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Constrained Deliberation: Public Involvement in Swedish Nuclear Waste Management

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Abstract: In this paper a typology of approaches to the governance of science and technology is applied to thirty years of Swedish nuclear waste management. During these years different kinds of interaction between industry, government, municipalities, researchers, environmental groups and citizens have been developed in order to reach decisions on where to finally store spent nuclear fuel. In all this, one common theme can be identified: the maintenance of a strong demarcation between science and democracy. It is shown that such an approach creates problems, while causing a fragile interface between experts and other groups. An alternative to this is deliberative governance, which means softening the boundary between science and democracy and enabling a simultaneous discussion of technical and political issues. In the Swedish history of nuclear waste, deliberative processes have never become strong. Instead they have often been constrained by other kinds of approaches, such as corporatist or agonistic governance. The paper concludes that a sustainable nuclear waste siting process, leading to robust decisions, needs an improved view of public involvement in decision processes, as well as better communication between different groups in order to strengthen a mutual process of understanding. This means the cultivation of deliberative governance.

Keywords: governance, democracy, science and society, nuclear waste, siting conflicts

Introduction: How to Decide on Nuclear Waste?

In the summer of 2002 the drills hit the ground in an area close to the Forsmark nuclear reactor site, in Östhammar municipality on the Swedish East Coast. The drillings are part of a five-year investigation, including the drilling of 4-6 holes, 1,000 m deep, to assess the bedrock's suitability for disposal of high-level nuclear waste. A few months later, drillings of the same kind started in Oskarshamn municipality, close to the Simpevarp reactor site in the south-east of Sweden (SKB, 2003a, 2003b). These two events were a tremendous success for SKB, the Swedish nuclear fuel and waste management company. After eight years of feasibility studies in eight different municipalities, two of them finally agreed to participate in site investigations, including detailed examination of the bedrock. In the 1980s and 1990s most people thought that nuclear waste could not be stored anywhere in Sweden. The public level of acceptance of living in the vicinity of a nuclear waste repository site was less than 10 percent (Hedberg & Sundqvist, 1998).

The success of SKB is the result of a timely process, including a strategic shift in the siting process. In the early 1980s SKB launched an ambitious drilling programme to investigate the bedrock at different locations. However these drillings met almost everywhere with strong local opposition. At that time the search for suitable sites was defined by SKB as a geo-scientific project looking for the best bedrock conditions, i.e. a "pure" technical question, which should be taken care of by technicians alone. By opposing the drillings local citizens

questioned the narrow framing of the nuclear waste issue, and a reframing of the whole siting issue was advanced.

From the early 1990s the SKB siting strategy has been directed towards achieving local acceptance, out of regard for the existence of local powers of veto at the municipal level. This has made it necessary to pay serious attention to the interests and opinions of local citizens and their representatives. The strategy of more closely involving the people in the concerned municipalities has resulted in success. In Sweden, after more than 25 years of controversy on how and where to store nuclear waste, the critical issue now seems to be on its way to reaching a solution.

This is, however, not the case in other countries. In the European Union, a picture of great distrust of institutions responsible for nuclear waste management is discernible. Twenty-nine percent of the citizens state that they are very worried about the way radioactive waste is handled in their own country, and only 10 percent trust the information provided by the nuclear industry (Eurobarometer, 2002). In the EU Commission Green Paper on secure energy supply it is stated that the future of the nuclear industry "depends on finding a clear and unequivocal answer to the question of the processing and transportation of radioactive waste" (EC, 2002). Obviously, nuclear waste management is in a critical state in many EU nations, and is described as the Achilles' Heel of the nuclear industry.

However, there are great differences of opinion among the 15 EU member states. Sweden is the nation whose citizens show the greatest trust in the information presented by the nuclear industry (36%) and are least worried about the management of nuclear waste (11%). One possible reason for this is that in Sweden there does exist a proposed solution to the nuclear waste problem, while many other countries' nuclear waste programmes have been stopped by strong opposition. But even if Sweden is a forerunner in nuclear waste management, it is still possible to identify a common problem, apart from the relative success of the different national programmes concerning implementation of investigations and facilities: *a too narrow framing of the waste issue*. In Sweden during the 1990s , the site selection process has become more open and inclusive towards different stakeholders, but the nuclear industry is still in control of the technical concept and often focuses more on winning acceptance for this concept than trying to improve mutual processes of understanding, i.e. they try to achieve public consent to a ready-made technical project (Sundqvist, 2002).

In this paper the Swedish efforts to find a suitable site for the disposal of nuclear waste are traced back in time, and the various siting strategies proposed and used by the nuclear industry, and supported — but sometimes also criticised — by politicians and government authorities, are described. During the 1970s the public assessment of nuclear power changed dramatically in most Western nations. From being a technical project with strong public support it became politicised and criticised. Since then it has been necessary for the nuclear power industry and the state to adapt to public opinion and involve citizens in decisions on nuclear power and nuclear waste. Therefore the point of departure of this paper is that stakeholder involvement and public participation are crucial to the establishment of a more robust solution to the controversial, and technical as well as socially uncertain issue of nuclear waste management, even if this is not made explicit, or is even denied, by key actors. In this respect, the applied format of stakeholder participation constitutes the technical project, and its success or failure could be explained by the format used.

The inclusive strategy of stakeholder involvement has been controversial in decisions on nuclear waste, especially with regards to how to define the roles of different actors (their relative importance and contribution) (Hedberg & Sundqvist, 1998). Therefore, it is important to be aware of the existence of strategic actions, aiming to convince others about the proper definition of the waste issue. Behind the shield of increased democracy and public involvement it is possible to find motives of strengthened control and greater room to manoeuvre for specific actors. The other side of democratisation of technical issues is an ongoing struggle over formats of participation. Who should have a say on how and where to store nuclear waste? Is public acceptance best achieved through fighting the presumed ignorance of citizens, or by taking their concerns seriously and from an early stage making them co-owners of the project? We should expect different formats of participation to be used at the same time, even by the same actor; these influence each other and become different layers of one specific strategy. One format could be rhetorically proposed as most preferable, and another used in practical work, the former presented front stage and the latter held strategically backstage (cf. Hilgartner, 2000).

In this paper the various framings of the Swedish nuclear waste issue are described along with the formats for public involvement, from the turbulent period of politicisation and national debate in the 1970s to the choosing of locations for site investigations in the early 2000s.

Above all these framings are about how to balance the effort to find good bedrock guaranteeing long-term safety (hundreds of thousands of years), with the effort to achieve political legitimacy in the public domain. The aim is to apply and further develop a typology of *formats of engagement* (types of governance) in decisions concerning science and technology, and through this contribute to a better understanding of the importance of public participation in nuclear waste management.

In the next section a conceptual framework comprising five types of governance is introduced. This framework, focusing most of all on formats of public participation, is in later sections used in order to analyse Swedish nuclear waste management. In the third section the story of the 1970s is told. This leads from a narrow technocratic framing of nuclear power and nuclear waste to a period of intense politicisation and polemic discussions in order to find a proper framing of a controversial issue. New legislation and a national referendum became important tools for the politicians to govern the issue. In the fourth section the feasibility studies conducted by SKB in eight municipalities in the 1990s to investigate their suitability for hosting a final repository for nuclear waste are analysed. These studies were undertaken on the principle of local acceptance, i.e. that municipalities wanted SKB to conduct a feasibility study. Different formats to engage the public were tried by both SKB and the municipalities. What were these studies about? Why did the municipalities take part in the studies, and why did two of them agree to continue with more detailed studies? The fifth section describes the revival of geological criteria by presenting voices critical of the choice of sites as being politically motivated. In the last section some normative conclusions are put forward concerning formats of public involvement in the nuclear waste issue. What types of public engagement are preferable in the contested area of siting nuclear waste? These conclusions are based on the theoretical framework as well as the results from the Swedish case study.

Formats of Public Involvement

In Science and Technology Studies (STS) the concept of *scientific citizenship* implies extended citizen engagement with science in response to greater expert involvement in society (Irwin, 1995, 2001). In today's technological societies citizens are increasingly being asked to help in assuring quality in decision-making by developing their own perspectives on the new

technologies they confront in everyday life. This has been called a *democratic turn* in science and technology, or the *democratisation of expertise* (EC, 2001)

> Scientific citizens participate in the task of deciding what constitute important opportunities and acceptable risks in the carrying out of science-based new combinations. By creating a closer identity between science and society; the scientist and the citizen, collectivities intent on enabling innovation are liable to experience both a growing socialization of science, and an advancing "laboratorization" of society (Elam & Bertilsson, 2003).

Generally in STS, there is an opinion that credible decisions on controversial science-based issues need to have widespread public support, which is not only about achieving public consent (acceptance) but also based on deliberative processes encompassing diverse viewpoints. In this a normative assumption is visible: "Public participation and engagement are emphasized as both inevitable and desirable in the framing and assessment of issues, validation of knowledge and weighing of evidence on which democratically accountable decisions are based" (Hagendijk & Kallerud, 2003: 2).

However it is too easy to just state that broader participation — more democracy and greater citizen engagement — is needed, but not explain why this is so (Perhac, 1998). Therefore, it is important to notice that arguments for extended public participation could be based on different reasoning (Andersson *et al.,* 1999). One rationale is *political* (strategic), arguing that public involvement is needed in order to strengthen the stability of decisions and the efficiency of implementation. When citizens are involved, accountability is widened and greater legitimacy can be achieved. Another rationale concerns *knowledge*. The public should be involved because they possess knowledge of a different kind than experts and decision-makers. This knowledge could be of crucial importance for the issue considered. A third rationale is *ethical* and implies that citizens should be involved because they are the ultimate source of social values which are expressed in decision-making. The environment, for instance, belongs as much to the public as to the decision-makers.

The question of rationales for increased public participation is also controversial within the STS community. Harry Collins and Robert Evans (2002) question an unspecified extension of the democratic turn, arguing that it has normative limits. According to them there are issues that should be decided by experts alone. In a reply, Brian Wynne (2003) argues that there is always room for a contribution of public knowledge in decision-making on technical issues. However, this kind of knowledge is not necessarily compatible with expert knowledge in that

it is about the relevance, ignorance and trustworthiness of expert knowledge. According to Wynne this kind of knowledge, which tries to understand expert knowledge "in the sense of its institutional dimensions", could always enrich more specialised technical knowledge (Wynne, 1993: 328).

In what follows, the rationales for increased public participation are further developed through the introduction of a conceptual framework elaborated by Rob Hagendijk and Egil Kallerud (2003).[1] The framework is comprised by five distinct types of governance (formats of engagement) concerning issues that involve science and technology. Before describing the five formats it is important to present some of the assumptions behind the typology.

A basic distinction is made between the political arena and the public arena. The former is connected to the formal system of political parties, political representation and public decision-making, while the latter is part of civil society, including mass media, civil organisations and engaged individuals. Important questions to ask are the following: What kinds of relations exist between the two arenas? Does the political sector consult the public? Does the public sector mobilise against the political? Which one promotes public participation and involvement with science? In connection to the distinction between the political and the public, the role of the state should be examined. In what ways does the state act within the political system and in relation to the public arena? What means are used? Does the state act inclusively or exclusively?

More than the political system and civil society, the scientific and professional sectors are of importance when analysing regulation of science and technology. Is public engagement framed differently in these various sectors? Again it is important to conceive the role of the state, how these sectors are co-ordinated by the actions of the state as well as expressed in legislation. Another crucial issue concerns the means of communication between the sectors and the two arenas. Are they agonistic or consensus driven, hegemonic or non-hegemonic, i.e. are clear distinctions made in advance among involved actors, about, for instance, who is right

[1] The typology is developed within the EU Thematic Network – Science, Technology and Governance in Europe (STAGE), as a methodological resource for analysing and comparing public participation and policy cultures in relation to conducted case studies in the eight participating countries. My paper is part of the Swedish contribution to these case studies. In the Hagendijk & Kallerud paper a sixth type is included, "market governance". This type is not relevant to Swedish nuclear waste management and is therefore not used in this paper.

and who is wrong? These questions are about communicative versus strategic actions (Habermas, 1987).

When analysing formats of public engagement it is of course important to consider the definition of the public and the motives behind its engagement. Is the public an entity to be educated by the experts, an important group able to "articulate how their lives will be affected by technological decisions", or "an important factor in the actual definition of options and constraints on decision-making" (Hagendijk & Kallerud, 2003: 10)? The answers will reflect diverse assumptions about the importance of the public contribution. The most general issue is about the framing of the question and how the framing is related to formats of public engagement. What roles are given to different actors, sectors and arenas by specific framings? A more technical framing will give stronger autonomy and power to experts, while a more political/democratic framing will emphasise the possible contribution of laypeople. In addition, Hagendijk and Kallerud (2003: 11) state that "[t]he approach does not assume that the 'public' is a given, stable entity… Rather, the 'public' and its role in the processes of governance are constructed in and through the processes and modes of governance themselves."

The five types of governance constituting the typology are ideal types and assign different roles and identities to the public and its input in the policy process. In practice, overlaps and combinations are easy to identify, and one type could be the frame of another. When following an issue over time formats of public engagement are changing. It is important to be aware of the contested area of the types of governance. Actors involved in governing science and technology will, of course, themselves characterise the policy process, and often there is no consensus as to what type best describes what actually is taking place. On the contrary, the types of governance are used as resources for actors — holding divergent views on what frames and formats are actually used and preferred — trying to convince others on how to behave and what should be done. As already mentioned in the introduction, the formats could be used rhetorically in a strategic way, in that one is promoted front stage (the one most acceptable to the people to be convinced), while another is held backstage (the one considered most workable according to the actor's interests).

Discretionary governance

The discretionary type implies no public participation in policy processes involving science and technology. Public trust in science and expertise is high and based on the assumption that science is a neutral and objective tool to be used in policy-making. In conflicts about the framing of governance, experts often strive for more autonomy and discretion. Therefore, even if not implemented in actual practice, the discretionary type is common in debates about science and technology. Looked at the other way around, it triggers demands for public participation among groups questioning the autonomy of expertise. From the perspective of the taxonomy, the discretionary type is not a proper model for science and technology governance. There, public participation is supported as well as considered crucial for achieving robust decisions. Discretionary governance is in this respect important only as a contrast, an image (a mirage) of the golden age of autonomous and powerful experts, but not an adequate model for governance in today's societies.

Educational governance

The educational type reflects a tension or disturbance between the existing policy and the public. That is a gap reflecting public resistance towards a policy carried forward by an identified technical elite. If the resistance is not dealt with, public support for science will further decrease. This type of governance indicates that experts lack public support. However, experts play the dominant role when trying to bridge the gap to restore public trust. Therefore, it could be hard to distinguish between educational and manipulative motives behind the efforts taken to restore confidence. The first would be an honest attempt to educate the public, the second primarily about restoring trust in order to achieve support for technical projects. However, the public are not necessarily the ones who should be blamed for the gap. Experts could be criticised for not taking responsibility for educating the people, but still the common, expert driven, diagnosis says that the cause is lack of information and knowledge among the public. The gap between experts and the public becomes visible in the public arena. The educational type of governance is agonistic and hegemonic, "conceiving the distribution of the essential resources in terms of haves and have-nots" (Hagendijk & Kallerud, 2003: 13).

Deliberative governance

The two types of governance described above are both based on the assumption of expert autonomy. They differ, however, on the role of public support, which is strong in the first type while lacking in the other. Deliberative governance is the opposite of such a perspective,

dissolving the demarcation between science and the public, facilitating public participation and focusing on rational public debate as a means to achieving a socially viable consensus. Deliberative governance inevitably takes place in the public arena, in practice usually as a complement to state decisions. It is non-hegemonic, no argument and no actor are in advance more important than any other. Of interest is a possible similarity between the educational and the deliberative types of governance. Deliberative governance, focusing on rational debate and the best argument, favours groups with strong resources and good connections to expert knowledge, i.e. the most rational form of knowledge. Deliberation could in practice mean maintaining expert hegemony. The democratic turn, bringing in the public in decisions on technical issues, is often presented within a deliberative conception of governance. However, there is a risk of reproducing what is criticised, reinstating a strong expert position and a clear-cut expert-lay divide, i.e. governance "played out on the scientists' home turf" (Elam & Bertilsson, 2003: 14). In this respect, and because expert disagreement is a fact, not only consensus but also dissent should be valued within deliberative governance.

Corporatist governance

In corporatist governance real differences of interests are recognised, but are managed through negotiations. Interests and opinions are stable and of hegemonic character. Governance is state-centred and the important arena is the formally political. Players in the public arena have to be consulted or "picked" by the state in order to influence the policy process. The marginalisation of the public arena is a similarity to discretionary governance. Organisations have to choose whether they want to be included in state governance or not. The price of being a partner of the state is usually less power in the public debate. But when the public arena is of less importance, as it is in corporatist governance, the choice is often easy. Important features are the strategies of inclusion and exclusion. How exclusive are the inclusions made by the state? Which organisations are invited to take part in negotiations with the state? Corporatist governance is collective. Individual citizens, who are not members of organisations, can not be partners of the state. When the public arena is weak the voice of individual citizens becomes excluded from the policy process.

Agonistic governance

In agonistic governance we find opposed positions. Direct action, boycotts and demonstrations are important characteristics of the process, which takes place in the public arena. The agonistic format of public participation is a protest against a dominant framing,

usually based on discretionary, educational or corporatist governance, which excludes substantial influence by the public. However, it is also a contrast to deliberative governance, which focuses on non-hegemonic and consensual solutions. Agonistic governance strives for increased public participation and values alternative views of science and technology in order to change dominant framings and formats of the policy process. Less powerful groups, dismissing the corporative and deliberative alternatives to get their voices heard, could choose agonistic governance in the public arena as a better solution.

In what follows these five types of science and technology governance are applied to the history of Swedish nuclear waste management. Three distinct phases are analysed. Above all, these are about how to balance science and technology with democracy. Science and technology are most often represented by geology, specifically how to find and assess good bedrock where nuclear waste could safely rest for thousands of years. Democracy is about both national and local politics as well as the participation of opinion groups and citizens. It is important to consider how the different types of governance could be used in their pure forms as well as combined in different ways in order to explain decisions on nuclear waste.

Absolutely Safe Disposal in a Time of National Political Controversy

The year 1972 is often considered the starting point for the politicisation of nuclear power in Sweden. This was also the year when nuclear waste was debated in the National Parliament for the first time. During the coming years, the issue of nuclear waste would play the leading role in the opposition to nuclear power. At this time the Swedish nuclear power programme was in the middle of its realisation. Despite some early criticism from the environmental movement, the unity in the National Parliament had so far been noteworthy. Political parties, which in 1970 motioned for further expansion of the Swedish nuclear power programme, a few years later strongly opposed nuclear power.

Before 1970, nuclear waste was not defined as a problem in Sweden, neither by natural scientists and technicians, nor by politicians and the general public. In the 1950s and 60s nuclear experts were considered the heroes and saviours of their time, possessing the ability to transform a technical power of warfare into social welfare, through the production of clean and cheap energy (Anshelm, 2000). Government reports, formulated by the best available expertise, gave responsible politicians no reason to start worrying about a nuclear waste

problem. The experts, as political advisers, suggested the prospect of international solutions, where the final disposal of the waste could take place, through recycling and new promising fields of application (Sundqvist, 2002: ch. 3). The early phase in the history of Swedish nuclear power is a good example of discretionary governance. There was no public discussion, not even in the political arena. There was only strong public trust in a unanimously government-supported technical programme. The role of the politicians was to provide funding, not to get involved in discussions of technical details. The work of transforming nuclear physics into nuclear power plants was delegated to the experts.

In the 1970s this technocratic framing of nuclear power was dramatically changed into one of the most politically controversial topics in Swedish society. The issue had unique effects on Swedish domestic politics; it cut across the traditionally strong left-right division in the party system, brought about the dissolution of the first non-socialist government after the second world war, and as the target of a national referendum (in 1980), it caused hotly debated problems of interpretation as regards the future of nuclear power in the country (Lidskog & Elander, 1992). The obvious change was the growing importance of the public arena. Governance was broadened; both experts and politicians became anxious about how to govern the issue of nuclear power. The public debate was characterised by both agonistic and deliberative components.

Many Swedes took an active part in the referendum campaign. Quite a few participated in study circles and educated themselves in questions of energy production, nuclear power and nuclear waste management. No question seemed to be too technical for laypeople to discuss. The mass media reported from the campaign on the front pages almost every day. A lot of public discussion went on and mass demonstrations were arranged. Most active in the public arena was the People's Campaign Against Nuclear Power (Jamison *et al.,* 1990). A detailed study of the nuclear power debate in Sweden in the 1970s concludes that no other "political issue during the post-war era can be compared to the nuclear power issue in regard to the extent and intensity of different activities aiming to influence and engage the general public" (Holmberg & Asp, 1984: 540).

The intense debate was most of all about the framing of the nuclear power issue. The discretionary type of framing was contested when critical voices raised questions about risks and technical uncertainties, about a future nuclear society where we all would have to live in

fear. Critical groups tried to reframe the issue from a technical question to one of what kind of society we want to have. In Sweden, this debate started in the expert arena. A few experts, and above all the Nobel Laureate Hannes Alfvén, influenced by the critical debate in the US in the 1960s about bomb-testing and effects of low-level radiation, tried to convince environmental organisations and politicians about the risks connected with nuclear activities (Sundqvist, 2002: ch. 3). In the political arena, the Centre Party, a former agricultural party trying to transform itself into a modern green party, soon picked up the critical arguments. In the campaign preceding the parliamentary elections in 1973, the Centre Party pushed the problems with nuclear power, and above all the unsolved waste problem, as an important issue for the citizens to vote on in the election.

When voting in the election for the national parliament in 1976, most of the constituents were guided by their attitudes towards nuclear power. The election resulted in the first non-socialist government in Sweden in forty-four years. A new government was formed, consisting of the anti-nuclear Centre Party, and the Liberal and the Conservative parties, which were positive to an enlarged nuclear power programme. The new Prime Minister, Thorbjörn Fälldin from the Centre Party, promised to stop the expansion of nuclear power in Sweden. The Government tried to solve its internal tension through new legislation concerning the fuelling of new nuclear reactors. The new law, called the *Nuclear Power Stipulation Act,* required that prior to fuelling a nuclear power plant, its owner had to show *how* and *where* the spent nuclear fuel could be finally stored with *absolute safety* (SFS, 1977:140). The focus on nuclear waste was much due to the Centre Party's assessment that nuclear waste was the most difficult problem for nuclear power to deal with.

When the Act came into force, six power plants were in operation, four under construction and another three planned. Consequently, to get permission to start the reactors under construction, the owners were obliged to develop a technical concept for the final disposal of nuclear waste. For nine months some 450 scientists and technicians were involved in this work, which resulted in more than sixty technical reports. On the basis of the reports, the KBS concept was presented. This technical system was based on a multi-barrier principle of safety, consisting of both technical barriers (canisters of lead and titanium) and a geological one (the repository being located 500 meters down in the bedrock).

Through the new legislation the nuclear power issue was transformed into a technical discussion of nuclear waste disposal. The Government, as representing the formal political arena, tried to narrow the definition of the issue by the Stipulation Act, by which the future of nuclear power became a question about safe nuclear waste management. This was an effort by political actors to take the initiative in a situation where the debate in the public arena dominated. The Act, however, did not create consensus. On the contrary, it fed more controversy (Sundqvist, 2002: ch. 4).

The nuclear waste experts trying to assess the safety of waste storage in the Swedish bedrock were not "left to themselves", nor unanimously trusted. Esoteric questions about long term stability and cracks in the bedrock were broadly debated. Due to these heated debates in the public arena and political pressure to reach quick and firm statements, the experts became strongly polarised. For political parties the application of the new legislation became a matter of how to navigate among diverse expert opinions. In a situation where state power was weak, a new kind of state governance emerged. This was about expert consultations. When both experts and the public opinion were divided it became important for politicians to pick the *"right"* expert. Thus they tried to intervene as well as adapt both to expert opinions and the public debate. The controversies among the political parties, as well as within the Government, intensified this pattern of actively picking the right expert. At a time of agonistic governance, this amounted to trying to see through the apparent homogeneity of expertise in order to find support for policies of either stopping or expanding nuclear power (Sundqvist, 2002: 102-103). This "picking" strategy is similar to corporatist governance and was a new development in Swedish political life regarding how to govern technology. Corporatist decision-making was taking place in a situation characterised by a strong public arena and a weak Government.

The discussion on how to regulate nuclear power was hegemonic. The debate, triggered by the Stipulation Act, was polarised between opinions on absolutely safe or absolutely unsafe disposal of nuclear waste. However, the divide between expert and lay knowledge was also brought up. Experts, politicians and citizens were all debating technical safety issues and bedrock conditions, and how to decide on the issue in relation to the requirements of the Stipulation Act. A few weeks after the Three Mile Island accident in March 1979, the political parties in Sweden agreed to a national referendum on the future of nuclear power, to be held early in 1980. The demand for a national referendum had already been proposed by

environmental organisations, and above all by the People's Campaign Against Nuclear Power. The Campaign had strong public support, demonstrated by the many signatures on petitions circulated in support of a national referendum. Behind the Campaign stood many different non-governmental organisations as well as political parties.

During the 1970s we can discern a strong controversy – an agonistic clash – between two different framings of the nuclear power issue, including the waste problem: a narrow technical definition, which was the old dominant type of framing, and a new broader political definition. For the first time in Sweden's history a high-tech, scientifically-based activity was contested by politicians and the general public. The politicisation of the nuclear issue reached its most intense point during the national referendum campaign, when every citizen was invited to take part in the decision on a technical issue. For technocrats the referendum was both incorrect and humiliating. To them nuclear power was not an issue to vote on; it was irresponsible to let the general public vote on nuclear safety issues and geological questions of waste storage. These questions ought to be handled and judged by technical experts. Other actors, however, considered the referendum a good idea for solving a controversial issue. They did not see nuclear power as a question for experts only, but as a political issue, and more so when experts disagree. In their opinion politicians were free to use different methods in order to solve critical questions, and a national referendum was one way to do this. Even some experts took this view (Brante, 1984: 136-137).

The formats of public engagement were organised both through political parties and civil organisations. The agenda was very much set and decided on in the public arena. The mass media was of great importance. Demonstrations and activities in the streets were well covered by mass media. During the years 1972-80, the process was agonistically driven. The political system – the government – had difficulty reaching consensus and deciding on the issue. The divide was within the coalition bourgeois government as well as the social democrats. What the Government tried, but due to internal controversy failed to do, was to define nuclear waste as a technical issue, and in a corporatist way connect experts to a political decision on absolutely safe disposal. The Government finally gave in to the public arena and a national referendum was held in March 1980. A slight majority of the general public in Sweden (58%) voted in favour of the decision to fuel another six reactors.

Local Acceptance and Enough Good Bedrock

After the referendum people in general were extremely tired of discussing nuclear power and nuclear waste, and these issues increasingly disappeared from the national public arena, and also from the agenda of national politics. The task of continuing the nuclear waste programme was however still prioritised – more reactors in operation meant, of course, the production of more waste. In the early 1980s SKB – the company in charge of the waste programme – formulated a systematic geoscientific research programme with the aim of supporting the site selection process. When the programme was ended in 1985, geoscientific investigations, including test drillings, had been conducted at about ten different sites (SKB, 1992a: 49). The drillings caused turbulence in most of the municipalities where they were conducted, even though they were more for general research than part of a site selection process. So called "rescue groups", local groups opposing test drillings, were founded at seventeen of the places where investigations were been planned or conducted (Lidskog, 1994: 57). Those groups are organised in a national "Waste Network" (Avfallskedjan).

The SKB programme of investigating suitable sites for a repository of high-level nuclear waste was now drawn into great problems. The drillings were rejected locally by concerned citizens, and in most places the protests were intense, providing a good example of agonistic governance. The drillings were not part of a formal political process, despite a legislated government review of the SKB research and development programme every third year (SFS, 1984:3). Licensing a proposed site is a task for the government, but before SKB proposes a suitable site, the siting process is not part of a formal political process. Therefore, the drillings were undertaken in the public arena, and due to the public reactions this arena was strongly contested. SKB conducted the drillings without dialogue, even without informing local residents. The only one informed was the landowner. The strategy of not involving people, and of defining the drillings as research, of interest only for the company itself (discretionary governance), turned into a disaster for the nuclear industry.

In 1986 it became obvious that SKB was trying to escape detailed geological criteria for finding proper sites. In an R&D programme, SKB drew the conclusion that "site investigations have shown that it is possible to find many sites in Sweden that are geologically suitable for the construction of a final repository" (SKB, 1986: 86). This conclusion led SKB to claim that, "other factors can be accorded greater importance in the siting" (SKB, 1989: 27; cf. SKB, 1986: 51). SKB explicitly argued against the opinion that,

with reasonable efforts, it was possible, from a geological point of view, to find a *best* place (SKB, 1989: 27). According to SKB, it is of greater importance to safety to be certain of high quality in the technological construction work, than to find the "best" bedrock. A rationale behind the changing SKB strategy is tactical, i.e. an adaptation to the social conflicts around the test drillings. If the bedrock is a less important safety barrier it will become easier for SKB to find the number of sites needed. A threat to SKB would be if an area, restricted in space, were judged as one of the best from a geological point of view, but the residents and local politicians strongly opposed a nuclear waste repository there. Swedish legislation, which includes the right of veto for municipalities on land-use issues (though some exceptions are admitted), would then make siting impossible.

In 1992 SKB formulated a new siting strategy, based on the consideration that possible sites should not be selected on geological criteria. Instead *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, 1992b: 66). Such studies were a new format for public engagement, proposed by SKB as a possibility to bridge the gap between the nuclear industry and the public. Consequently, SKB sent a letter to all 286 municipalities in Sweden (SKB, 1992c). The letter was openly worded, presenting the work of managing and disposing of nuclear waste, and also pointing out that a show of interest would not mean future commitments. If representatives of the addressed municipalities wanted to know more about nuclear waste management or perhaps would be interested in letting SKB carry out a feasibility study, they were asked to get in touch with the company. A feasibility study includes investigations in different fields: bedrock (no drillings included, only investigations of already collected geological data), land and environment, transportation and societal impact, and also compilations of previously made studies and existing knowledge. The study is viewed by SKB as a tool to start talking to citizens and their representatives (SKB, 1997a: 21). The SKB presentation of a feasibility study is close to deliberative governance.

However, when a municipality agrees to let SKB conduct a feasibility study it declares an interest in hosting a final repository for high-level nuclear waste. When SKB is invited by a municipality to carry out a feasibility study, its interest in this territory has already been declared and also its belief that it may be possible to locate a repository in this area. Therefore, both SKB and the municipalities involved had reasons for participating in a

feasibility study, and could be said to be *strategic actors*, though focusing on different aspects of the nuclear waste issue: the municipalities on employment opportunities, and SKB on possibilities to conduct more detailed investigations and finally construct a repository at this specific site. This situation indicates that a feasibility study is much about corporatist governance: SKB and the municipal council negotiating their interests. The communication between the two parties is in this respect strategic and hegemonic.

The new siting strategy provides a way beyond a narrow technocratic siting strategy: to give local politicians and citizens concerned a say, and in a deliberative way discuss where to store nuclear waste. However, this also means the strengthening of the power of SKB and gives the company stronger possibilities to find the needed acceptability — in that at least some Swedish municipalities volunteered to be part of feasibility studies — in order to implement a ready-made technical solution. From the perspective of SKB, what are lacking are convinced municipalities. Perhaps educational governance combined with corporatist governance could bridge this gap.

Feasibility studies in northern Sweden

In 1993 two neighbouring municipalities Storuman and Malå, located in the sparsely populated interior of northern Sweden, decided to allow SKB to conduct feasibility studies (SKB, 1995a, 1996a). In September 1995, after the completion of the study, the residents of Storuman decided in a local referendum against the continuation of the SKB work (71 percent voted against), and two years later the residents of Malå did the same (54 percent voted against) (SKB, 1998: 94).

The two studies were organised in a similar way. The most explicit element of corporatist governance was the establishment of a steering committee (consisting of two managers from SKB and two politicians from the municipalities) to lead the work, and a reference group (representing political parties, the County Administrative Board and the most important non-governmental organisations) assigned as an advisory group to the steering committee.[2]

[2] SKB 1995a: Appendix 2. Corporatist governance means that the state co-operates with organisations in public decision-making. Concerning a feasibility study it is not the state (or the local state: the municipality) which initiates or conducts the study, but a private corporation, SKB. However, an ambition of SKB is to make contact with the municipality, and in this respect it wants to utilise corporatist strategies, in order to share the responsibility of the study with the municipality. The municipality, on the other hand, has to organise the study from its own perspective, and in this it could more or less act in a corporative way, both in relation to SKB and NGOs, when carrying out review work and making decisions about the study.

However, in the signed agreement between SKB and the municipalities it was clearly stated that SKB was responsible for the feasibility study, which in practice was led by a project manager, while the steering committee and the reference group could give advice and influence the work. The feasibility study was to be paid for by SKB and was to include the costs the Municipality would incur in the execution of the study. Due to the arrangement the general public as individuals had no possibility to formally influence the work. However, several public information meetings were held during the studies, where individuals could ask questions and comment on specific issues. In both municipalities SKB opened a local office where citizens could receive information and ask questions.

One conclusion to be drawn from both studies is that corporatist and agonistic governance dominated and worked alongside each other: the latter as a reaction to the former. The agonistic type was also a reaction to the lack of deliberative space where critical questions could be asked and listened to, such as in the working of the reference groups. Corporatist governance was most visible in the formal organisation of the studies, and agonistic governance as an important part of the referendum campaigns. The steering committees, a good example of corporatist governance, were elite organisations for important negotiations. The general public had no access to these groups. The referenda changed this pattern, since there everyone's vote was counted equally. The public arena was strong during the whole process, but became of crucial importance in the referendum campaigns. The feasibility studies became a clash between strong actors who wanted, respectively, to continue or reject the work on final disposal of nuclear waste in their municipality. These two opposing interests were represented by SKB and the critical groups. Some leading politicians were also widely viewed as holding pro-opinions. Therefore, two inflexible and well-organised interests involved in a power game tried to influence the general public on how to vote in the referenda.

Campaign organisations (both negative and positive) were quickly established in both municipalities. The media debate, as well as the discussion between the general public and the political parties, was intense during the studies, and peaked during the referendum campaigns. The debate was more intense in Storuman than in Malå. During the period from January 1993 to December 1994, before the Storuman referendum campaign started, more than 1,000 items were published in the media on the subject (SKB, 1995a: Appendix 5). Another important difference was that in Malå an independent review of the final report of the feasibility study

was organised before the referendum was held. This was made possible by a government decision allowing concerned municipalities to apply for funds to compile and distribute information to citizens and carry out review work in addition to feasibility studies (Swedish Government Decision 11, 1995). This was a decision aimed at strengthening the independent role of the municipality as a reviewer of the work of SKB. One reason for this decision was that the citizens of Storuman viewed the municipal administration as a supporter of the feasibility study and not as an independent reviewer.

In its own evaluation of the Storuman study SKB criticises the voters in the referendum for deciding too early on how to vote. The results of a survey show that 55 percent of the voters had decided how to vote when they first heard about the plans of a nuclear waste repository in Storuman. Only 30 percent of the voters changed their minds during the study. SKB asserts that this shows that "attitudes were based on emotions" (SKB, 1996b: 4). However, this could also be said of SKB's opinion of Storuman and Malå as suitable areas for a final repository for nuclear waste. Since 1992 SKB has believed that almost every municipality in Sweden would be suitable for hosting a final repository, and this was also SKB's judgement of Storuman and Malå before the investigations of their suitability started. Consequently, SKB's conclusions in the final reports (identical wording in both) is that "areas exist within [Storuman/Malå] Municipality which may offer good prospects for the siting of a deep repository" (SKB, 1995a: x, 1996a: x). In Malå this conclusion was drawn despite the fact that 1) most of the bedrock consists of ores and mineral deposits valuable for extraction; 2) the waste would have to be transported through the municipalities of Skellefteå and Norsjö, which both have stated that they would not allow such transportation; and 3) existing road and railway systems were not sufficient to carry the waste. These factors were not considered negative for the evaluation of Malå as a suitable municipality for hosting a final repository for nuclear waste, despite being viewed as important factors (SKB, 1996a: 129, 131).

In Storuman, SKB was critical of the early date set for the referendum, before evaluation of the study was undertaken. According to SKB this gave the citizens less time to learn about the results and inform themselves from a broad base of arguments (SKB, 1996b: 7). This statement reflects an educational view of the public, which believes that education takes time, and according to SKB there was not enough time for public education.

Feasibility studies in nuclear municipalities

After SKB wrote to all Swedish municipalities to ask about their interest in hosting a nuclear waste repository only two volunteered for a feasibility study. In 1994 SKB pledged to carry out five to ten feasibility studies, and in May 1995 a study of the possibility of storing nuclear waste in the five municipalities already hosting nuclear facilities was presented (SKB, 1995b). It was obvious that SKB did not want to choose where to carry out feasibility studies based on a specified list of criteria, and especially not one based on a geological comparison of the Swedish bedrock. Instead SKB motivated its choice of sites for feasibility studies purely on the basis of the municipality in question having shown an interest in hosting a nuclear waste repository or its already hosting a nuclear facility.[3]

According to the SKB study of the five nuclear municipalities, the possibilities were good in Östhammar, Nyköping and Oskarshamn, whereas in Varberg there were some uncertainties, and in Kävlinge the situation was complicated. Then, using this study as a basis SKB asked the first four if they would agree to a feasibility study. Just four weeks after being asked, in June 1995, Östhammar said yes. Nyköping discussed the proposal but decided not to take a formal decision on the issue, stating that they could not formally prevent SKB from conducting a feasibility study, and also stating that they were not negative to such a study.[4] Varberg decided not to allow SKB to carry out a feasibility study. At the time of the decision a minor earthquake in the area led to strong public opinion against nuclear waste disposal. Finally, in Oskarshamn the issue was thoroughly investigated before a decision was reached. In October 1996, almost one and a half years after being asked, Oskarshamn decided to allow SKB to conduct a feasibility study.

When comparing the situation in Storuman and Malå with that in the three municipalities already hosting nuclear facilities, two important differences can be noted. First, the latter are already familiar with nuclear activities, which seems to generate a more positive attitude among citizens and politicians towards such activities. Second, as described earlier, the Government decided in May 1995 that municipalities could apply for funds to carry out review work and inform the public in connection with feasibility studies (two million SEK per year) (Swedish Government Decision 11, 1995). This possibility was utilised by Malå in its

[3] In the study of the five nuclear municipalities, existing infrastructure and competence were seen as positive factors, which according to SKB motivated its interest in these municipalities (SKB, 1995b: 1). They were also considered to have an advantage as regards the transport issue (SKB, 1995b: i).

[4] SKB 1997d: 19. It was also stated in the SKB inquiry to the municipalities hosting nuclear facilities that no formal approval was required but "a necessary condition for conducting a feasibility study in a proper way is that SKB and concerned municipalities agree on the forms it will take" (SKB, 1995c).

review work, but was used by the three nuclear municipalities already from the beginning of the studies, in order to build up competent review and information organisations of their own. In practice this meant that corporatist governance became less dominant. The municipalities identified themselves as independent decision-makers with respect to SKB. In the following description of the three new studies two factors are concentrated on: 1) the relationship between SKB and the municipality; 2) the municipalities' efforts to involve their citizens – their openness to citizens' attitudes and to what extent they allow them to participate in the decision-making process.

In Nyköping no political decision was taken about a feasibility study. It was asserted that such a study was the sole responsibility of SKB, and that no formal decisions had to be taken to let SKB conduct a study. The Municipality did not cooperate with SKB in a jointly set up steering committee, which in both Storuman and Malå was the executive body of the study. Nor was an agreement signed. Consequently, the Municipality had no formal possibility to influence the planning of the study, and corporatist governance did not take place between the Municipality and SKB. The Municipality did, however, set up three different groups: a preparation and information group, consisting of eleven representatives from political parties represented in the Council, a reference group, representing NGOs, and a group of civil servants. Before the start of the review work, the aim of the groups was not to influence the study but to follow it, receive information from SKB and forward this to the citizens (SKB, 2000a: 31). The Municipality also made efforts to activate citizens. Public seminars and information meetings were held, where citizens could be informed about the study.

Obviously, the Municipality played an independent role in relation to SKB. However, citizens who wanted to take a stand early on and influence the direction of the feasibility study were, because of the municipal strategy, denied this possibility. To accept a feasibility study means to be among the few municipalities (5-10) from which at least two are to be selected for further investigations. Thus, to reject participation in the feasibility study could limit the possibilities of influencing the outcome of the process. From the viewpoint of the Municipality there was no formal political process going on. Therefore, it is not accurate to talk of public involvement in political decision-making. Nevertheless, representatives of groups critical of a feasibility study in Nyköping left the reference group claiming that the group was not democratic, and that its only task was to give legitimacy to the study (Södermanlands Nyheter, 1996). The action group "Save Fjällveden" applied to the

Municipality for funds for “independent” information to the citizens, but this was rejected by the Council. The Group then appealed to the County Administration, the Nuclear Power Inspectorate and the Government, respectively, but without success. Leading politicians in Nyköping were accused by the Group of arranging the study in an undemocratic way, and making influence impossible by judging the study as a non-political issue. A mutual distrust between some NGOs and responsible politicians became obvious during the study (SOU, 2001:35, p. 35).

SKB was sometimes frustrated by the municipal leadership’s lack of engagement (Johansson *et al.,* 2002). Politicians tried to downplay the importance of the study, stating that of course SKB had to make technical investigations. This is almost a reversed discretionary strategy, trying to push back the responsibility to the company and disclaim participation and engagement in the study. In the SKB final report, the overall conclusion is that there are suitable areas for the storage of nuclear waste within the municipality of Nyköping. This assessment was already made by SKB in the earlier report.

In Östhammar an agreement between the Municipality and SKB was signed, which regulated the study and stated that the responsibility for the study belonged to SKB (SKB, 2000b: 31). The Municipality set up a reference group, consisting of representatives of political parties represented in the Council. The aim of the group was stated to be to follow, review and judge the study, and inform the public on questions related to a nuclear waste repository. A working group of four civil servants was also formed for the daily administration. The municipal project organisation consisted solely of politicians and civil servants; no representatives of NGOs or the general public were involved. This means that citizens were not represented by individuals or by NGOs, but only by elected politicians.

Contact between the Municipality and its constituents was facilitated by the opening of a municipal office, a counterpart to the offices opened by SKB in every municipality hosting feasibility studies. The Municipality also arranged seminars and information meetings. However, the intensity of the local debate among citizens was low. In its final report SKB concluded that the study had not been a major issue for public debate in Östhammar (SKB, 2000b: 36), unlike the situation in Storuman and Malå. Quite late in the process, in 1997, an action group critical of the study was established, but, compared to the one in Nyköping, the group kept a low profile. In September 1997 SKB reached the same conclusion as in the three

municipalities previously investigated, and the same as already stated in 1995: the Municipality of Östhammar is a territory well suited for hosting a final repository for nuclear waste, especially the area close to the Forsmark nuclear power plant (SKB, 1997d: 195).

The first Swedish commercial nuclear power plant was built on the Simpevarp peninsula, 20 km north-east of the town of Oskarshamn. Since then two more reactors have been constructed and fuelled at the same site as well as the interim facility for spent nuclear fuel, CLAB. Oskarshamn also hosts the Äspö hard rock laboratory, which was established in the late 1980s. During its first meeting after SKB's request to carry out a feasibility study, the Municipal Council in Oskarshamn decided on a plan of action. Among other things this included the creation of two working groups: one consisting of experienced politicians and the other of ten young politicians. The Council gave the groups the task of studying the issue and informing the public prior to the Council making a decision. The two groups distributed brochures, and arranged meetings and debates. The youth group organised radio slots and information stands in shopping centres and schools, as well as a short-story competition. In conjunction with a debate between SKB and the People's Campaign Against Nuclear Power, the colleges in Oskarshamn were given the opportunity to vote on whether a feasibility study should be carried out (76 percent voted yes). In their final reports both groups stated that they were satisfied with the way in which they had carried out the job given to them by the Council. They were of the opinion that they had gotten the message across and succeeded in stimulating public debate on the feasibility study and nuclear waste disposal.

In October 1996 the Municipal Council decided to allow SKB to conduct a feasibility study. However, this decision contained several conditions, among them the following two: 1) the decision-making process has to be nationally coordinated, 2) no further decisions will be taken in the Municipality before all feasibility studies are completed, a programme for the site investigations is published by SKB and reviewed by government authorities, detailed site selection criteria are presented, and the exceptions to the municipal right of veto have been clarified (SKB, 1997b: 6-7).

A municipal organisation to strengthen local competence in order to support the Council was set up. All members of the Council constituted the reference group, which was complemented by six specified working groups of politicians and representatives from non-governmental organisations and a small group of experts from outside the municipality. In Oskarshamn the

feasibility study was organised such that the Municipality was as independent as possible of SKB, however it could not be as thoroughly independent as in Nyköping. The Municipality clearly stated that SKB was responsible for the feasibility study, the results and the judgements made in the final report. However, SKB also had the responsibility of answering questions raised by representatives and citizens of the Municipality. Therefore, it was the responsibility of the Municipality that questions, which were viewed as important, be asked and receive answers. During the study, public debate was not intense, resembling that in Nyköping and Östhammar, more than Storuman and Malå. However, more citizens were involved in the process in Oskarshamn than in Nyköping and Östhammar. No action group critical of the feasibility study was established. In the final report SKB argued that there are large areas in the municipality suitable for a final repository, and that the area close to the Simpevarp reactor site is the most interesting (SKB, 2000c: 228).

Comparison and selection of sites

The three nuclear municipalities organised their participation in the feasibility studies in different ways. Nyköping did not participate in a formal process, or wish to influence the study before the review started. In Nyköping critical organisations refused to participate in the reference group. In Östhammar a small group of politicians from the Municipal Council made up the reference group, while in Oskarshamn all the members of the Council constituted the reference group, complemented by working groups with representatives from NGOs. Thus, the definition of the public was not individual citizens, but elected politicians and NGOs. In Storuman, Malå and Nyköping the meetings of the reference groups were dominated by SKB and their presentations of results from the investigations. These meetings were more of a one-way communication than a dialogue. In Östhammar and Oskarshamn the reference groups played a more independent role, asking questions and placing requirements on the investigations being carried out by SKB.

None of the nuclear municipalities arranged a local referendum about whether to allow further investigations to be carried out, as Storuman and Malå did. This solution gives the citizens the power to decide the outcome, which usually creates a situation characterised by agonistic governance. One interesting aspect of the comparison of the feasibility studies is that SKB, when asking nuclear municipalities to accept a study, judged the following factors as advantages: infrastructure, competence, transportation system, and familiarity with nuclear activities. Obviously, these factors are lacking in Storuman and Malå. In Nyköping,

Östhammar and Oskarshamn SKB designated areas close to the existing nuclear facilities as being of the greatest interest. It was argued that such locations were preferable because of the possibility of utilising existing facilities, and because the transportation of the waste could be minimised. But how then could SKB's interest in Storuman and Malå be explained?

Scientific questions about the bedrock, the engineered barrier and long-term safety were not important parts of the discussion in the feasibility studies. The question of justice – "why northern Sweden?" – was considered important by many citizens in Storuman and Malå, but never became a topic in SKB's studies or in the review work. Neither did the mineral-rich bedrock in these municipalities pose a major problem in the public debate, which concentrated on job opportunities and negative effects on tourism. The nuclear municipalities tried to play a more independent role with regards to SKB than did Storuman and Malå, and viewed themselves more as reviewers than supporters of the studies. This was facilitated by the possibility to apply for funds for independent review work. In Storuman and Malå the municipalities were more closely connected to SKB. Some members of the reference group in Storuman felt co-opted, arguing that the group and its work were a "flagrant example of pseudo-democracy: A travesty of democracy" (SKB, 1995a: Appendix 4:3). The existence of such feelings is a reason for increased agonistic governance.

Both SKB and the feasibility municipalities had reasons to participate in a feasibility study, and could be said to be strategic actors. The strategic agenda of SKB includes the opinion that suitable sites exist in many parts of the country, while that of the municipalities considers nuclear waste to be a controversial substance with a bad reputation, but which could provide needed employment opportunities and better infrastructure, i.e. municipal prosperity. This situation is a good example of corporatist governance.

In 2000 eight feasibility studies were completed. In addition to the five municipalities described above, studies in Tierp and Älvkarleby, which are neighbours of Östhammar, and Hultsfred, a neighbour of Oskarshamn, were commenced. When the three last studies started SKB announced that no more studies were needed, most of all due to the time aspect. SKB's executive director stated that municipalities earlier in line could not sit and wait too long for new studies to be completed (Göteborgs-Posten, 1999). SKB felt the time pressure and rapidly completed the three new studies, but because of this met critical comments from the municipalities.

In December 2000 SKB presented a comparison of six studies (Storuman and Malå were excluded due to the results of the referenda), and a selection of the three most promising areas to conduct site investigations, including drillings in the bedrock (SKB, 2000d). In this report, SKB recommended three municipalities of further interest for site investigations: Östhammar, Oskarshamn and Tierp. In addition to these, Nyköping was suggested as a substitute. The municipal councils in Oskarshamn and Östhammar agreed to site investigations, while the councils in Nyköping and Tierp rejected the SKB proposal. In 2002, site investigations, including an extended drilling programme, started in Östhammar and Oskarshamn in order to determine whether the sites were good enough to host a final repository for nuclear waste.

Geology Back in Business

In January 2002, a headline in Dagens Nyheter, Sweden's most important daily paper, announced: "Worst Sites Chosen". In an article signed by nine people – two geologists, one political scientist, and six representatives of environmental organisations – it is argued that new findings in geo-hydrology conclude that the best site for long-term storage of nuclear waste is an inflow area (recharge area). Such areas are usually located at inland sites characterised by groundwater inflow (Holmstrand *et al.*, 2002). However, the sites proposed by SKB as most promising for site investigations are outflow areas, located in coastal areas (Oskarshamn and Östhammar), while the site in Hultsfred, judged by SKB as being of less importance, is in an inflow area.

According to the article, the reason behind SKB's choice of sites for investigation has not been to find the best bedrock conditions, but to achieve political acceptance. SKB has been granted the right to independently select sites, as well as set its own selection criteria, and therefore it chooses sites where social acceptance seems most easy to achieve. Hence the ambition is only to find "enough good bedrock" (Holmstrand *et al.*, 2002). From the perspective of geo-hydrology and long-term safety criteria the proposed sites are among the worst possible. Obviously, the site investigations should be carried out where the physical prerequisites are presumed to be the most promising in order to fulfil safety criteria. This is however not the case in Sweden today. According to new research findings, supported by the Swedish Nuclear Power Inspectorate, it is evident that inland sites have a better safety potential, but such sites have not been chosen. On the contrary, such sites have been actively

dismissed by SKB. The article concludes that the selected sites can not be defended by scientific evidence.

The article in Dagens Nyheter was published at a time when the feasibility studies were completed and SKB had made its choice of site investigations. However, not all of the municipalities had responded to the SKB proposal. Östhammar and Nyköping had made their decisions, the former accepting and the latter not accepting to be part of site investigations, while Oskarshamn and Tierp had not yet come to a decision about the issue. The article helped to reintroduce the nuclear waste siting issue into the national public arena.

In accordance with legislation, the two national authorities, the Swedish Nuclear Power Inspectorate (SKI) and the Swedish Radiation Protection Authority (SSI), reviewed SKB's choice of sites for site investigations. SKI had earlier criticised SKB's strategy of siting, while proposing a more science-based selection process using geological criteria (e.g. SKI, 1993a; cf. Sundqvist, 2002: 115-117). Both authorities commented on the geo-hydrological findings referred to in the Dagens Nyheter article, and also mentioned the national media attention initiated by the article.

> SSI considers that it is good that SKB is now planning to produce a better documentation to be able to assess the importance of recharge and discharge conditions and salinity conditions in the choice of sites for site investigations. It is important that analyses are designed in such a way that they give a perspective on the choice of sites for site investigations, and that the siting alternative Hultsfred can be assessed in a more satisfactory way…" (SSI, 2002: 40).

As described above, the municipality of Hultsfred is mentioned as the most promising alternative from a geo-hydrological point of view. The feasibility study in Hultsfred was one of the last two studies conducted by SKB. The SKB presentation of preferable sites for site investigations was made in December 2000, and this was before the Council in Hultsfred had finalised its review of SKB's report. The municipality heavily criticised SKB for rushing to reach a final decision on the choice of sites and for ignoring the opinion of the municipality (SOU, 2001:35, p. 41). This, perhaps, is a reason behind the Municipality's critical review, focusing largely on the SKB site selection criteria. In this, Hultsfred is voicing the demand for a more science-based selection process, which a few months later was to be nationally highlighted in the Dagens Nyheter article.

> In an argument where, from the standpoint of final storage short-sighted private and public economic considerations predominate, SKB declares it to be sufficient that the bedrock be 'good enough'. Hultsfred Municipality does not share this opinion. Safety is uniquely important. The siting process must not focus on seeking acceptance at the expense of finding an absolutely safe location… To therefore dismiss test drillings in Hultsfred by saying that the Municipality is geologically similar to Oskarshamn, and that no more information is needed to assess the suitability of 'Småland-granite' is clearly mistaken in that regard… Of course it's not possible to draw conclusions about safety from the level of social acceptance, though it certainly is interest from the business point of view. Or are we to suppose that the safest spot is located in the municipality which happens to have the highest percentage of yes-sayers? (Hultsfreds kommun, 2001)

From the argumentation in the Hultsfred review as well as in the Dagens Nyheter article we can notice that political parties, i.e. environmental organisations and a municipality, want to narrow the issue and give expert opinions on safety a more crucial role in the site selection process. Instead of using political criteria, for instance a municipality's desire to host a nuclear waste repository, the argument tends towards technical criteria. One reason behind the Hultsfred opinion is that technical arguments seem to provide the strongest support for the ambition of being part of a site investigation. However, by raising technical arguments Hultsfred is criticising a politicised process, where the ambition and opinion of the municipality should be downplayed. So, what is being proposed is discretionary governance, more or less based on the political motive of being part of a site investigation. This example means that we are back to the situation of the 1970s, where for tactical reasons the solution to a political controversy was sought through technical means, i.e. political parties pushed the issue towards discretionary governance.

Of the eight investigated municipalities, two – Storuman and Malå – declined to continue based on the results of local referenda. Another two, Nyköping and Tierp, were asked to participate in site investigations but in council decisions decided not to take part, while Älvkarleby and Hultsfred were assessed by SKB as being of less interest, and were not asked to participate further. Only Östhammar and Oskarshamn agreed to site investigations. It has not been easy for SKB to find municipalities interested in siting studies. In this respect, it is flattering for SKB that one more municipality wants to be part of a site investigation, in that Hultsfred is arguing that for safety reasons their bedrock should be investigated as well. Less flattering, however, is that this request calls into question the SKB choice of sites, for being based more on familiarity with nuclear activities and existing infrastructure than geological criteria.

Today, SKB is not enthusiastic about using more detailed geological criteria and eventually starting a third site investigation. SKB is focusing on the two ongoing investigations and wants to evaluate them by using several criteria, not only geological ones. Moreover, Oskarshamn municipality, which has long been the strongest candidate for hosting a final repository and already hosts the interim storage facility, is not happy with the initiative taken by their neighbour Hultsfred. Not much is gained from being a neighbour to a waste repository: the risks are close but the benefits far away. This is perhaps an important reason behind the Hultsfred initiative. What could be expected from the public discussion on geo-hydrology and inland vs. coastal location, is that the SKB evaluation of sites in the years to come will be more intensively reviewed from such a technical perspective.

From the governance typology, a strong focus on expert opinions in a situation of political controversy does not contribute to sustainable governance, as was already shown in the 1970s. This amounts to establishing a strong demarcation between science and democracy. The alternatives are reduced to, on the one hand, just trusting the experts without understanding why, or on the other hand, in a politicised and active way picking the "right" expert who absolutely decides about safe or unsafe sites. Neither of these alternatives are conducive to robust decision-making on technical issues. However, the critique of unclear criteria could be differently interpreted, in that SKB is criticised for not properly taking account of findings, scientific or not, which are important for the site selection process. The task, then, is to utilise these findings in a better way, which does not create strong boundaries between different groups and different kind of arguments. This is what is important for science and technology governance, and what should also be focused upon in the site investigations carried out today. Such a solution could not easily answer the question whether SKB's decision on site investigations should be opened up to also include Hultsfred. However this issue will be discussed more generally in the concluding section.

Conclusion: The Limits of Deliberation

Since 1992 SKB has argued that it is possible to finally store nuclear waste safely at many sites in the country, maintaining the siting principle of local acceptance. From this viewpoint the only thing required to realise a repository is a municipality willing to host the facility. However, government authorities and the general public do not agree with SKB on this point and have clearly expressed that they will only accept a repository if it can be shown that the

proposed site is satisfactory, which at the very least means that it is better than compared alternatives. Many people still want the best site to host the repository, and SKB, in surveys, asks people about their willingness to accept a repository, "[i]f it were decided that *the best place* for storage of high-level nuclear waste was in your municipality?" (see Hedberg & Sundqvist, 1998, italics added). This argument clearly opposes the siting strategy so far applied by SKB. To focus on municipalities possessing infrastructure, competence and positive attitudes towards nuclear activities is not in accordance with long-term safety requirements and the importance of the bedrock for achieving safety. According to the opinion held by government authorities and the general public, the question of why feasibility studies have been conducted in the eight municipalities has never been answered by SKB.

In the first phase described in this paper (the 1970s), a situation of politicised discretionary governance was identified. This meant a paradoxical kind of communication between experts and political actors framed by a requirement for absolutely safe nuclear waste disposal. Expert opinions were used as weapons in a fight over the future of nuclear power. The polarised situation coloured the experts black and white, creating an unstable equilibrium, a flip-flop thinking, which was a consequence of the strong demarcation between science and society and the (false) expectation that scientific results could be absolutely true or absolutely false (cf. Collins & Pinch, 1993: 142). From the perspective of the typology we can observe that the problem with a strong demarcation is present in all types except deliberative governance.

In the second phase the discussion was broadened, becoming a question of agreeing to take part in feasibility studies. These studies were characterised by an "everything goes" attitude. In every study SKB came to the same conclusion: that areas suitable for a nuclear waste repository exist within the Municipality. The lack of criteria for evaluation, as well as comparison of different alternatives, caused an unclear situation and confused citizens: "what was really at stake?" The municipalities had to say yes or no to an ill-defined issue. However, also of importance in the second phase were the many public discussions, creating deliberative space. But due to the unclear objective of these discussions the conclusion is that SKB strongly controlled the interpretation of the results of the studies and how to use them for later comparison. In the third phase we noticed a reaction against unclear criteria, and we were pushed back to an absolute rhetoric; this time framed as a question of best and worst sites.

What has never taken place is a meeting between science and democracy, i.e. open discussions of criteria, where questions such as “how important is geology?” and “why northern Sweden?” could be discussed by a wide group of people, without the false expectation of reaching absolutely true answers. The apparent paradox of citizens wanting decisions to be both more science-based and more publicly influenced could then be dissolved (Hedberg & Sundqvist, 1998: 108). Only from the perspective of a strong demarcation between science and democracy is such a result hard to understand.

Since the time of the Stipulation Act SKB has tried to escape detailed criteria set up by the government and authorities. From the perspective of the company the feasibility studies were an experiment in democracy, letting citizens and local politicians discuss the siting issue. However, the way they were carried out strengthened the control of SKB. The nuclear waste decision-making process has so far been dominated by technocrats who consider a nuclear waste repository to be safe enough to be realised at many different locations in the Swedish bedrock. Since it had been hard for SKB to find a site where inhabitants hold a positive attitude towards a nuclear waste repository, technocrats argue that the best way to reach an agreement on the siting issue is increased democracy. From such a viewpoint democracy means the process of transforming people’s negative attitudes towards a repository into positive ones, i.e. a process of acceptability. The democratic process is reduced to lubrication oil, when already defined and decided projects have to be accepted by the wider society. From this perspective people would accept a repository if they only possessed adequate knowledge. This example shows a strong demarcation between those “who have” and those who “have not”, i.e. an educational view of public involvement.

Environmental organisations, anti-nuclear groups, politicians and citizens who do not want a final repository to be built in their municipalities, tend to argue against the credibility of SKB and seem to reject all of SKB’s proposals. This could be called a NIMBY-attitude, which often means the avoidance of corporatist governance. These players replace the corporative channel with an agonistic one, which is utilised in order to convince people to reject every SKB proposal, because they “know” that these proposals are uncertain, risky and illegitimate, and therefore have to be rejected (e.g. SKI, 1993b: Appendix 1).

In the feasibility studies almost every party declared the need for increased local involvement. However, the various understandings of involvement differ. SKB understands it as a

mechanism for providing information to people about the safety work accomplished, in order to convince them to accept a repository in their municipality. Critics of SKB try to use public involvement as a mechanism to reject the proposals of SKB, as was shown in the referenda held at the conclusion of the first two feasibility studies. This strategic agenda is in strong contrast to deliberative governance. The kind of governance focusing most of all on acceptance and rejection is in accordance with corporatist governance, but is also in harmony with agonistic and educational governance. After the first two studies were completed, in Storuman and Malå, corporatist governance was rejected by the municipalities. The nuclear municipalities tried to discuss the issue of waste disposal in a more independent way, with the aim of creating deliberative space for a discussion among politicians and citizens, without taking a stand in advance. However, the SKB strategy has been to bridge the gap of public resistance by using educational governance.

What has been lacking during the thirty years of nuclear waste discussion in Sweden is a softening of the strong demarcation between science and democracy, i.e. a deliberation of all aspects of the issue. However, this is the only way to create robust and stable relations between different actors, where all have the right to contribute to the decisions on this controversial issue. If this does not happen, the strong shifts from “absolutely safe disposal” to “worst sites”, will continue to flourish, creating unnecessary confusions, false expectations and fragile interfaces between involved parties, i.e. flip-flop thinking.

In Sweden, the site selection process during the 1990s has shown that it is possible to advance a nuclear waste programme by using a narrow technocratic approach, including an educational view of the public. In this, SKB is in control of the technical concept and exerts itself to create social acceptance for this concept. SKB has a huge budget for information, which has been used in the feasibility studies. The SKB approach is hegemonic; a clear divide between experts and laypeople is maintained. SKB knows what it wants to achieve and has managed to get acceptance for a ready-made technical concept. What are open for discussion, deliberative or not, are not questions about the technical concept, long term safety or bedrock conditions, but formats of public engagement with non-technical issues. Agonistic efforts have not changed this situation. A siting strategy based on an educational approach towards the public is still at work in Swedish society. In the coming years it will be seen if this strategy will also be successful in the site investigations in Östhammar and Oskarshamn. However, to achieve more substantial success deliberative governance should be cultivated.

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