into the nuclear legislation, SKB described their plan of the practical process of going through with the deep geological storage of spent nuclear fuel in FUD – 92. From that moment, they planned to take the step from research, development and demonstration to industrial adaptation. The main alternative presented was the KBS-3 method and the work of finding a suitable location started after this point. In the same report, SKB highlighted the importance of affected municipalities getting funding to be able to participate in the EIA-process in a qualified way (SOU, p. 151). SKB started their feasibility studies in 1993 in Storuman and Malå (Sundqvist, p. 187 and 189) and an EIA-forum was established in Oskarshamn in 1995 in connection to the proposed encapsulation facility (SOU, p. 159). The project was at this time affected by a number of

²⁴ see for example IAIA:s Principles of Environmental impact assessment best practice: http://www.iaia.org/modx/assets/files/Principles%20of%20IA_web.pdf

Acts demanding an EIA and even if the requirements varied, SKB had the intention to achieve a combined basis for decision through the EIA-process (SSI p. 7).

Even if the feasibility studies held many elements from the EIA process; the authorities were continuously informed about the work and information meetings, seminars and debates were arranged for the public, SKB meant the feasibility studies were not conducted in a formal EIA-process (SOU 149 – 165). These were to be called informal consultations, and not legally defined EIA consultations, even if they were organized as if they were, and labelled as, and experienced as a legally defined EIA process by participants, including the government. For SKB, the legally stipulated preliminary consultations started when the site investigations began. This was also when SKB reported to the County administrations and the project became a legally defined project (Sundqvist 185-186).

SKBs consultation activities – regional and public

The formal consultation consists primarily of regional and public consultations in the two site selection municipalities. There are also consultations taking place between SKB and the authorities as well as with other countries that might be affected by the project according to the Espoo convention. The consultations have concerned both the encapsulation facility and the final repository (SKB a).

Public consultations are held once or twice a year in each municipality. Earlier, these meetings were divided into meetings for the public, and meetings for the environmental organisations, but lately, they have been integrated. Some arrangement changes have also been made, for example, the presentations by SKB have been shortened to enable more time for questions from the public. The consultation meetings are held in places with easy access for the citizens, first as a general gathering and then as an open meeting, opened for additionally two weeks to enable the participants and others to give their comments and get this input documented. SKB sets the agenda for the meetings and there are different themes every time. There is information material available before the meetings (Soneryd, p. 25 - 27). SKB has received criticism from consulted parties that too much time was given to information from SKB and that there was too little time for discussion. Due to this critique SKB changed the format of the meetings. Lately, SKB arranges an information meeting in connection to the public consultation meeting and starts the consultation meeting with a short

summary of what has been said during the information meeting. Besides this short introduction the consultation meetings are devoted to questions from the audience.

The regional consultations, called ‘MKB-forum Oskarshamn’ and ‘Samråds och MKB-grupp Forsmark’, are held three or four times a year. SKB, the municipalities, the County administration and the authorities (former SKI and SSI, today SSM) participate. The County administration has the chairmanship and the agenda is set by a group consisting of representatives from the different actor groups. These meetings encompass about 20 participants and once a year they are held commonly for both municipalities. Since 2005/2006, the meetings have been public, but however, the general public and environmental organisations can only attend as observers and not participate in the discussions (Soneryd, p. 26 - 27).

Local information activities

Even if SKB make distinctions between the formal consultations and other local information- and communication activities, they also see these as important for the process. SKB realized the need for good and respectful relations and communication after the mistrust they met locally in the beginning of the feasibility studies, which could be linked to a lack of information and communication. This founded a base for information activities on the local level that take place also at present. The local information activities consist of formal activities like seminars, meetings with schoolchildren and people in the neighbouring areas, study visits and Christmas fairs. An important part of the work is also to create relations with the citizens in a more informal way and to spread practical information about the projects and what is going to happen. SKB is also interested in getting input from the people living in the concerned areas. Study trips are arranged for the local citizens with both guided tours, lectures and time for informal communication. There is also a lot of people visiting SKB’s different facilities, mainly schoolchildren (Soneryd, p. 22 - 25). A central information activity, started already in 1989, is the tours SKB has organized onboard their ship m/s Sigyn, the ship that transports the spent fuel to Oskarshamn for interim storage (Eriksson, p. 107). Throughout the years the ship has sailed to a number of Swedish sites, but with an increasing focus on places of interest for SKB. There has also been a tendency that the tours focus more and more on specific target groups and exclude others. The tours have consisted of seminars and exhibitions with a variety of themes over the years (Eriksson, p.133 - 137).

Thematic discussion

The following sections aim to discuss SKBs consultation activities thematically: the first theme is about participation; as a second theme we discuss the boundaries between different consultation activities. In a third section we discuss mediation through demonstration or dialogue at the public consultation meetings. This section is longer than the others and includes an analysis of a selection of SKBs overhead slides that they present at these meetings (or at information meetings in connection to the consultation meetings).

Participation

Participation in the different consultation activities differs as the various activities focus on different actors. The regional consultations involve SKB, the County Administrative Board, representatives from the municipality and the authority SSM. The public consultation meetings are open to the public and other interested parties such as environmental organisations, which have had the possibility to get funding for their engagement since 2004. The consultations with the authorities and national administration boards are held separate in further other occasions (SKB a.). SKB is clearly making a distinction between what is counted as formal consultation activities and the local information activities are not part of these. At the same time SKB emphasizes that consultation takes part all the time and that the local information activities are important occasions for contact between SKB and parts of the public (Johansson 2008). In local information activities SKB tries to reach different segments of the local public. This separation of activities and participation has been commented upon by representatives from both the municipality and environmental organisations. The project leader of the nuclear waste project in one of the municipalities said:

Det jag känner att jag har minst insyn i det är ju dialogen mellan myndigheterna och SKB. Att SKB vill hålla på sitt det förstår man, de är ju ett företag som jobbar mot någonting. (...) Vi har frågat om det finns möjlighet för oss att vara med som observatörer vid vissa möten där SKB och myndigheterna har expertmöten. Och vi har fått som svar från myndigheterna att det går inte, det får vi inte det. (...) Motiveringen var nog i så fall, jag har ju fått det i skrift, och det var rätt länge sen, men att man inte vill ha för många med på mötena, och mötena får inte bli störda av frågor, det är nog mera på den nivån (Interview Lindfors).

A member of an environmental organisation commented the regional consultations in this way:

Nu är det SKB som driver dom och dom driver dom som dom vill och dom kallar dom för miljö, MKB-samråd på regional nivå och allting sånt här va, men det är ju inga samråd enligt miljöbalken, för fortfarande får man inte ställa vilka frågor man vill och vem som helst inte är välkommen (Interview Gunnarsson).

But the increased influence from environmental organisations has also led to giving the meetings a higher level of legitimacy:

Jag tror ju det att vi har skänkt dom här icke-, dom här dåliga samråden på regional nivå har vi skänkt en högre status. Vi har gjort dom till samråd som dom inte är i och med att vi är med. Man kan i protokoll visa att vi haft inflytande på frågeställarna och sånt där samtidigt som vi inte får prata, vi får inte lägga in underlag, vi får inte komma med skriftliga inlagor efteråt, vi får inte ut underlaget i förväg och sådana här saker, så jag tycker att vi har medverkat till att någonstans urvattna processen (Interview Gunnarsson).

The lists of participants present at all regional and public consultation meetings from 2005 to 2007 in SKB's minutes indicate that there has been an increase in the number of different actors participating. In 2005, the environmental organisations participating were MKG, Milkas and to some extent Döderhults nature protection agency, later on, organisations like SERO and Efö has also been involved. KASAM and the regional union have also increased their participation. The regional meetings have since they were opened up to the public involved between 10 and 20 people that participate as observers, mainly representing the public and the above-mentioned organisations. 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, any of the authorities or above-mentioned organisations) varied from 10 to 40 (SKB c.).

The allowance of environmental organisations to participate as observers at the regional meetings has, according to a member of one of them, changed what is discussed at these meetings:

Tidigare så pratade man bara egentligen processfrågor, man informerade varandra om vad som var på gång inom kommunen, inom länsstyrelserna, vad man gjorde, vad man hade för planer om framtiden och sådana där saker och SKB informerade var dom befann sig någonstans i processen. Det var väldigt mycket informationsutbyte. Nu plötsligt blir det frågestund och så ställs det upp frågor som blickar bakåt, det här har ni sagt, det här och det här har ni sagt där, det här har vi läst och tagit del av, hur kommer ni hantera det och varför är det på det sättet. Plötsligt så blev frågestunderna mer laddade så att det har haft betydelse (Interview Gunnarsson).

The quote above is from a representative of the environmental organisation MKG and he is saying that the increased influence of different actors at the regional meetings has resulted in a changed character for the meetings, from being mainly informative to being more critical.

Boundaries between the different consultation activities

As we have seen, SKB meet actors in different arenas and in different ways. When SKB present their consultations, they highlight that there are differences between the formal consultations and other local information- and communication activities, but at the same time that they see informal meetings with the local citizens as an important ground for a good process (Soneryd, p. 22). A member of one of the environmental organisations described the relation between the different activities in this way:

Man har alltså närboendemöten här i kommunen som drar 200 folk och man bjuder på buffé på herrgårdar och sådana här saker och det är jättetrevligt med sådana här arrangemang, det kommer ingen på samrådsmötena. (...) Nej, dom är tvingade att ha samråd bara. Skulle dom inte vara tvingade så skulle dom bara ha närboendemöten med landgång och sånt där. För det ger så mycket, mycket mera feed-back för dom är helt beroende av den här acceptansen, att kommunen står bakom (Interview Gunnarsson).

Good EIA-practice is to see all communication with the affected actors as potentially important contributions to the planning process and thus as part of consultations. An episode that involved a public official from Oskarshamn municipality and SKB in November 2007 indicates that SKB do not see the consultation process as a continuous process and that there are moments of when to discuss or not:

en händelse i november förra året va, där vi i Misterhultsgruppen kände att det här med miljöfrågorna fick vi liksom inte riktigt vara med och diskutera vad vi ville få ut utav det, och vi plockade ihop med hjälp av våra miljöspecialister visste på vad vi ville få ut av en transportutredning till exempel, och sen skickade vi in det till SKB då, och sen hörde vi ingenting. Och det kan ju inte fungera så, vi måste ju kunna ha en dialog om vad vi vill att de här utredningarna ska innefatta för det är ju ändå oss det berör härvid va. Så vid ett tillfälle åkte vi upp till Stockholm och träffade Saida och hennes grupp där uppe som sysslar med MKB och kommunikation och väldigt öppna och positiva och liksom såhär nu vill vi jobba med er, tillsammans med er på det här sättet, för att få det si och så va, och vi blev väl i princip utkastade, haha, om inte bildligt, om inte verkligt så i alla fall bildligt och där de talade om för oss att ja, vi har minsann samråd i Oskarshamn och där kan ni framföra er synpunkt och 14 dagar efter samrådet så kan ni komma in med skriftliga synpunkter, ni får alla våra utredningar härvid på remiss och ni får lämna synpunkter på dom och så vidare, det räcker för er (Kaj Nilsson).

In late 2005, it was notable that even if the consultations concerned both the encapsulation facility and final disposal, the focus was on the encapsulation facility. Some people attending the meetings were asking when the whole system was going to be discussed. According to SKB, this separation was made because it was the last chance to give input on the encapsulation facility²⁵. SKB said all questions were welcome to bring up for discussion but at the same time that it is not reasonable to discuss the whole system at once and that it is important to have a thematic focus. This led to comments such as “Kan jag ställa den här frågan idag, kanske man sitter och undrar” and “Vi från miljörelsen undrar när vi kan diskutera helheten, det är helt absurt att dela på detta” (Observations 14/11-05). The thematic focus and separation of the system seems to have led to uncertainties and frustration among

²⁵ The background was that SKB planned to deliver the application for the encapsulation facility according to KTL in 2006, and the application for the final disposal according to KTL in 2008 and for the whole system according to the environmental code in 2008 (From protokoll: <http://www.skb.se/6367eb19-5d65-46ce-8e71-f96992606e6a.fodoc>).

some of the participants who attended the meeting. On another meeting, a safety related incident had recently occurred at SFR – the final disposal for low and middle level waste in Forsmark. SKB was not willing to discuss the incident at first, even if there was a clear connection to the theme of the meeting, which was “safety and radiation protection”. SKB argued that this was a question for them to discuss with the authorities and not in the context of a public consultation meeting (SKB b.).

We have now seen some examples of how boundaries are drawn, both in the consultation process (between the various consultation activities) and within the consultation meetings (between what is allowed to be discussed and what is not). The division between public and regional consultation meetings is part of such boundary work. The regional consultations have been opened for the public, including NGOs, to attend as observers since 2005/2006. A member of one of the environmental organisations described the regional consultation meetings as follows:

Vi [miljöorganisationerna] har ju framfört kritik till att överhuvudtaget kalla det här för samråd för det är ju inte samråd. Det här är ju informationsmöten där regionala aktörer och myndigheter informerar varandra om vad som är på gång. (...) Och man pratade ju överhuvudtaget inte om MKB-frågor, utan man informerade varandra och det var vi väldigt kritiska till att man kallade det för samråd och tog in det i samrådet så att säga, då är ju frågan var är kommunen någon stans för dom var inte på dom här MKB-samråden som fanns här i kommunen där man hade ett samrådsmöte med ett underlag och där man diskuterade vad man skulle lyfta, det som liksom var MKB-samråden, där fanns inte kommunen med så vi frågade var är ni någonstans, varför är ni inte aktiva och varför ställer ni inte frågor? Nej men vi träffar SKB i andra sammanhang. Vilka då sammanhang? Jo vi har egna samråd med dom. Ja vilka sammanhang? Ja vi har dom här regionala samråden. Och så tittar man i protokollen, inte en enda miljöfråga diskuterades utan man pratar om helt andra saker (Interview Gunnarsson).

Environmental organisations have requested to be official participants at these meetings but they have been denied this, with reference to that the regional consultations are a meeting form that the participants values and wants to maintain (Soneryd, p. 27). The same person representing an environmental organisation as quoted above, described this rejection in this way:

Det var länsstyrelsen här i Uppsala sa nej direkt. Det här är inga formaliserade samråd enligt miljöbalkens paragraf sex utan det här är samråd som vi har som är informativa och här ska det inte vara med. (...) Miljöorganisationerna har sin arena i dom här kommunala samråden, medan Kalmar sa ja och då stod vi där, Uppsala med rumpan bar och hamnade i dålig dager så då blev kompromissen det att ja då får ni vara med som observatörer. Alltså utan att delta, utan att informera eller utan att delta på samma sätt som andra och det innebär ju att dom här samråden är ju inte samråd enligt miljöbalken så det är någonting helt annat. Så när MKG och MILKAS kom med här och det började pratas, den lilla frågestunden som kommer efteråt så restes då frågor kring projektet, risker och säkerhet och sådana här saker. Då insåg man ju liksom det att dom här protokollen som ligger till grund för det här, dom kommer ju att vara en del i samrådsunderlaget och då valde länsstyrelsen att kliva av. Så det gjorde dom från och med årsskiftet i år, då klev SKB, eller länsstyrelserna av som den som bjuder in till dom här samråden eftersom dom ska samtidigt vara en part som ska granska den här processen. (...) Så nu är det SKB som driver dom och dom driver dom som dom vill och dom kallar dom för miljö, MKB-samråd på regional nivå och allting sånt här va, men det är ju inga samråd enligt miljöbalken, för fortfarande får man inte ställa vilka frågor man vill och vem som helst inte är välkommen (Interview Gunnarsson).

This illustrates a process of division and separation. There is a separation between informal and formal activities as well as between regional and public consultations. But the room for participation is also segmented: where different actors participate, where and when they are allowed to speak and which questions are suitable to ask.

Demonstration and dialogue

In order to further analyse SKB's approaches to mediation, we will now turn the focus to their presentations at the consultation meetings. SKB gathers different actors that have the possibility to interact with each other in the consultation process, but is SKB mediating through demonstration or dialogue? As presented in the beginning of this report, mediation through demonstration is often visual and typically designed to show ready-made facts beyond discussion, the safety of new technologies, and the reliability of data. The public witness and react upon what experts claim to know and have decided upon, while mediation

through dialogue involves citizens in activities where no final answer or truth exists and includes an approach to facts and reality that admits that there can be alternative perspectives deserving of attention. Oral and visual presentations will be studied with a focus on safety and alternative methods. To compare SKB with other actors' and organisations' approaches to mediation, the overhead slides used at one of the hearings (on deep boreholes) within the Transparency programme will be studied.

Analysing pictures

The consultation meetings imply a number of factors that contributes to a total impression of SKB for the participants at the meeting. Gerholm means that communication is closely linked to its situation: it consists of a phrase, a statement, mode of expression, gestures and attitude together with the occasion, location, way of dressing and social status (in Aspers et al, p. 44-45). In this section, we have chosen to focus on one specific feature of the communication process that the consultations are a part of, namely the OH slides used by SKB in their presentations. Pictures are often not paid attention to or taken for granted and seldom questioned, but yet important to study (Aspers et al, p. 10). A picture does not mean the same thing to everyone who views it, and the same can be said about all data material and documentation: it gets its meaning in the theoretical and practical context in which it is placed (Aspers et al, p. 228). Pictures can be used not only as empirical material but also as rhetorical devices; they communicate not only through the object shown, but also through its aesthetic. Empirical data such as numbers, quotes, tables, graphs, diagrams and so on can be used to reinforce an analysis as well as for pedagogic or rhetoric purposes (Aspers et al, p. 239 – 240). The material consists of all power point presentations that SKB have shown during their EIA consultations, mostly regional and public, between 2002 and 2008 that is available at the SKB webpage²⁶. From this extensive material, we have chosen two main focuses: safety and alternative methods. The selection process was divided into three parts. To study how SKB presents safety, a consultation meeting on safety was used as a starting point. From the slides from this event, six pictures were chosen, all showing safety in one way or another and we have also used observation notations from the meeting. The six pictures were used as a reference when searching the whole OH-material for pictures showing similar issues. This

²⁶ Altogether there are presentation slides from 35 consultation meetings available: 10 public, 21 regional and 4 other. There is material from two meeting in 2003 and none from 2002. There is also more material from Samråds and MKB-grupp Forsmark than from MKB-forum Oskarshamn.

was done in order to be able to see how safety has been presented throughout the consultation process. The material was also scanned for pictures about alternative methods, which we will return to in section (x).

Analyzing visual images is not a straightforward task, and there is no certainty about how pictures work and what they do to their viewers, nor about practical ways of studying them (Rose 1-2). But of course, there are methods for analyzing pictures and visual images. Here, I will use some ideas from Rose and Augustsson on how to view pictures. Rose emphasizes that it is important to both view the picture itself: what is being shown and what is not being shown, as well as to think of the relation that the picture has to the viewer: which public is it intended for and how do the audience interpret the picture (p. 188 – 190). Augustsson describes the analysis of web pages, and the importance of studying the choice of layout, the choice of information that is included as well as excluded, how the text is written and the use of pictures (in Aspers et al, p. 148). I will use this frame and focus on both the picture itself and how it might be interpreted by the viewers. In addition, I will search for patterns in how the pictures have been used over time: do they return, are they changing or are they unique at one occasion?

Consultations and safety (part one)

A public consultation meeting was held May 31st 2007 in Östhammar municipality. The theme of the meeting was 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. Representatives came from the authorities SKI and SSI, the environmental organisations MKG and Milkas, The energy organization EfÖ, the county administration, region union and Östhammar municipality (SKB, b).

The afternoon (between 4 and 6 p.m.) consisted of presentations by SKB. The OH slides used contained both text and pictures, sometimes plans and sketches of technical details, some had questions, some conclusions. I will now look at some of the pictures more in detail.

The Jig saw puzzle



Picture 1: Overview picture of concepts and assessments

The jigsaw puzzle picture is used in the beginning and in the end of the first presentation, and in between it is gone through piece by piece. It shows a drawing with the whole system, from the facilities on the surface to the deep repository, divided into puzzle pieces, one piece for each concept or assessment report. The whole presentation ends with the puzzle picture again, and the presenter says that taken together, this makes everything safe (observations 31/05/07).

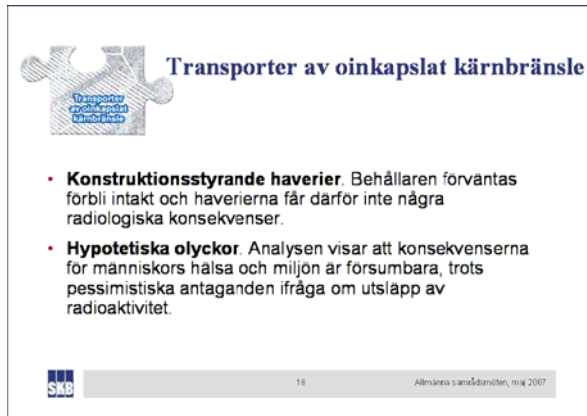
Transportation



Picture 2: Transports of spent nuclear fuel

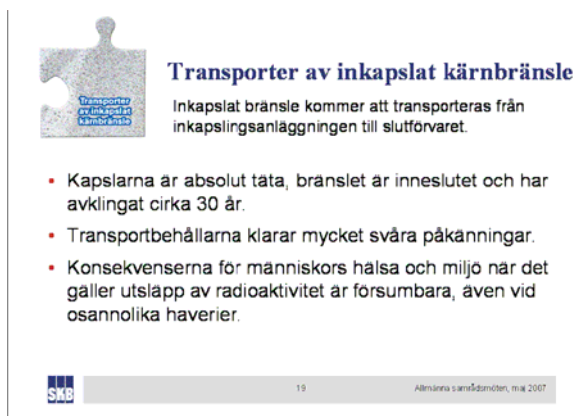
Three pictures in the presentation concerned the transportation of nuclear waste. Picture two shows the transportation of spent nuclear fuel by use of a map of Sweden and pictures of a boat and trucks that are carrying the fuel around the coast. It shows both the transportations of short- and long-lived fuel. The transportation of encapsulated spent fuel that will come with

the final disposal is put in relation to the transportation of fuel that is being carried out today that is not encapsulated, which SKB says they ‘have great experience from’ (observations 31/05/07).



Picture 3: Transports of non-encapsulated nuclear fuel

Picture three show details of one piece of the puzzle (picture 1): transportation of non encapsulated fuel. It talks about construction accidents that the canister expects to stay intact and that an accident therefore will not have any serious consequences. Concerning hypothetical accidents it says that analysis shows that the consequences for human health and the environment would be negligible, even if pessimistic assumptions in terms of emissions are made.

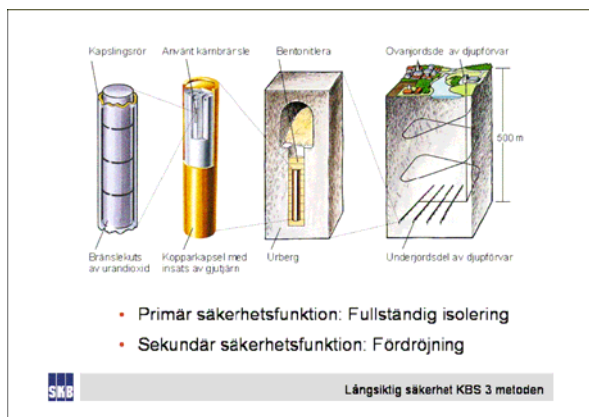


Picture 4: Transports of encapsulated nuclear fuel

Picture four also shows one of the puzzle pieces: transportations of encapsulated fuel. It says the fuel will be transported from the encapsulation facility to the final disposal facility and that the capsules are safely sealed, that the fuel is encapsulated and has already decayed for 30

years. The transportation canisters can cope with very hard stress and the consequences for human health and the environment in terms of emissions of radioactivity are negligible, even in the event of unlikely accidents.

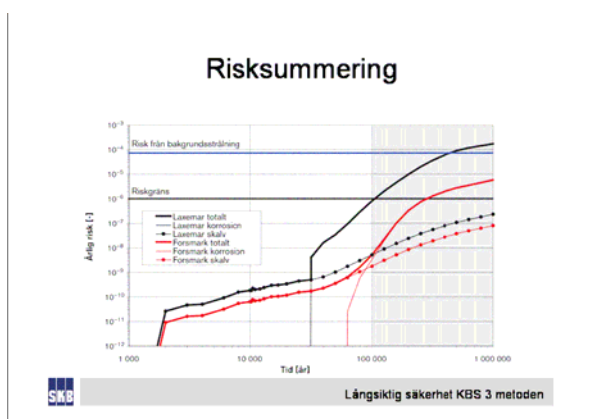
Safety functions



Picture 5: Safety functions

Picture 5 shows the components of final geological disposal. It shows the capsule cylinder, the copper capsule, the copper capsule placed in bentonite clay and finally its position in the parent rock. The primary safety function is absolute isolation, the secondary is delay.

Risk



Picture 6: Risk summary

Picture 6 shows risk by using a diagram. The risk estimations are put in relation to the risk limit and the background radiation. It shows that the potential risk for both locations are lower

than the one from background radiation and lower than the risk limit in at least 100.000 years from now, but that it after this period exceeds that limit. The presenter says it is unfair to compare the two graphs (Laxemar and Forsmark) and that newer data from the Laxemar site is showing more optimistic conditions. They have made many pessimistic assumptions and the graph will therefore most likely sink (Observations, 31/5-07).

Analysis of OH-pictures showing safety

When showing the map of Sweden in picture two with the transportations of fuel around the coast and putting the future transportations of encapsulated fuel in relation to the transports of non-encapsulated fuel that is taking place already today, one impression you might get is that it is less risky with the transports that will come than with the present ones. It therefore also can give the impression that the future transportations will be safer. However, using this as a reference says nothing about the actual safety since the safety of the transportations taking place today isn't demonstrated. Also the graph showing risk (picture 6) uses a reference to something that is already known today, and that we live with everyday: background radiation. Also observe that this picture shows risk: it is the risk of (yes, of what?) that is lower than the one of the background radiation and also than the allowed limits, which is not the same as that the effects of what would happen if that risk turned out to be reality is less destructive. That could however be one way to interpret this picture.

The two slides with puzzle pieces about transportation gives no possibility for the audience to estimate these claims since there is no background information given to these assumptions. The pictures simply claim that this is safe.

When searching the whole OH-material, it is clear that the pictures studied above are almost all of them unique for that occasion. Hence, the OH-material will be examined in search of pictures similar to these or that is related to them in some way.

The Puzzle (picture 1)

The puzzle picture is unique but references to the specific pieces (concepts and assessments) can be found. Most often it is only references to reports or studies, like SR-Can, SR-Site or the safety assessment for INKA, describing very briefly what has been studied in the specific report. What is shown is for example the report lay out, the time schedule for its delivering and review process and so on. It is harder to get a picture of what the reports contain. For

example, at a meeting for public authorities and departments in 2003, SKB showed a plan of what they were planning to include in the preliminary safety assessment for the encapsulation facility (Overhead slides a.). At a public consultation meeting in Oskarshamn in November 2005, one part consisted of SKB demonstrating nuclear technology safety and the encapsulation facility. The slides describe what nuclear technology safety is, how it is reached, definitions of radiological accidents and other definitions of principles and concepts. One picture describes in a simple way the safety analysis methodology that they use, systematic classification of what they dimension for and not in their safety assessments. The outline of the preliminary safety assessment is shown and the legal review procedure surrounding it. Slides also show distractions and incidents that might happen. The section finishes with a ‘remember’-slide saying that the encapsulation facility is a simple facility and process, that there is small consequences outside the facility and that it isn’t SKB that decides if its safe or not – it is the authorities and the government (Overhead slides b.). The same meeting in Östhammar and its regional counterpart also included another part about safety and risk that the one in Oskarshamn didn’t. It summarised in some points the safety assessment for the encapsulation facility in Oskarshamn and its relation to the Forsmark case. One slide said that risks occur mainly in the construction phase, that this project doesn’t differ from other larger construction projects and that the main risks that have been identified are emissions of oil and diesel to the ground. Mitigation efforts to diminish the risk are being developed (Overhead slides c.).

A regional meeting in December 2007 dealing with safety related issues like corrosion-studies on copper. The slides show mechanisms of different conditions that the copper can meet in the environment, and they include technical terms, graphs and pictures showing the capsules. One slide about friction corrosion says that SKB have not fully been able to write this off as a reason for capsule failure. This slide thus shows uncertainties where SKB have not been able to show safety. The meeting also included some slides about the filling- and sealing materials. Drawings, pictures, tables, figures and sketches were used. There is one section that shows a newly initiated bentonite laboratory, asking why do we need a bentonite laboratory: ‘we have already demonstrated that we can install capsules and buffer and that we can refill and seal tunnels, isn’t that enough?’ and the slide after this has the headline ‘We have already done so much’ and the next slides are used to describe why a new laboratory is needed and what will be tested in the new place (Overhead slides d.).

Transportation (picture 2-4)

The pictures about transport of the waste are also unique. There is a lot of slides about transports, but mainly concerning expected noise levels and the expected increase of transports of construction material. The only time that transportation of the fuel is talked about is during a consultation meeting for public authorities and departments in 2003, where a slide describes in text that transportations are needed and how they will vary according to the different localisations, also saying that SKB will investigate and account for the safety and environmental aspects these transports will have (Overhead slides a.).

Safety functions (picture 5)

On a public meeting in 2005, an identical picture was shown one time as a demonstration of the KBS-3 method, but without the text. Pictures with only the copper capsule are shown in a number of presentations. It shows a picture of the capsule like in the one with the barriers, with details about its sizes and weight.

Risk (picture 6)

6 december 2006 – joint regional consultation meeting with Forsmark and Oskarshamn. The first presentation is about conclusions from SR-Can. Slides list its objectives, diverse facts about the report and risk limits. One slide shows the conclusions regarding the risk criteria, saying that no capsule failure is estimated to occur for several thousand years; that Forsmark is estimated to reach the authorities risk criteria and that Laxemar preliminarily do the same, but that more data is needed. One slide shows conclusions about barrier design and function, saying for example that more studies are necessary to clarify the effects of water-bearing splits and what the heat from the capsule can result in. They also show two slides on Risk, one with the assumptions behind the calculations, and that the data for Laxemar isn't representative. The graph about Risk is also shown (Overhead slides e.).

Legislation is often used to reinforce the reasons behind acts, for example by showing quotes from the environmental code. There are also very few slides where uncertainties are shown, with some exceptions however. 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 has control over safety. However, there are some slides that

declare that more studies are needed to clarify certain uncertainties, even if the word uncertainties isn't used, and this exemplifies that there is not always "definite truths" about safety that are being delivered.

Consultations and safety (part two)

Now we return to the consultation meeting on safety held on 31st May 2007 to study how SKB talked about safety during the discussion. The recent safety related incident in SFR was a topic many participants at the meeting wanted to discuss. SKB gave some background information to the incident in SFR, in short saying that the changed scenario had to do with insufficient communication with SSI and that the safety had never been threatened. At first, SKB did not want to discuss the question but when both the moderator and the audience demanded answers, they showed some willingness, admitting they had made a mistake. However, SKB kept highlighting that the safety had never been threatened and that it was a formal limit that had been crossed, while the audience were concerned about how SKB can guarantee safety for high-level waste in a final disposal for million years when not being able to guarantee the same for low-level waste in SFR.

There are some examples from the meeting that shows that SKB was not giving any comprehensive answers, but simply referring to what they have done in specific documents. Two examples are:

Fråga: Risken kanske ökar med hundratals procent just på grund av människans nyfikenhet. Vad finns för riskbedömning när det gäller detta? Det är kanske bättre med ett djupare förvar eller ett övervakat?

Svar: (SKB) Myndigheterna har tagit hänsyn till dessa aspekter och de finns med i SR-Can. (SKB b.)

Fråga: Vi har inte pratat alls om radionuklider, bränsleupplösning, transporttider eller utsläpp och konsekvenser. Det saknar jag.

Svar: (SKB) Allt detta ingår i SR-Can där konsekvenser över tiden redovisas. (SKB b.)

But there were other issues, for example, when SKB was being questioned about the capsules or human errors in the safety analysis, when SKB gave more comprehensive answers. For

example, as an answer to a question about human error, SKB described the capsule laboratory, the capsule tests, statistics and what mistakes the people who handle the systems can do as well as informing that analyses concerning what can happen if estimations are wrong, if there are consistently defects and so on. One participant in the audience commented the background material for the meeting as being too thin as a basis for consultations. SKB replied that there will be another meeting on safety when they have more results from the safety assessments. In one way, this shows an open attitude to consult with the public before having the final answers, but at the same time, the meeting did not show many examples of SKB initiating a dialogue around the safety issues that there were still no final answers to, neither did SKB initiate discussions on uncertainties that might remain even after safety assessments have been finalised (SKB b. and Observations 31/5-07).

During the discussions the audience asked questions and made comments and SKB replied, sometimes comprehensively, sometimes more brief and defensive. There were also examples of questions that SKB did not want to discuss at all at first. SKB demonstrated what they know and referred to documents rather than trying to explain the issue. They showed some vulnerability when saying they had made mistakes leading to the SFR incident.

From the meeting on safety, we now turn to all consultation meetings that we have observations from to see how safety and safety analysis have been communicated and discussed. During a presentation at a regional meeting in 2006, SKB commented an earlier question from a participant that the EIA for the encapsulation facility was not complete. SKB said it was not meant to be complete as SKB wanted to get input before it was finished. SKB argued that good EIA practise is to not to show final documents but to consult early with the material available, and that this is in line with how SKB organises the planning and consultation process (Observations 10/3-06). This indicates that SKB at least officially presents its intention as being to run a process characterized by dialogue and upstream engagement. There are other indications however that SKBs interest in getting input is only half-hearted. For example, at the same meeting, MKG expressed worries that details on ice-ages and earthquakes and affluxion had not been dealt with enough by SKB. SKB answered that these three issues will be handled carefully in the safety analysis that would be presented later the same year. This is an example of SKB not being open for discussions on these issues and how they are dealt with before the report comes. At the consultation meeting on the same topic in Oskarshamn, SKB responded to a similar question about safety and ice-ages. They

answered that they work intensively with SR-Can, trying to illuminate all relevant issues and go through all processes that could break the capsule, but that they cannot give a detailed technical answer before SR-Can is finished. Moreover, SKB stated that that on the basis of what they know now it is unlikely that anything can break the capsule before an ice-age (Observations 22/3-06). This is a rather comprehensive answer, but still, being vague and not giving details and inviting to discussion about any uncertainties before the report is finished.

The following episode is an example of SKB demonstrating results in retrospect when changes are already made, showing that safety is not negotiable. SKB described that new discoveries had shown that an old requirement (from the authorities?) concerning temperature on the capsule and buffer was not necessary any more. They said the argumentation around this was gathered in an internal PM and that this would be included in SR-Can (Observations 10/3-06). This is a good example of a demonstration, that is, statements on how things are, without giving background and instead referring to the document where the information can be found.

But there are also elements of dialogue and upstream engagement to be found. For example, at a regional meeting in 2005, a participant in the audience told a story about some youth she had met in one of the site investigation municipalities. They had attended SKB's information sessions and had not got any information on risk. The woman asked SKB to include more of this in their material. SKB answered that they will go through their material and see if they can include something more on this area (Observations 17/11-05).

There are also several examples of SKB saying that they will bring a raised question to their experts or take input from the audience into account: "Vi tar med oss dina synpunkter" and "det om buller har vi tagit till oss och det kommer" which is examples of allowing upstream engagement. There are also times when SKBs answers to questions from the audience are detailed and comprehensive. At a public meeting SKB described in detail the process in the encapsulation facility, from how the fuel is taken up from the reservoir to the final check if there is any radioactivity left on the outside when the copper capsule is sealed (Observations 5/4-05). At another public meeting SKB talked about what would happen if a capsule would be dropped, also explaining the problems they experienced (Observations 17/11-05). This shows that they sometimes can be clear with the things that might happen.

To sum up, the meetings held elements of both dialogue and demonstration when communicating safety. Examples of dialogue is when SKB says it will consider the input given from the audience, or admitting they do not have the whole truth yet, saying ‘this is where we are now’ and ‘most likely things will not change’. SKB has also obeyed enquiries of making changes in the set-up of the meetings, for example by shortening the presentations from SKB and enabling more time for questions from the audience. Examples of mediation through demonstration is that the meetings are shaped by SKB setting the agenda and starting off with long presentations, and that the procedure often follow the pattern that the audience puts questions to SKB and SKB give the answers. SKB does not take initiatives to find out what the audience thinks. SKB seems to most willingly talk about the issues that have already been studied, where there are results to talk about and studies to refer to. There is little background given to the results, SKB communicates results and facts, not the background behind them, and they very often refer to documents where the information can be found.

The transparency programme and alternative methods

In chapter 4, the transparency programme was described and the first hearing in the programme was about deep boreholes. Here we shall first look more closely at how the transparency programme was organized and then turn to the hearing on deep boreholes to see if it can stand as an example of dialogue and upstream engagement

Before the transparency programme started, the consultant employed by the Nuclear Waste Council held separate meetings with a number of different actors to get input on the planned programme and enable them to suggest issues to focus on in the transparency programme.²⁷ These actors gave general suggestions and more specifically on the format and content of the programme and they suggested topics where they saw a need for a deeper review. They were also asked to comment on the planned hearing on deep boreholes (Simic & Andersson, minutes). The list of issues that these meetings resulted in was long, and the consultant made a suggestion on nine issues based on this list, which the Council later made a few changes to (Andersson, 2007:22). When the pre-study was finished, the report with the suggested plan of the programme was sent out to the previously consulted actors by e-mail and they were asked

²⁷ Ahead of the programme, meetings were held with SKB, SKI, MKG, MILKAS, SERO, Oskarshamn, Östhammar, Regionförbundet Kalmar län, Länsstyrelsen Kalmar län, Regionförbundet Uppsala Län.

to give input on the proposal (Andersson, 2007:30-46). Meetings were also held in late 2007 after the start of the programme²⁸ where the actors could give input on the hearings that had been held so far and also on the planned schedule for the continuation of the programme (Simic, minutes). The way the transparency programme was formed was enabling upstream engagement and influence from different actors, even if the actors that could affect the programme were chosen by the Council. There were no final answers presented and this way of doing it enabled influence before decisions on the transparency programme were taken, even if the decisions in the end were taken by the Council.

Several actors had suggested deep boreholes as a topic for the transparency programme, and even if the Council did not itself prioritise a hearing on this issue, they chose to go through with it (Interview Hedberg). The Nuclear Waste Council described that it had a standpoint on the question, but they also saw it as their duty to stimulate discussion and dig deep into questions. This, the Nuclear Waste Council stated at the hearing, would enable a debate that could lead to a review of the Council's own standpoint (Observations, deep borehole). The hearing lasted for one and a half days. First, four background presentations were held by different experts, three of them members of the Nuclear Waste Council. After that, three presentations on technology and safety were held, one by SKB and the other two held by other experts, one representing the environmental organisation MKG, the other representing xx. Each of these three presentations was followed by questions from a panel, consisting of representatives from the Nuclear Waste Council (Program, deep boreholes). The first day ended with a panel debate with seven national politicians, one from each party. The second day continued with a presentation by an expert on drilling techniques, then there was time for reflections on the question: had new facts come to the surface that changed the situation and in that case – what efforts were needed to be able to compare deep boreholes to KBS-3. SKB as well as the environmental organisations were questioned by the panel. After presentations by the authorities, the panel with three representatives from the Nuclear Waste Council questioned the authorities. After lunch the second day the hearing started. The moderator – a Swedish broadcast journalist, Göran Skytte – and the audience chose actors for a panel that were questioned during the last section of the hearing (Program, deep boreholes).

²⁸ In the fall 2007, meetings were held with SKB, Östhammar and Oskarshamn municipality, the environmental department, the environmental organisation MKG and the authorities SSI and SKI

The attitude of the Council arranging this hearing on a subject that was highly of interest to others and being ready to re-evaluate their standpoints shows an open attitude. The programme design equalized SKB to the other actors and experts from SKB were given the same time for presentations as other experts. This is an important difference compared with the consultation meetings, where SKB sets the agenda and is the main expert on the technical difficulties. However, it is still highly technically oriented and it is still primarily “experts” who are doing the talking.

The Nuclear Waste Council’s representatives functioned as questioners during the hearing, but what type of questions did they ask? SKB were questioned about their view on barriers, the requirement for multiple barriers and which relation the requirements and the method have. They were also asked about ice-ages and the possible risks of an invasion. Their knowledge about societal and political questions was also challenged in relation to their heavy technical focus. The environmental organisation MKG was asked many questions about their standpoint on deep boreholes; if they advocate the method and if they found it uncomfortable being seen as advocates for a specific method; their view on the relation between KBS-3 and deep boreholes; what their values are and what they want. They were also asked about what they have against the concept of redundancy (the passive barriers), why they see natural barriers as superior to technical ones and what they consider of the safety philosophy of SKB and the authorities. A representative for the environmental organisation Milkas was asked about the differences between Milkas and MKG, their ideas of earth tremors and why this person prefers Dry rock deposit (DRD) – because he was the inventor of that method?

The two experts who held presentations were also questioned. The expert on drilling techniques was asked about how big land areas are needed for deep boreholes, if SKB is right in their saying that the drilling technique is the most difficult challenge for deep boreholes and which competences that are available in the oil industry and how they can be applied in this context. The second expert was asked in what bedrock the holes he described had been drilled and if he could choose, where would he put the holes. He was asked to comment the development in geophysics and he was also asked to comment SKB’s standpoint that the knowledge about the bedrock is too poor for deep boreholes and that deposition is impossible to control.

The authorities were asked about their different views – SSI and SKI have different views on the multiple barrier system and SSI were asked about their demand for more money to develop the knowledge base on deep boreholes and what benefit that would have. They were also asked if they see BAT as the same thing as best available Radiation protection, and like SKB they were asked about their view on invasion (Observations, deep boreholes).

The questions that were asked to the two experts were questions of fact only. They were also asked to verify standpoints delivered by SKB which indicates that these experts functioned as experts possessing the ‘truth’, while the experts from both SKB and the environmental organisations were questioned in a much more challenging way, trying to reach their hidden values behind their standpoints. Even the authorities were asked questions that searched more for their standpoints and values than the two experts.

Consultations and alternative methods

We will now study how SKB has presented deep boreholes and other alternative methods in the consultations. Again, we will both study overhead slides and how alternatives have been discussed. We will also put the overhead slides used by SKB at the hearing on deep boreholes in relation to the other actors slides to compare how they presented deep boreholes.

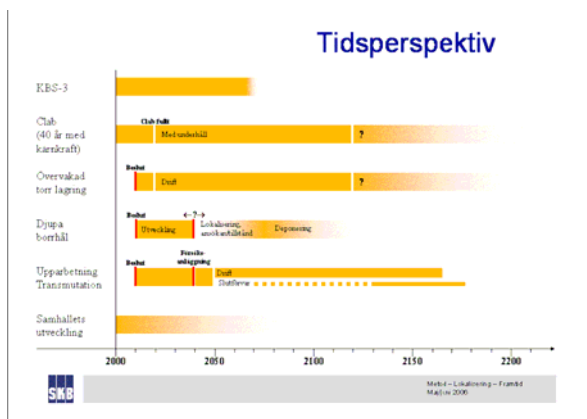
Analysis of OH-pictures showing alternative methods

Already in 2003 at a consultation meeting for public authorities and departments, SKB showed pictures of their plans concerning what to include in the EIA alternative description. There, they said that alternative methods, the zero-alternative and alternative locations will be described (Overhead slides a.). During a consultation meeting specifically for environmental organisations in Östhammar in 2004, a number of interesting slides were shown, several of them unique for that occasion. One showed in text the motivation to the governmental decision in 2001 on FUD-K, saying that ‘SKB should use KBS-3 as the reference for their planning’ and that ‘the government expects questions of which alternatives to account for in the EIA report will be considered in depth in connection with the prescribed consultation’. There were also slides that showed each alternative and listed requirements and reasons why alternatives didn’t meet these. Only geological depositing met the requirements. Four different alternatives for geological depositing were shown: KBS-3, Long tunnels, WP-Cave and deep bore holes. One slide also compared KBS-3 to a method called VDH (Overhead slides f.). The most interesting thing about these slides is that there are many pictures

describing alternatives showed that are never showed elsewhere, and that the comparable meeting in Oskarshamn didn't have these pictures at all.

At a public consultation meeting in Forsmark held on June 1st 2006, the SKB consultant Kemakta konsult AB made a presentation on the subject of how to describe alternative methods for taking care of spent nuclear fuel. The first slide showed a number of options for taking care of the fuel, from reprocessing and sea dumping to two hedged alternatives: monitored storing and geological deposal. A second one showed a sketch of deep bore holes and a lot of detailed text and another showed available geo-scientific information with a list of existing deep bore holes and a picture of the deepest hole existing today. A fictive picture of how an area would appear with deep bore holes was shown as well as a slide that showed safety by the use of text describing uncertainties concerning the deposal technique, saying that only one barrier carries the main isolating- and delaying function and that if stable conditions but also that there is a limited exchange of water between the deep system and the systems near the surface. The presentation also included two pictures that described prolonged storage in CLAB, one with only pictures of the facility and one saying it could cope with 100 more years, but also what consequences an abandonment can have. Monitored dry storage was showed by the use of pictures of facilities from different locations over the world. Two slides dealt with transmutation and listed facts about it and described the presumptions for transmutation, that new facilities need to be developed and built, that the fuel is highly radioactive and requires distance-controlled processes and powerful radiation protection. Finding a solution to a challenge like this could be seen as generative and positive for the development in another context, and as a chance to develop new skills and technologies. The potential to extract more energy from the fuel in future is here presented as too risky and requiring a lot of work. The impression is that it is a troublesome alternative. The presentation finished with a text slide that showed results of transmutation, saying for example that it will take a hundred years or more to transmute all Swedish fuel; that the period that the waste needs to be separated from human beings decreases (probably compared to if it isn't transmuted), but the bottom line is that final storage is still necessary even if using transmutation (Overhead slides g.). A positive aspect with transmutation, the dramatic decrease of the wastes' radioactivity, gets in shade of the final sentence saying a final storage still needs to be built by presenting them in this order and relation to each other. If SKB wanted to highlight the possibilities and good aspects about transmutation, this could have been done by giving the positive aspects more room.

The next presentation was also held by one of SKB:s consultants, EuroFutures, who had made a study of society’s future capacity to take care of spent nuclear fuel. They had analysed risks and threats in the future that could have effects on a continuation of storing the fuel temporarily. One picture showed their analytic model, one a list of their made interviews and material and they showed some pictures with only text about societal capacity, critical factors and threats to this capacity. The conclusion drawn was that there are factors that have a direct effect on Sweden’s ability to handle the waste in a safe way ‘forever’, that Sweden’s capacity to build a final repository is the most critical and vulnerable factor and that it will be affected negatively in the future. Therefore, a decision to keep storing the fuel temporarily must forego a careful analysis of the consequences that it will have on securing final disposal at a later date (Overhead slides g.). After the consultants’ presentation, SKB continued and showed their time plan for their different applications and then this figure about time perspectives:



Picture 7: Time perspective

It shows time lines for the different alternatives and it shows that the KBS-3 method is the only method that is fully compatible with the development of society. SKB continued with a number of slides with excerpts from the legislation concerning the description of alternatives required.

At the equivalent meeting in Oskarshamn on May 31st 2006, the presentations were almost the same but not entirely. There, one of the introducing slides about the consultation showed three points, saying: not a consultation meeting about alternative methods to KBS-3; information about the alternatives that has been studied in SKB:s research programme; information about the site investigations that SKB have carried out hitherto. Kemakta and Euro futures showed

the same presentations as described above. This time, the time perspective picture (picture 7) was shown in connection with a list of requirements and 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 (Overhead slides i.). This gives the impression that there is only one method that can be chosen, because none of the others can cope with all the requirements recounted.

In two regional consultations in March/June 2006, the consultant Mannheimer and Swartling held a presentation about the legislative requirements of alternatives and what they mean. Kemakta and EuroFutures showed the same presentations as in the public consultations. The two regional meetings in September 2006 gave feedback from the public consultations on alternatives held earlier. SKB showed some slides with comments that had arrived since the meeting. The text-cuts regarded for example concerns about SKB:s new approach regarding alternatives and the background to this new approach. In Östhammar, some slides showed comments from the municipality with concerns over if SKB saw the meeting in June 2006 as an information meeting or a consultation meeting, since their intention was to inform about alternatives, not to consult about them (overhead slides j.). By showing these pictures with comments from the consultation participants, SKB shows some openness to discuss their intentions, even if they do it somewhat late in the process, when the decision is already taken and changes made.

Over all, the impression is that there is no room for any other alternatives than KBS-3. Now and then, SKB show pictures of their time schedule for the nuclear fuel programme, which has no room for any alternatives.

Conclusions

SKB shows an attitude towards dialogue in theory. They say that they are consulting before having final results, and that they want input before any final documents are written. We have seen some examples of this also in practice, as when presenting preliminary results and uncertainties, or when taking suggestions from the audience into account. However, using demonstrative strategies are more frequently occurring. We have seen some examples of SKB using pictures where data is put in contexts which highlight their standpoints; they become arguments for their standpoints. Also frequent is references to legislation and societal control

system as guarantees for trust and reasons to believe that that KBS-3 is the best alternative and that they will build it in a safe way. The overhead slides mainly demonstrate already defined knowledge, also the process as a whole with its separation of participation indicates a resistance to bring different actors together to deliberate. We have also seen examples of both upstream and downstream engagement, but in general, the consultation is a process of downstream engagement, consulting around already defined problems, presenting decisions already taken or studies already made.

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Overhead slides

- a. <http://www.skb.se/563ce659-9df8-431d-9b80-0f2474ee1ef0.fodoc>
- b. <http://www.skb.se/fe16edc4-d327-4b14-a8fe-0684149891e5.fodoc>
- c. <http://www.skb.se/fa44ae46-e122-4ae3-af1a-a77fddf26a5e.fodoc>
- d. <http://www.skb.se/9530dfa6-ec11-4824-b2e8-7356bb7f7e76.fodoc>
- e. <http://www.skb.se/0c2720a6-09cc-4626-ae6-d01bf89a5588.fodoc>
- f. <http://www.skb.se/18e294a0-1f10-477c-a9b8-e06ab9a87c97.fodoc>
- g. http://www.skb.se/Templates/Standard_19140.aspx Bilaga A.
- h. http://www.skb.se/Templates/Standard_19140.aspx Bilaga B.
- i. http://www.skb.se/Templates/Standard_19125.aspx Bilaga A.
- j. http://www.skb.se/Templates/Standard_19144.aspx Bilaga 2D

Pictures

Picture 1: Overview picture of concepts and assessments

<http://www.skb.se/cdc9db44-d830-4dfe-9a2a-701e8e2aedb.fodoc>

Picture 2: Transports of spent nuclear fuel

<http://www.skb.se/cdc9db44-d830-4dfe-9a2a-701e8e2aeedb.fodoc>

Picture 3: Transports of non-capsulated nuclear fuel

<http://www.skb.se/cdc9db44-d830-4dfe-9a2a-701e8e2aeedb.fodoc>

Picture 4: Transports of capsulated nuclear fuel

<http://www.skb.se/cdc9db44-d830-4dfe-9a2a-701e8e2aeedb.fodoc>

Picture 5: Safety functions

<http://www.skb.se/bf197e38-7b9c-4169-84b0-0166831df283.fodoc>

Picture 6: Risk summary

<http://www.skb.se/bf197e38-7b9c-4169-84b0-0166831df283.fodoc>

Picture 7: Time perspective

http://www.skb.se/Templates/Standard_19140.aspx, Bilaga B.

Interviews

- Kjell Andersson, Karita-konsult, consultant for Kärnavfallsrådet and previously for Oskarshamn and SKI.
20 May 2008
29 May 2008
10 June 2008
- Kenneth Gunnarson, chairman of OSS (Opinionsgruppen för säker slutförvaring i Östhammar)
2 June 2008
- Björn Hedberg, chief secretary, Kärnavfallsrådet
30 May 2008
- Virpi Lindfors, leader of the final disposal project in Östhammars kommun
19 May 2008
- Kaj Nilsson, former project leader of the LKO project in Oskarshamn
13 May 2008
- Magnus Westerlind, SKB, previously head of the nuclear waste department at SKI
27 May 2008

Observations

Observations 5/4-05, Public consultation meeting in Oskarshamn, Linda Soneryd
Observations 14/11-05, Public consultation meeting in Östhammar, Linda Soneryd
Observations 17/11-05, Public consultation meeting in Oskarshamn, Linda Soneryd
Observations 10/3-06, Regional consultation meeting in Forsmark, Linda Soneryd
Observations 22/3-06, Regional consultation meeting in Oskarshamn, Linda Soneryd
Observations, 31/5-06, Public consultation meeting in Oskarshamn, Linda Soneryd
Observations, 1/6-06, Public consultation meeting in Östhammar, Linda Soneryd
Observations 31/5-07, Public consultation meeting in Östhammar, Linda Soneryd
Observations, 20/11-07 Deep boreholes, Transparency prog. Linda Soneryd
Observations 24/4-08, System analysis seminar, Transparency prog. Linda Soneryd
Observations 4-5/6-08, Site Selection, Transparency prog. Linda Soneryd

Other documentation

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