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REVIEW OF THE PUBLIC INVOLVEMENT IN THE SITE SELECTION PROCESS FOR A DEEP GEOLOGICAL REPOSITORY FOR SPENT NUCLEAR FUEL IN EIGHT COUNTRIES

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Content

Abstract

Site selection processes for repositories of high-level nuclear waste in eight countries were reviewed from the point of view of public involvement. The countries included in this study are United Kingdom (UK), Germany, France, Switzerland, Canada, Japan, Sweden and Finland. The site selection processes reviewed clearly manifest that successful implementation of geological disposal needs public involvement and participation. In all countries examined the first attempts to find a site for a final repository of spent nuclear fuel took place well before the turn of the millennium. In the 2000s the overall approach to site selection has been changed. In general, it has been understood that implementing geological disposal is not only a about technology and science but a social and political process in which clearly defined steps for public consultation and decision-making are needed. Depending on the country, legal framework can provide citizens with rights and possibilities to affect the site selection process and decision-making. The only country where the construction of the final repository has started is Finland, whereas France and Sweden are still awaiting a license to start repository construction at the dedicated site. In Switzerland and Canada intrusive site investigations are well underway at several sites while UK, Germany and Japan are in the early phase of involving citizens and localities in the site selection process.

Keywords

High-level nuclear waste, geological disposal, site selection process, public involvement, legal framework, intrusive investigations.

1 Introduction

Geological disposal of spent nuclear fuel is a topical issue worldwide in countries that have nuclear reactors for generating electricity or for research purposes. Processes for selecting a site for a final repository are currently ongoing in many countries.

In the Czech Republic, four sites out of nine were selected for the site investigations in 2020. The Czech nuclear waste management organisation SÚRAO is tasked to implement the selection process and conduct intrusive investigations at dedicated sites. In this context, SÚRAO has ordered a review to benchmark different processes in a few countries in order to get insight about the ways how different stakeholders are engaged in the process.

As titled in the document, the focus is on the disposal of spent nuclear fuel (and on the high-level radioactive waste in general). However, in some cases the site selection process targets to a combined repository including also low and intermediate level waste that is not acceptable for surface disposal.

It should also be noted that the political systems and decision-making vary from country to country, resulting sometimes confusing terminology, especially when speaking about government decision making. Despite of this, the terms that are used in this document follow the country-specific representation of governmental institutions.

2 United Kingdom

2.1 Overview of the site selection process

The first attempts for screening suitable sites for final disposal of nuclear waste in UK started already in the 1970s when the first test drillings took place close to the Dounreay nuclear site in Scotland. Thereafter opposition started to grow, and the Government had to give up the programme for site characterization. In the 1982 the nuclear waste management company Nirex (Nuclear Industry Radioactive Waste Executive) was established to implement strategy for the disposal of LLW and ILW. At that time, the focus of the process was not on the HLW. Pursuits for finding communities failed because of opposition and a lack of local and wider support for site investigations.

In 1999 House of the Lords Select Committee on Science and Technology dealt with the unresolved waste problem and issued a report that highlighted the need for policy that underlines the importance of public acceptance in the process. As a result, the Government announced in 2001 the policy decision “Managing Radioactive Waste Safely” (White Paper) that outlined five stages programme on how to proceed with long-term management of radioactive waste. An essential part of this programme was an extensive public consultation to seek views of different stakeholders in regard to nuclear waste management.

Expert Committee on Radioactive Waste Management (CoRWM) was established in 2002 to assess different options for radioactive waste management with the help of public consultation and stakeholder engagement. In 2006 CoRWM published its recommendations to the Government highlighting geological disposal as the best available approach for the long-term management of nuclear waste. At the same time, CoRWM emphasized continued commitment to safe and secure interim storage of nuclear waste.

In 2004, Nirex was replaced by the new Governmental waste management organisation, Nuclear Decommissioning Authority, which was tasked to carry out the site selection procedure.

In order to realize CoRWM’s recommendations, the Government issued the second policy decision “Managing Radioactive Waste Safely - A Framework for Implementing Geological Disposal in 2008 (White Paper). From the siting community point of view, the policy decision emphasized voluntarism and partnership and right of withdrawal up until a stage when construction of a repository should begin. Part of the site selection strategy were also the engagement and benefit packages for the participating communities, but exact sums of subsidies were not defined in the policy decision. Participation was realized when a formal decision was made by the decision-making body of the community. From the site suitability point of view, sub-surface screening criteria were defined for considerations to include or exclude sites for further investigations. The site selection process that was triggered by the Policy Decision of 2008 initiated expression of interest by two communities in West Cumbria. Both the Copeland Borough council and Allerdale Borough council were in favour to participate in the site selection process, but the upper tier, Cumbria County Council voted against which brought the siting process to a close in 2013.

A new public consultation (Call for Evidence) was organised in 2013 when it seemed obvious that there were no communities actively involved in the siting process. The purpose of the consultation was to improve the process further and to gather lessons learnt from the policy decision of

2008.719 responses were received online and 15 consultation events were arranged. The public consultation was followed by the third White Paper “Implementing Geological Disposal” in 2014. As an update to the earlier one, the test of public support (e.g. local referendum) was introduced as measure to consider withdrawal from the process.

Also the level of funding to participating communities was made more precise: Community investment of up to one million pounds (£1m) per involved community, per year, was made available in the early stages of the siting process and two and a half million pounds (£2.5m) per year for the community that progresses to the stage of intrusive borehole investigations. The starting point for the new strategy was the national geological screening before asking the interest of voluntary communities for participating the process (Figure 1).

Figure 1 Diagram of the site selection process (White Paper 2014)

After the third White Paper, the new organisation for implementing Government Policy on geological disposal of higher activity waste, Radioactive Waste Management Ltd (RWM) (wholly owned subsidiary of the NDA), started to raise public awareness on the issue and promote discussion on the site selection process. RWM brought up the waste issue on different social media platforms and their web site, conducted public opinion surveys and held workshops in different locations in UK.

The Government issued the fourth Policy Decision (White Paper) “Implementing geological disposal – working with communities” in 2018, which defines the structure of community involvement in community working group at an early phase (learning phase) and community partnership (focusing phase) at later phase of the process (Figure 2). During the learning phase any interested community can set up a working group to begin local discussions and fact-finding in the community. Should there be further interest to the project after learning phase, the community can enter to the partnership phase by making a partnership agreement made by the community and RWM.

The representation in these groups is also defined in the White Paper, clearly manifesting that the right of withdrawal rests with the relevant local authorities (in West Cumbria district council and county council, for instance).

The first working group was set up in the Copeland Borough in November 2020 and the second in the Allerdale Borough in January 2021, both locations in West Cumbria.

Figure 2 Process for working with communities (White Paper 2018)

2.2 Legal framework

UK Government has the responsibility for the long-term strategy of nuclear waste management. It should be noted, however, that the Government policy and decisions do not involve Scotland, where the Scottish Government has their own strategy for nuclear waste management. Northern Ireland and Wales have their own Governments as well, but their strategies in GDF siting are compatible with the English one. However, this review primarily refers to the processes in England and Wales where the recent public consultations have taken place.

Department for Business, Energy and Industrial Strategy (BEIS) is the Government executive responsible for nuclear decommissioning and management of nuclear waste. Nuclear Decommissioning Authority (NDA) is non departmental public body, which is the successor of NIREX since 2004.Radioactive Waste Management Ltd (RWM) is a wholly owned subsidiary of NDA, who has given the responsibility to RWM for implementing geological disposal of higher activity radioactive waste. In practice, RWM is the state authority acting on the interface with local communities. Committee on Radioactive Waste Management (CoRWM) was set up on the basis of the consultation related to the Government White Paper in 2001. The purpose of this expert group was to review options for long-term management of radioactive wastes in the UK and recommend an option or combination of options for long-term solution providing protection for people and the environment. Its task was to engage public in reviewing and assessing different options for the long-term management of radioactive wastes.

The Office for Nuclear Regulation (ONR) regulates nuclear safety and security of nuclear licensed sites, including transport and safeguards of nuclear material in the UK.

The Environment Agency regulates the disposal of radioactive waste from nuclear licensed sites and from other premises generating nuclear waste. The regulatory role of the Environment Agency in regard to GDF starts when a site or sites have been selected for further investigation. The Environment agency and the ONR will jointly regulate a GDF because both environmental permits and a nuclear site licence will be required. The regulators do not have a formal role in the decision-making process to select potential sites for development of a GDF. However, the regulators will be available to provide information and advice to the community partnership and other relevant stakeholders. Planning Inspectorate is the authority that manages the licensing process for deep drillings.

Health and Safety Executive (HSE) will have a role in ensuring the health and safety of work relating to surface base investigations (deep borehole drillings). Involvement of HSE will cease when the site has been licensed for GDF by ONR.

From the public point of view, the legal framework in UK provides with good possibilities to influence the site selection process. First of all, the Policy Decisions made by the Government emphasize importance of public participation and voluntariness and right of withdrawal of communities. In principle, a community can withdraw from the process before accepting the construction of the repository. Despite that the siting communities do not have the actual right of veto based on law, earlier experience has shown that local Governments can reject and stop the siting process. Moreover, the Localism Act 2011 brought along the principle of subsidiarity (social and political issues should be dealt with at the most immediate level) emphasizing the role of local level in decision making. However, since there is commonly two-tier administration in UK (county council and the smaller district council), both administrations need to agree on invoking the right of withdrawal if they wish to stop the process. The right of withdrawal remains with the communities until the licensing of the construction of the GDF.

If the site selection process proceeds to the deep drillings (deeper than 150 m), the project is regarded as Nationally Significant Infrastructure Project (NSIP) according to the Planning Act 2008 and a separate licensing is needed for this task. The application process, which allows public to participate and register in the process as an interested party, takes at least a year. A Public hearing is part of the process.

Deep drillings require also an environmental permission, which belongs to the jurisdiction of the Environment Agency.

2.3 Involvement of stakeholders in the process on the local, regional and national level

The latest Government Policy Decision (White Paper 2018) has revived the site selection process by precising the decision-making structure on a local level. During the early stages of the siting process, RWM will enter into ‘initial discussions’ with Interested Parties and will carry out high level evaluations of areas and/ or sites suggested. Initial discussions on community’s interest in participation are first taking place in the Working Group.

Discussions on a proposed location for a GDF can be initiated by anyone or any group of people with an interest in the siting process, and who wish to propose an area for consideration. Interested parties will contact the delivery body, RWM, for initial discussions. Once both sides have had an initial ex-change of information and agree that the proposal merits further consideration, they must jointly inform all relevant principal local authorities and open up discussions more widely in the community. A principal local authority is a district, county or unitary authority. Relevant principal local authorities (district council and county council) represent people in all or part of the area under consideration. A Working Group will be formed of the interested party, RWM, an independent chair and facilitator. The Working Group will identify the geographical area within which RWM will seek potentially suitable sites for a GDF, which is called the Search Area.

A Search Area will be derived from the area first put forward for consideration by the Interested Party. In Cumbria County, where the candidate districts Allerdale and Copeland are located, the search area will be defined using district council electoral ward boundaries. As Allerdale, for instance, is divided into 23 electoral areas (divisions) there could be potentially 23 Search Areas following these boundaries. As the Search Area identification progresses, the Working Group will look to understand the geographic, social, economic, environmental, cultural, and administrative structures for the area under consideration using readily avail-able information. This analysis will help to determine whether the area has potential to host a GDF and will identify constraints and opportunities, informing the scope of more detailed evaluation work should the area continue in the siting process.

All relevant principal local authorities must be invited to join the Working Group, but it can still proceed in their absence. The Working Group will start to gather information about the people and organisations in the area who are likely to be affected or have an interest in a GDF with a view to identifying members for a formal Community Partnership. This Community Partnership will include community members, organisations, RWM and at least one relevant principal local authority. It will provide a vehicle for sharing information with the community and for finding answers to the questions the community may have about geological disposal, the siting process and how they, as a community, could benefit. In addition to the direct funding of RWM (see figures 1 and 2), the realization of the project would bring investments to the community. If it is to be successful, it will be important for a Community Partnership to reflect, both in its composition and views, the community it is representing and be respectful of a wide range of opinions. In order for the Community Partnership to form and operate, at least one relevant principal local authority must agree to participate.

A community can withdraw (Right of Withdrawal) from the siting process at any time up until it has taken a Test of Public Support. This can be based on voting or on a public opinion poll. The decision on whether to withdraw the community will be taken by the relevant principal local authority, or authorities where there is more than one, on the Community Partnership. Where there is more than one relevant principal local authority on the Community Partnership, all must agree; no single relevant principal local authority will be able to unilaterally invoke the Right of Withdrawal. RWM can also withdraw at any time, for example if it determines that the siting process is unlikely to be successful in a particular community.

Before a decision is made to seek development consent from the Secretary of State, there must be a Test of Public Support by the community to demonstrate it is willing to host a GDF. Relevant principal local authorities on the Community Partnership will have the final say on when to undertake this Test of Public Support in order to seek the community's views on hosting a GDF.

All relevant principal local authorities on the Community Partnership must agree to hold the Test of Public Support for it to go ahead.

After the issue of the White Paper 2018, RWM organised a series of public events to help people understand the context of RWM's proposed approach to Site Evaluation for a Geological Disposal Facility (GDF) and to answer any questions individuals or organisations may have about public consultations. In England, there were events in eight cities and two in Wales. These events were attended by approximately 200 participants. In addition, RWM received 90 comments from academics, local authorities, parish councils, environmental regulators, non-governmental organisations and interested individuals online during three months of consultation. In November 2020 the Copeland Borough in West Cumbria expressed its interest for GDF and the Working Group was set up. Local inhabitants are rep-resented in the working group by the councillor from the Copeland Borough Council, member from the Cumbria association of local councils (parishes), and member from the Copeland district association. In addition, there are participants from local enterprises, and four members from the implementer (RWM). The Working Group has an independent chair and a facilitator.

In January 2021, also the Allerdale Borough in West Cumbria expressed its interest for GDF and launched a working group. In March 2021, Cumbria County council's cabinet decided not to become in-volved in the working group of Copeland. The leader of the Cumbria council accused the process of being deeply flawed and argued also that the council have already been through the process in 2013. "We're not going to go through this charade again", as the leader of the cabinet described the situation.

Not only the Cumbria County is opposing the GDF in the area. There are also locally strong NGOs that operate in Cumbria and other areas in UK. Currently many of them are still active and inform their stakeholders through their websites. The following NGOs can be regarded relevant in this respect:

- Cumbrians Opposed to a Radioactive Environment (CORE)
- West Cumbria & North Lakes Friends of the Earth
- Radiation Free Lakeland (RAFL)
- Nuclear Free Local Authorities (NFLA)

In addition to their separate communication channels, these NGOs have set up a common web portal, No2Nuclear Power, which is run by a private consultancy.

At national level, NGOs (e.g. Greenpeace) are mostly campaigning against operating nuclear power plants and Government plans of nuclear new build. However, CND (Campaign for Nuclear Disarmament) is actively campaigning against the GDF in addition to nuclear resistance. In practice the site selection process continues now from where it ended in 2013: the same communities that were interested in hosting the GDF, are still in favour of the project, while the Cumbria County is still opposing it.

2.4 Discussion topics

The public consultation on the site evaluation that RWM arranged in different locations in England and Wales and online in late 2018 and early 2019 brought up 90 responses and 800 individual comments. The received feed-back to preformulated questions posed by RWM can be summarized in the following key messages:

1.There could be more clarity on how the requirements have informed the site evaluation documents, including those relating to the National Policy Statement and National Parks;

2.Matters relating to safety could be clarified and better explained and consideration given to security being given more prominence;

3.The importance of community could be highlighted and the evaluation considerations expanded;

4.The importance of geology to many of the evaluation considerations could be explained more clearly and be more prominent;

5.Specific matters were raised in relation to the environment, engineering feasibility, transport and costs siting factors;

6.The purpose and scope of the site evaluation documents could be clearer;

7.The language and content of the site evaluation documentation is very technical in places and would benefit from additional clarity and ex-planation; and

8.Greater clarity on RWM's approach to evaluations, in particular, comparative assessments, would be beneficial.

In other consultations and in the public debate, stakeholders have been primarily focused on the following topics:

- Feasibility of geological disposal
- Alternatives for geological disposal
- Trust in Government
- Insufficient information on geological disposal
- Local decision-making

Feasibility of disposal has been questioned from the beginning of the first at-tempts to find a site for radioactive waste since 1970s. Currently the corresponding arguments are still on the table when NGOs oppose Government plans on disposal. For instance, The Radiation Free Lakeland from Cumbria states that "the plan for a GDF is premature technically, scientifically and ethically". At the same time, opposing NGOs state that "radioactive waste should be recoverable and stored at existing nuclear sites rather than placed in a GDF". NGOs consider that final disposal would rule out other options for managing the waste in the future.

Lack of trust in the Government has emerged in public consultations (e.g., in the public consultation arranged by DECC in 2016). The most recent indication of mistrust is the decision of the Cumbria council to decline membership in the working group of Copeland Borough. The county council considers that the Government does not want to be in a position where local authorities could actually influence the process as it happened in 2013, when the MRWS process came to close last time. One of the key issues on a local level is the procedure by which the community makes its decisions in different phases of the process. Moreover, how is a community defined in this respect?

The challenge of decision-making arises from the fact that in many places in UK there are two-tier administration: the district level (Borough) and the county level. In addition, there is still the lowest tier, parish (village), which do not have full-time staff in their administration as the upper tiers. Anyway, the challenge in decision-making is relating to representativeness: in what way is each tier represented in decision-making? In the current site selection process, the local decision-making is addressed to district council and county council, both of which must agree on holding a referendum (test of public support) at a point when they want to decide whether to remain or withdraw from the process. In this respect, the situation is challenging in the Copeland working group, since the Cumbria County has now left an empty chair in the group. This will undoubtedly weaken the representativeness of the working group and emphasize the dilemma in the decision-making.

2.5 Lessons learnt

The site selection process for GDF has been in continuous change and development since the first attempts of this endeavour in 1970s. As of 2001 the site selection process has been managed by the Government Policy Decisions (White Papers), which have been updated four times up to present. The process has become more transparent and open, voluntariness of communities to participate is emphasised and right of withdrawal from the process has been the Government Policy since 2008. Moreover, the structure of the funding is such that it might attract communities that are looking for opportunities to boost their economy.

One of the learnings of the past is that the communities need time to get acquainted with the information relating to site investigations and GDF. In the recent public consultation on site evaluation, stakeholders brought up that “matters relating to safety could be clarified and better explained”. The same applied to geological information indicating the site suitability. Overall, “the purpose and scope of the site evaluation documents could be clearer”.

Fortunately, the implementer (RWM) has allocated sufficient time for addressing different questions arising from the local stakeholders. It is expected that this “learning phase” without any community commitment to drillings would take about five years. This phase would include non-intrusive investigations to find out the suitability of a site for deep drillings. The learning phase would be followed by drilling phase if the community were willing to continue the process. Despite the numerous developments in the site selection process, there are still challenges to overcome. People’s trust towards Government is fairly weak and the waste issue is strongly polarized locally and regionally. Legacy waste that has origins in development of nuclear bombs, makes the argumentation for proponents of disposal even more difficult. On the other hand, numerous NGOs

opposing the GDF are significant opinion leaders and have partly outsourced their communication to professional consultancies.

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3 Germany

3.1 Overview of the site selection process

The planning of geological disposal of nuclear waste started in Germany already in the late 1950's. In the 1960's the predecessor of the Federal institute for Geosciences and Natural Resources (BGR) recommended salt domes for disposal of nuclear waste. In 1977 the government of Lower Saxony pro-posed the Gorleben salt dome for investigations and the Federal Government accepted this decision. Neither a systematic decision-making process nor a wide site investigation preceded the designation of the Gorleben site, which led to strong local and regional opposition to the project. Surface-based investigations started in 1979, followed by the underground investigations in 1985. The exploratory shaft was built by 1996 and the underground studies continued until 2000, when the moratorium for Gorleben investigations was announced by the Federal Government.

As a result of the moratorium, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) set up a Committee on a Site Se-lection Procedure for Repository Sites, AkEND (Arbeitskreis Auswahlverfahren Endlagerstandorte) in 1999 to develop a site selection procedure based on technical selection criteria that are independent of rock type. In its work, the Committee was also expected to provide for public participation in different forms. AkEnd published its recommendations in 2002. The proposal consisted of five consecutive steps for site selection with various forms of public participation in the individual steps. The proposals of the AkEND were not adopted, largely because relevant stakeholders did not join the participatory process that was one of the fundaments of the AkEND proposal.

It was not until 2013 when the site selection process took a step further: the Act on the search and selection of a site for a repository for high-level radio-active waste– the so-called Site Selection Act (Standortauswahlgesetz – StandAG) – entered into force. Later the Act was complemented and amend-ed on the basis of the recommendations of the Repository Commission (Endlagerkommission) in 2017. One of the proposals of the Repository Commission was the founding of the National Accompanying Body (Nationales Begleitgremium, NBG) to promote public consultation and participation in the process. Alongside with public engagement activities, screening of geological data of Germany has been ongoing by the Federal Company for Final Storage, BGE. The starting point of the new process has been the "White Map", where no area is ruled out in advance before a geological screening is carried out. In September 2020, an interim report of the geological screening was published and followed by an extensive public consultation.

3.2 Legal framework

The Site Selection Act provides the overall framework for the site selection process. The Act stipulates, i.a.:

• Selection of the final site by 2031

• Decision-making at different phases of the process and the related actors

• Public participation procedure

• Technical site selection procedure

• Site suitability and exclusion criteria and their application

• Safety requirements (e.g. retrievability requirement after 500 years of the closure of the repository)

According to the Site Selection Act the procedure should be participatory, science-based, transparent, self-questioning and learning process. There are three decision-making points defined in the Act: the first one relates to the start of drilling investigations on site, the second concerns the large-scale underground explorations (e.g. research tunnel) and the third one about the final selection of a site. The ultimate decision in all three cases rests with the Bundestag (Parliament). For each decision a Federal law must be passed by the Bundestag. Before the decisions are taken to the Bundestag, they are inspected by the regulator, the Federal Office for the Safety of Nuclear Disposal (Bundesamt für die Sicherheit der nuklearen Entsorgung, BASE).

After the inspection, BASE forwards the proposal for a decision to the Feder-al Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesumweltministerium, BMU), which is the authority responsible for the disposal of nuclear waste in the Federal Government and carries the overall political responsibility for the site selection process.Proposals for the selection of sites for deep drillings and subsequent under-ground investigations and for the final selection are made by the implement-er, the Federal Company for Final Storage (Bundesgesellschaft für Endlagerung, BGE).

BGE will also be responsible for the construction, operation and closure of the final repository. In September 2020, BGE issued its report on the suitable areas for site investigations, based on the geological screening of the whole country. Later on, during phase 2 of the process, BGE will carry out deep drillings on the chosen sites after the Parliament has ap-proved the sites for further investigations.

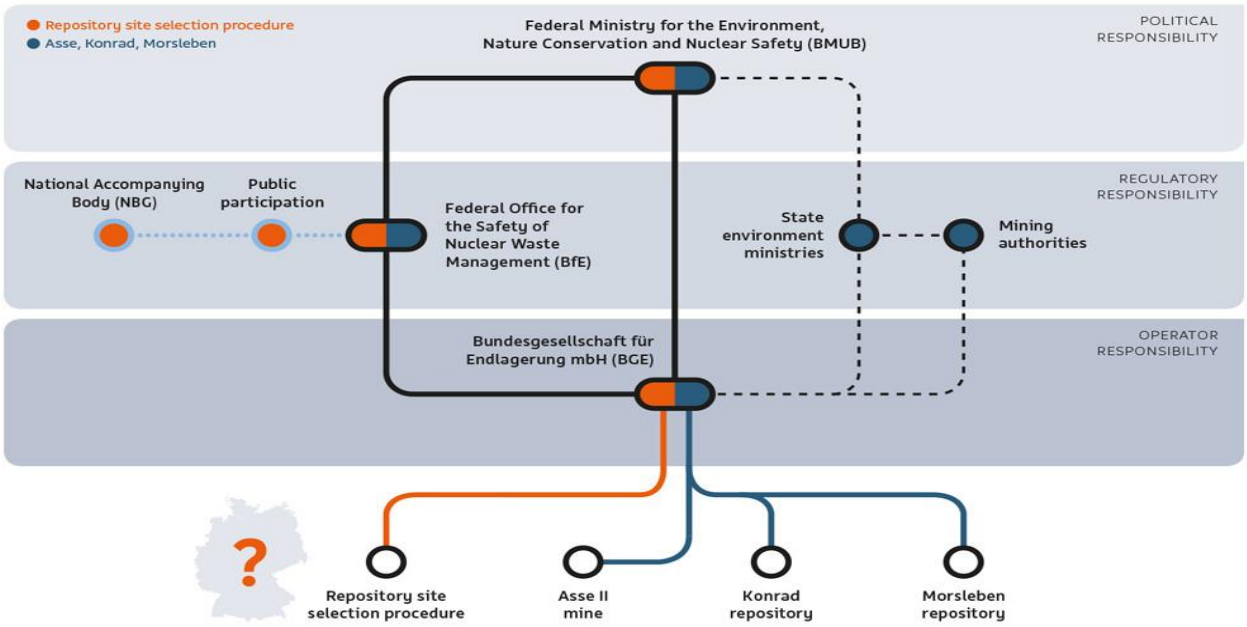

Figure 3 Key actors of site selection process in Germany (by courtesy of BGE)

One of the fundamentals of the Site Selection Act is that the citizens must be involved as co-creators of the procedure. The regulator, BASE, has an important role in this respect. The Act stipulates that the BASE "shall ensure that the public is fully and systematically informed of the objectives of the project and its likely impact at an early stage and during the period of the site selection procedure and of the forms of participation envisaged". The Act calls for a dialogue-oriented process with the use of Internet and other suitable media. The Internet platform provided in the web site of BASE enables, i.a., any stakeholder to comment proposals, reports and documents related to the process. In addition to the role of BASE in public communication, the Site Selection Act provides for a separate body, National Accompanying Body (Nationales Begleitgremium, NBG), which has a mediating and monitoring role in public participation of the process. The aim of the NBG is to enable confidence in the implementation of the procedure. The NBG consists of 18 members, 12 of which are "recognised public figures" appointed by the Bundestag and the Federal Council. The remaining six members are citizens, who are nominated in a participation procedure. Additionally, the NBG has a participation officer with a "task identifying potential conflicts at an early stage and developing proposals for their resolution in the site selection procedure." Along with BASE and NBG, BGE is conducting its own implementer-based communication to citizens, participating also in public consultation forums of BASE and NBG in an advisory role. Although the Site Selection Act highlights public involvement and communication in the process, it does not acknowledge right of veto on a local or regional level. The Repository Commission, which has contributed to the Site Selection Act, concluded, that the right of veto would make it easy for municipalities and regions to reject the process even if the scientific evidence indicated the site suitability.

3.3 Involvement of stakeholders in the process on the local, regional and national level

Suspension of the underground investigations that lasted for 20 years in Gorleben was due to the public opposition. Like in the UK, the Federal Government in Germany nominated an expert group who found out that public participation is one of the fundamentals in the site selection process. Since then, the role of general public has been acknowledged in the development of the process and the related legislation. After the Gorleben moratorium, it was not until 2017, when the site selection actually started again with several possibilities for the general public to participate and impact the process.

Basically, there are three platforms for public interaction and participation in the process. The Federal regulator, the BASE, enables any stakeholder to comment on the process and related reports on its website, where the regulator also arranges on-line conferences around the repository issue. The other platform is provided by NBG, whose means of communication consist of on-line conferences, live-streams, on-line workshops on dedicated topics etc. These events are not organised by NBG only, but other organisations (e.g. NGOs, regions, municipalities) can set up their own on-line conferences which are linked to the NBG web site.

As a third platform, BGE has arranged online consultations for public to discuss about its application of site screening methods during the initial screening stage in 2019 - 2020. Since the start of Covid-19, all events are organised on-line only. The publishing of the interim report on subareas eligible for a repository by BGE on September 2020, launched the site selection process and discussion in different areas in Germany. Soon after the issue of the interim report, the BASE organized two-day kick-off conference (online) for general public on the results of the geological screening. More than 600 questions were asked by the participants.

The next public conference was held as a three-day online event in February 2021. About 1100 citizens, scientists, representatives of social organizations and affected municipalities came together in the virtual space. They ex-changed views on the interim report on sub-areas of the BGE, but also on the participation procedure. Up to 1000 people took part in the plenary session and in more than twenty working groups. After the conference, a separate feedback event was organised by the NBG. Based on the feedback, the conference was considered useful despite the limitations of participation and interaction due to the digital format. Also the representativeness of public was seen inadequate, especially low participation of younger people was obvious in this regard. Following the first online conference on sub-areas, two more conferences will be held by the BASE during June-August 2021. At the end of the conferences, a report is drawn up by the participants. This independent consultation outcome must be taken into account by the BGE in its proposal for intrusive investigations (drillings) at sites. After the proposal of BGE for site investigations, regional conferences will be held in the affected regions. In the conferences, public can comment on the site proposal and call for an inspection. The proposal of BGE will be scrutinized by the BASE and submitted to BMU. Lastly, the Bundestag has to accept the proposal by accepting the Federal law on site investigations.

3.4 Discussion topics

The discussion topics that are dealt with in this chapter are based mainly on the questions raised by the participants and on the feedback that was given in the kick-off conference in October 2020 and in the first consultation conference in February 2021.The issues that were mostly raised up by the stakeholders were relating to the criteria that are applied in the site selection. It is evident that stakeholders do not understand that different criteria will apply at different phases of the process. Currently, the inclusion of sub-areas is based on geological and safety criteria that stem from the Site Selection Act. Some people have asked whether the repository can be constructed in populated areas or under existing buildings, or touristic area (e.g. Wadden Sea) and whether minimum distances to residential areas apply in this regard. Although none of these factors fulfils an exclusion criterion, they will be taken into consideration when the BGE applies the so-called planning science assessment criteria for making a proposal of sites for intrusive investigations. However, willingness of local people towards repository is not regarded as a criterion for site selection. Some people were uncertain about the status of Gorleben in the process. Initially and according to the Site Selection Act, Gorleben was included in the BGE's assessment during which Gorleben was discarded because it did not meet the geological and safety criteria.

One of the concerns brought up in discussions was related to the sufficient representative participation of different stakeholders in the process. Especially the share of youth in the consultations was considered low suggesting that they should be reached and engaged better in the future. Questions were also raised relating to the possibility of making an appeal against the selection of locations. This is possible at two points of the process: 1. Before the large-scale underground investigations (end of phase 2) 2. Before the final location for repository is decided (end of phase 3). By all accounts, an appeal is not possible when it comes to drillings in the beginning of phase 2. People were also concerned about the possibilities of regions to get involved and participate in the process more effectively in the future. The BASE promised to arrange regional conferences on the issue, which enable to focus the discussion on regional concerns.

Some of the questions dealt with alternatives of geological disposal and the overall safety of the concept and the related long period of time.

3.5 Lessons learnt

Since the early days of geological investigations in Gorleben site in the 1970's, a fundamental change in regard to public involvement has taken place during the last decade. The starting point for the change has been the introduction of the Site Selection Act (2013, amendment 2016). All the essential elements of site selection process are stipulated in the Act. It defines clearly the roles and responsibilities of the Parliament (Bundestag), The Ministry (BMU), regulator (BASE), implementer (BGE), public engagement office (NBG) and regions (Länder).

Different steps and decision-making points in the process are also stipulated including the goal for selecting the repository site by 2031. Moreover, the Act sets out the procedure for public participation and communication emphasizing the role of citizens as co-creators of the procedure. The set-up of a dedicated and independent office (NBG) to promote public participation and to

raise overall awareness of the issue, is exceptional but seems functional in the process. In addition to the NBG, the active role of the regulator (BASE) in engaging and communicating with the public is conspicuous in the early phase of the process. Presumably the early involvement of the regulator adds credibility and promotes people's trust in the process. Lastly, the Site Selection Act sets out the scientifically scrutinized criteria of which the site selection will be based on. Since the criteria are transparently and clearly written in the Act, it will presumably reduce speculation about the bias of the comparison of the sites. However, some NGOs (Friends of the Earth, Ausgestrahlt) have criticized the process for the lack of transparency and failures to meet the objectives of the Site Selection Act (participatory, science-based, transparent, self-questioning and learning). On the other hand, opposition is arising at potential siting areas and demonstrations have been held against the site selection procedure. The common argument is related to the uncertainties and long-time frames of final disposal.

Currently, the site selection process seems to progress as purposed in the Act. First public conferences have focused on the BGE screening which indicated suitable areas for intrusive investigations. Numerous public events and information meetings have been planned for the future by the NBG and the BASE manifesting good opportunities for stakeholders to participate in the process. What has been extraordinary so far, is the fact that the Covid-19 has not hindered the participatory process: all the planned activities have been implemented as on-line conferences, most of which can be found afterwards in YouTube.

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4 France

4.1 Overview of the site selection process

In France, the development of the geological disposal project has been carried out under the control of the French Parliament. It was launched by the first French radioactive waste Act in 1991 which included the set up of the organisation responsible for the final disposal of nuclear waste – Andra. Since then, the main milestones in the site selection process have been as follows:

• 1994-1996 Geological investigations carried out by Andra to locate suitable geological sites, based on voluntary applications from local authorities.

• 1998 Meuse/Haute-Marne site is selected by the Government for the construction of an underground laboratory.

• 2000 Construction of Andra's underground laboratory in Meuse/Haute-Marne begins.

• 2005 Andra concludes that a deep geological disposal facility in Meuse/Haute-Marne is feasible and safe, in its "Dossier 2005 Argile".

• 2005 First public debate on the management of HLW.

• 2006 Act on Transparency and Security in the Nuclear Field (later Transparency Act) is passed

• 2006 Act of 28 June is passed, adopting reversible deep geological disposal as the solution for HLW.

• 2006 Studies continue in the underground laboratory to refine the disposal facility design.

• 2009 The government approves the 30 km2 underground zone pro-posed by Andra for studying the location of the underground disposal facility

• 2010 – The government approves Andra's proposal for work in the host rock zone planned for the disposal facility based on the advice of the regulator (ASN) and the National Review Board (CNE), followed by the consultation with elected officials and the Local Information and Oversight Committee (CLIS). This further geological exploration con-firmed that the Callovo-Oxfordian formation in the host rock zone exhibited favourable characteristics to the siting of a deep geological disposal facility.

• 2011 Decree authorising Andra to continue its activities in the under-ground laboratory until 2030.

• 2012 – Presentation of the conceptual design for the disposal facility project, name Cigéo.

• 2013 – Second public debate on Cigéo organised by the National Public Debate Commission. The debate was held on the internet due to the difficulty of holding public meetings.

• 2014 Following the public debate on the geological disposal project, Andra's board decided that "Andra will submit a set of documents to the Government consisting of a master plan for the operation of the geological disposal project, the Safety Options Report and the Retrievability Technical Options Report to prepare for the examination of the construction licence application for Cigéo".

• 2016 Cigéo moves into the detailed engineering design phase.

• 2016 Act of 25 July on the terms of construction of Cigéo and its reversibility.

• 2019 Public debate on the French National Plan for the Management of Radioactive Materials and Waste (PNGMDR).

4.2 Legal framework

The mission of the French National Agency for Radioactive Waste Man-agement, Andra, is the long-term management of radioactive waste, including the geological disposal of HLW. Administratively, Andra operates under the three ministries of ecology, research and industry. The regulatory body, the ASN, is the independent authority created under the 2006 Act on Transparency and Security in the Nuclear Field, ensuring the control of nuclear safety and radiological protection Another public organisation operating within radiological protection and nuclear safety is the IRNS (French Institute of Radiological protection and Nuclear Safety). In comparison to ASN, IRNS is more focused on radiological research and training activities. However, IRNS is also tasked to assess issues of nuclear safety of Andra's Cigéo project and to participate public communication in this regard.

The National Commission on Public Debate (CNDP) organises and con-ducts official consultations for major infrastructure projects in France, like the Cigéo.The High Committee for Transparency and Information on Nuclear Safety (HCTISN) was created by the 2006 Transparency Act as a forum to debate in the fields of hazards and impact of nuclear activities on health, environment and safety at the national level. The committee can issue opinions on any topic related to nuclear safety and security as well as take up any issue concerning access to information and propose provisions to ensure transparency.

At the national level, National Commission of Evaluation, CNE, assesses the progress of research and studies related to the management of radioactive materials and waste, including Andra's Cigéo project. The CNE is an in-dependent institution and reports to the Parliament. In France, the regional level incorporates both districts (département) and larger units. To this end, Public Interest Groups (GIP) are public legal entities to develop cooperation between public and potential contractors involved in the project on a district-wide basis. In this respect, GIPs has been set up for the Cigéo project in each of the Meuse and Haute-Marne districts consisting of more than 300 communities within the proximity of the Bure underground laboratory.

For local consultation and informing purposes in the vicinity of nuclear installations, the Transparency Act of 2006 introduced Local Information and Oversight Committee (CLIS). Municipal and regional councils, environmental protection associations and other interest groups are represented in the CLIS. The implementer and the regulator attend to the CLIS meetings in an advisory role. Overall, the composition of CLIS is defined in detail in the Transparency act.

4.3 Involvement of stakeholders in the process on the local, regional and national level

Legislation in France provides with good opportunities for public at different levels to participate in the discussions that relate to the decision-making in nuclear waste management. Long before the currently organized official public debates, in the 1980's and 1990's, site investigations triggered strong opposition at the candidate localities. For instance, local resistance led to temporary moratorium of preliminary investigations on four sites in 1987. Although Andra could resume investigations on four new sites in 1994, strong local opposition, including demonstrations and even acts of vandalism, still existed. Even at the time Meuse/Haute-Marne region was selected for the construction of the URL (1998), there were demonstrations that have continued up to present.

Nationally, there has been three public debates since 2005 when Andra issued the "Dossier" on the feasibility of geological disposal. The second one in 2013 was related to the implementation of Cigéo and the third one in 2019 on the National Radioactive Materials and Waste Management Plan (PNGMDR). Public consultations on national level are managed by the National Commission for Public Debate (CNDP) and the Special Committee (CPDP), which reports the results to the Parliament. For the public debate, the Special Committee organized general public meetings in Paris and in four major regional cities (Lille, Rennes, Bordeaux and Strasbourg), plus another sixteen more specialised debates in all corners of the country in 2019. The broad guidelines for the next PNGMDR were anounced in the beginning of 2020, followed by the recent PNGMDR post-debate consultation that ended in April 2021.

Asked by Andra in 2017, the CNDP appointed two guarantors on the consultation of the public debate on the Cigéo project. The purpose of the guaran-tors is to guarantee not only the quality, intelligibility and sincerity of the in-formation disseminated by Andra, but also that the consultation procedures allow the widest and continuous possible participation of the public. The guarantors issued their findings on the 2019 public debate, of which will be discussed on the next chapter. At the national level but with a regional focus, the high-level committee for Cigéo (CHN) has met with variable frequency since 2013, to discuss eco-nomic development in the area of Meuse/Haute-Marne and in particular, in the surrounding area of Bure. The committee is chaired by the secretary of state of the Minister of the Ecological Transition and includes politicians from the state, regional and community level and representatives from nuclear industry.

Following the public debate in 2013, Andra launched the Ethical Committee and Society made up of ten independent national, local and international experts from various fields (science, law, environment, ethics and philosophy, health, economy, territory). At four annual meetings, the Committee is-sues opinions and recommendations on ethical and societal issues and on dialogue and involvement of stakeholders in Andra's activities and projects.

On regional and local level public participation is organised primarily through the local information and follow-up committee CLIS. The other locally operating interest group, the GIP, is more focused on the development of the local economy in the context of Cigéo project. For instance, the GIP in the Meuse region launched the Underground Environment Skills Centre with Andra in 2017, with the aim, among other things, to promote training of skills and development of knowledge and practical know-how in the underground environment. GIP received between 9 and

15 million euros per year from 2000 to 2010 and 30 million per year from 2010. Nuclear waste producers (power companies) are the primary source of funding to the GIP.

From the local and regional point of view, The CLIS is the most important platform for the information exchange between the local people and the Andra and the regulator ASN, which have the consultative role in the CLIS. The most recent (March 3, 2021) composition of the CLIS includes 86 voting members, 56 of which come from the municipality and county councils of the Meuse and the Haute-Marne. The rest of the members consists of, i.a., state officials (3), parliamentarians (4), environmental associations (7), Farmers union (3), Trade unions (5), etc. In recent years the CLIS has convened 2-4 times annually. The CLIS has a dedicated website, where the minutes of the meetings and plenty of information relating to Cigéo are available.In addition to the "official" communication platforms mentioned above, Andra deploys various means and channels of communication to involve stake-holders comprehensively (civil society, citizens, local actors, inhabitants, etc.). For mobilising different audiences and giving them means to contribute to the repository project, Andra has used the following methods:

• Door-to-door campaigns: Andra initiated visits to the households in the Center of Meuse / Haute-Marne to understand better local people's perception of the work planned for Cigéo, as well as the possible changes in their daily life and in the region. Almost 2,700 households were met by the Agency's teams in 2016 and ca 1000 in 2017.

• Concertation workshops: Andra has organized workshops with discussion topics relating to water management, energy, transport (road and rail networks), spatial planning and landscaping, the environment and the living conditions in the context of Cigéo.

• Territorial Workshops: based on the experiences from major construction projects (Flamanville EPR, Grand Paris, High Speed Line) Andra has launched territorial workshops in order to improve regional integration of the Cigéo.

Andra has an outreach program for youth, trying to engage them in the discussions of radioactive waste management as a societal concern. A good example of reaching out for younger generations, was a dedicated number of a daily newspaper, L'Actu, targeted for young people in France. This special issue was produced in cooperation with the publisher and Andra, dealing entirely with the Cigéo project.

It is also noteworthy to point out the specific approaches with stakeholders by the IRSN, who has a long history of cooperation with the ANCCLI (French National Association of local public information committees) on the nuclear waste management issue. Together with CLIS, these organisations have regularly organised workshops for local people to build up their capacity upstream in the process and to better understand the technical and long-term issues of geological disposal.

4.4 Discussion topics

At the moment (spring 2021), one of the topical issues discussed in the CLIS relates to the Declaration of the Public Utility (DUP) in regard to Cigéo. The relating public consultation is expected to last until the end of 2021 after which the DUP needs the issue of the decree by the

Government. When realised, the status of DUP has significant legal effects, like right to expropriate land for the purposes of Cigéo. DUP is the last step in the repository project before the construction license, for which the DAC (Authorization to Create) is required. In practice, the DUP concerns only the communities (14) which are located inside the footprint of Cigéo, consisting of 11 municipalities, two depart-mental councils of Meuse and Haute-Marne and the Grand Est regional council. So far, four municipalities have issued opinions unfavourable to Andra's request for a declaration of DUP (March 26, 2021). The arguments for their opposition rests with various concerns the localities have towards Cigéo:

- Research is not showing clearly that there are no health risks related to the project;
- The construction of Cigéo will risk the ground water resource, especially during the dry season;
- The project will pollute the ground water;
- The project will cause noise and visual nuisance;
- What happens to agriculture and to hunting?
- What happens to road traffic?
- The project will lead to the cutting of several hectares of the local forest "Lejuc";
- The village will die under the pressure of Andra.

Some of the municipalities also considered that they did not have sufficient time to give an opinion on the project, especially when the report on Cigéo project consists of 4000 pages of text, being sometimes very technical. Those communities that are in favour of the DUP, had some reservations to the DUP though. A lack of concrete answers is one cause for criticism. On the other hand, it is emphasized that all measures should be taken to ensure the safety of the populations concerned by the transport of radioactive waste to the installation of Cigéo, and in this regard, health monitoring should be put in place during the pilot phase of the project.

The opinions of the communities will be taken into account in the Ministry of Ecological Transition, who will issue a statement on the DUP after the public debate. In addition to DUP, Andra has started public consultation on the Pilot Indus-trial Phase of Cigéo (PHIPIL). The first on-line workshop in this context was held in January 2021 with 280 participants. In the live chat, the following questions and concerns were raised:

- Safety of final disposal is not proven
- Accident that led to a death of a person during the excavations in 2000 is still unsolved
- Could a supervised and controlled long-term storage of nuclear waste be alternative for geological disposal?
- Can the research conducted by Andra be considered scientifically independent?
- Sufficient time should be allocated to public consultation
- What would be the consequence of the fire accident in Cigéo?

Many of these concerns are such on which the guarantors of the National Committee of the Public Debate have paid their attention to in their report published in the late 2020. The guarantors considered that Andra should justify its findings and solutions better since the public has expressed their concern about the overall design of the project and doubts on the feasibility of the Cigéo.

For the coming consultations of the PHIPIL, Andra has identified the following four topics of local concern:

• development of living conditions

• infrastructure of transportation

• energy supply

• water cycle.

4.5 Lessons learnt

Over the last 20 years of Andra's repository project, a lot of progress has taken place in public involvement. Part of the public participatory framework is based on the legislation that provides with platforms for public debate (like CLIS and GIP), but the other part rests with the operations and activity of Andra. One of the lessons learnt is undoubtedly the time and space needed for the public consultation. As mentioned earlier, geological disposal is a complicated issue, which preconditions sufficient time for discussion and understanding. On the other hand, the discussion should take place there where the most affected people spend their daily life. Therefore, Andra has focused its communication on the Meuse and Haute-Marne area to meet people face-to-face to discuss about and to listen to their concerns (door-to-door campaign, for instance). A conspicuous feature in the French siting process is the well-functioning team play between Andra and the different committees on public debate, and with the regulator (ASN) and the Institute of Radiological Protection (IRSN). It seems that these organisations have shared the same view on the necessity of public involvement in the process. Moreover, the participation of the ASN and the IRSN in the public consultation, especially on the local level, adds credibility to the process. Support from the state authorities to the repository project has been significant and helped Andra in its mission. Perseverance is one of the attributes that can be attached to the French siting process. At the same time, Andra has learnt not to be provoked, despite that there are still quite many opposing voices to the project, especially on the local level. In this respect, Andra's capacity to listen, accept contradiction and talk about sensitive topics like risk, health, environment and impacts has developed over the years.

Ethical attitude is an important principle that Andra follows in its consultations. It is important to admit that there are risks and uncertainties and Andra is not an expert in everything, but also the public possesses part of the solution.

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5 Switzerland

5.1 Overview of the site selection process

With the start of commercial use of nuclear energy in Switzerland at the beginning of the 1970s, the issue of safe disposal of radioactive waste became increasingly in the focus of public and political debate. This prompted the company owned by Swiss radioactive waste producers, Nagra (National Cooperative for the Disposal of Radioactive waste) to present a concept for disposal of all waste categories in February 1978. Gradually Nagra started intrusive site investigations for low and intermediate level waste (LLW/ILW) in the 1980's and concluded that the Wellenberg site in canton Nidwalden would be suitable for the construction of the repository. An application for the construction of the repository was submitted in 1994 but because of the opposition of the canton the license application was never approved. The last cantonal vote refusing the repository took place in 2002.

In parallel with the investigations for LLW/ILW, Nagra explored the feasibility of geological disposal for high level radioactive waste (HLW). First, the research focused on crystalline rock in the Grimsel rock laboratory (since 1979) and later on opalinus clay in Mont Terri rock laboratory (since 1996). Followed by the research in rock laboratories, Nagra conducted intrusive investigations in the canton of Zürich. Based on the results, Nagra published a report to prove the safety and feasibility of geological disposal. Followed by a comprehensive review and a positive evaluation of the report by the federal authorities and international experts, the Federal Council approved the report demonstrating the feasibility of disposal in 2006.

The next step in the site selection process was the adoption of the Sectoral Plan by the Federal Government in 2008. The Sectoral Plan is a roadmap for implementing the site selection procedure for the geological disposal of LLW/ILW and HLW, in two separate repositories or combined. The objective is to ensure that sites for geological repositories are evaluated and identified in a fair, transparent and participatory process, emphasizing the solution of long-term protection of people and the environment. The Conceptual Part of the Sectoral Plan specifies a three-stage site selection procedure (Figure 4) and defines the safety-related criteria, with land use and socio-economic aspects playing a secondary role. It also defines milestones, the roles of all stakeholders and the collaboration between the Federal Government and the cantons, neighbouring countries, etc. Each stage follows the same procedure: Nagra proposes, the authorities (eg. ENSI, SFOE, FOEN etc.) review the proposal, followed by a three-month public consultation, and at the end, the Federal Government decides. The Swiss Federal Office of Energy (SFOE) is in charge of the site selection procedure as well as regional participation, which is an important part of the site selection procedure in all stages.

In the first stage, Nagra submitted proposals for six suitable geological siting areas for LLW/ILW and three for HLW repositories to the SFOE in 2008. The regulator (ENSI) reviewed Nagra's documents and confirmed all six geological siting areas proposed. SFOE conducted a public consultation in 2010 and submitted a report to the Federal Government who approved all potential siting regions.

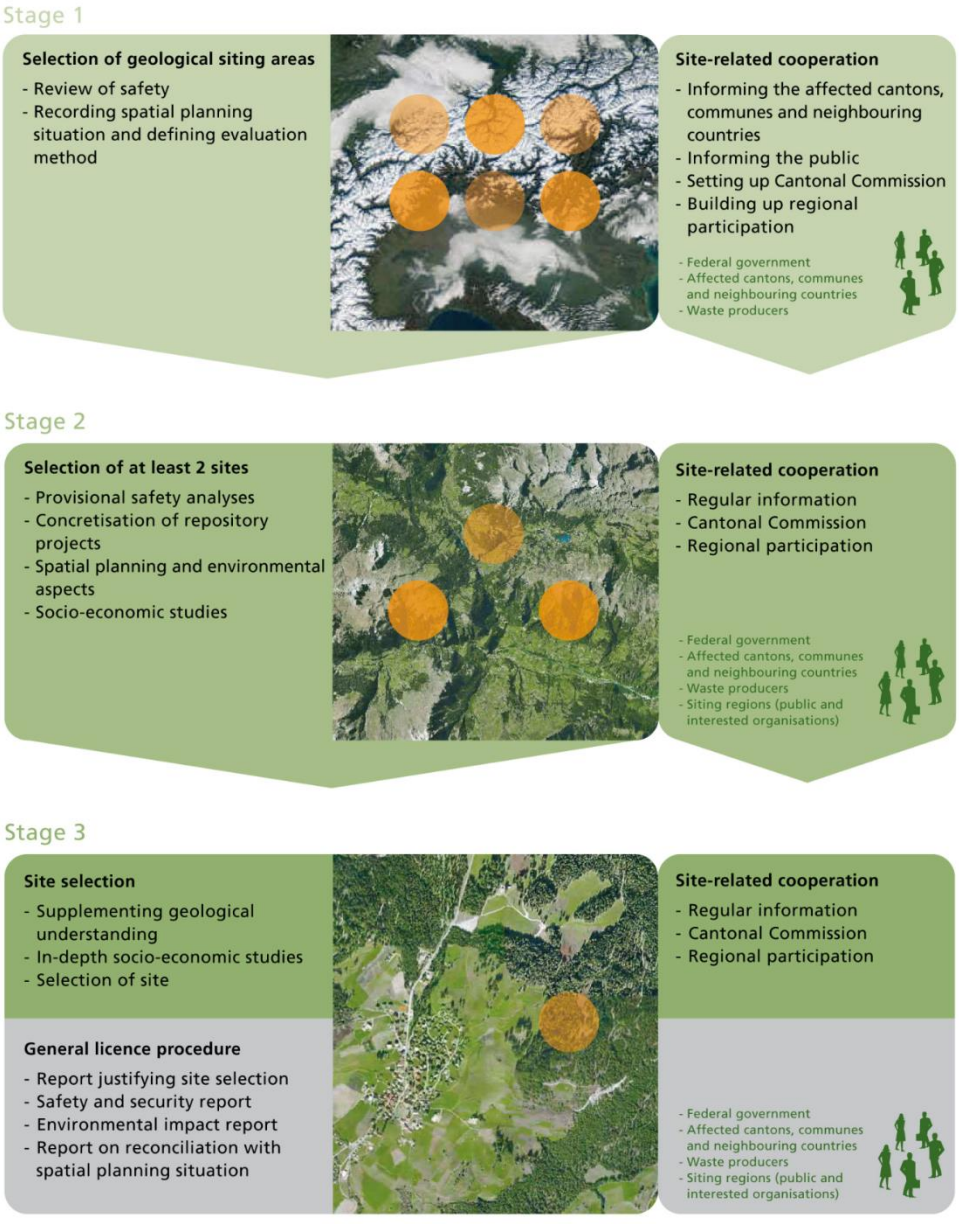

Figure 3 Site selection and the site-related cooperation (Source: SFOE (2008), Sectoral Plan for Deep Geological Repositories: Conceptual Part).

The second stage focused on reducing the number of siting regions to at least two per waste category (LLW/ILW and HLW). In parallel, the approximate designation of locations for the surface facilities (e.g. encapsulation plant) started. In November 2018, stage 2 ended with the Federal Council's decision to further explore the three siting regions Jura Ost, Nördlich Lägern and Zürich Nordost in stage 3.

Based on the results of the geoscientific investigations, Nagra will announce the site or sites for which it will prepare general licence application around 2022. Nagra will then prepare the application and expects to submit it to the Federal Council by 2024. The decision of the Federal Council must be approved by the Parliament which is planned to take place in the beginning of 2030's. It is also possible that a facultative referendum will be arranged before the final decision.

5.2 Legal framework

The Sectoral Plan is the key element that steers the site selection process. It also integrates different stakeholders – decision makers on a national, can-tonal and community level with the interested public and, organizations, political parties, associations, nuclear waste producers etc. to participate at every stage of the process and express their opinions, concerns and proposals. Interesting point in the Sectoral Plan is the fact that the process owner is SFOE who bears the overall responsibility for the implementation of the sec-toral plan, whereas Nagra's task is to carry out the site investigations and submit the general license application. In addition to SFOE, the following authorities have contributed to the preparation of the Sectoral Plan and are actively involved in the process as experts and advisers:

• Swiss Federal Nuclear Inspectorate (ENSI) is the regulator and bears the overall responsibility for the safety assessment of sites. ENSI is also tasked to make expert knowledge available to federal, cantonal, and communal authorities and the public at large;

• Expert Group for Geological Disposal (EGTL) supports and advises ENSI, i.a., in the safety assessment of the investigation sites;

• Federal Office of Spatial Development (ARE) bears the overall responsibility for spatial planning issues in the site selection process and supports the SFOE in this regard;

• Federal Nuclear Safety Commission (NSC) advises the Federal Council, the Federal Department of the Environment, Transport, Ener-gy and Communications (DETEC) and nuclear supervisory authorities on the nuclear safety issues. In the Sectoral Plan, NSC's task is to give opinions and advise ENSI during three stages of the process.

There are also other authorities and expert groups which are currently in-volved in the site selection process:

• Nuclear Waste Management Advisory Board advises DETEC on the implementation of the site selection procedure. The mandate of the advisory board is to ensure that the search for a suitable site for a deep geological repository leads to a solution that is safe, sustainable and socially acceptable;

• Federal Office for the Environment (FOEN) reviews and evaluates environmental aspects and supports the SFOE;

• Federal Office of Topography, Swisstopo supports and advises ENSI on geological questions arising in the sectoral plan and general licence procedures;

• The task of the Technical Forum on Safety is to discuss and answer technical and scientific questions on safety and geology submitted by the members of public and other stakeholders. ENSI informs the public on the Forum's work.

The Sectoral Plan (ref. https://pubdb.bfe.admin.ch/en/publication/download/8171) also describes the roles for the cantons and communes, of which will be discussed in the next chapter. Altogether, roles for 15 different stakeholder groups (previously mentioned groups included) are described in the Plan.

5.3 Involvement of stakeholders in the process on the local, regional and national level

Although the affected communes, regions and cantons do not have a right of veto, the Sectoral Plan ensures collaboration with the concerned communes, regions and cantons and neighbouring countries. They are the key stakeholders and have been engaged early on. The sectoral plan defines in detail the role of each stakeholder in the site selection process. Since the site investigations and the construction of the repository have impacts mainly on a local and regional level, the public participation is primarily channelled through the regional conferences and the related working groups (Figure 5).

From the participation point of view, the siting region is made up of the siting communes which are located partly or wholly within the planning perimeter of the repository. In justified cases, other communes can also be included in the siting region. In practice, the planning perimeter in each of the three regions under investigations is several kilometres. As a result, one region can consist of tens of communes who are represented in the regional conference. The conference can also be composed of representatives from agriculture, tourism, industry, youth, NGO's, political parties and citizens without affiliations as in the Jura Ost region. Thus, the number of the representatives per conference can be as high as 100. Most of the delegates are inhabitants of the local communities in the potential siting region. Official representatives of the communities (ca. 50 %) are nominated by the community-counsels. Representatives from different NGOs or interest groups (ca. 30%) are nominated by the corresponding organisation. But also other interested individual persons (ca. 20%) could join in the be-ginning of the process and are now members of the conference. The regional conference is led by the chair and a board, who is elected for a certain term by the members of the conference. The decisions are based on a majority vote, if voting is needed.

Due to the proximity of the three siting regions to Germany, Germany can delegate a specific number of members to the regional conferences. This enables German stakeholders to participate in various committees and working groups.

On the German side, technical expertise and advice on the Swiss site selection process rests with the German Expert Group on Swiss Deep Storage (ESchT). The group reports to the Ministry

for the Environment, Nature Conservation and Nuclear Safety (BMU) and to the German Monitoring Commission Switzerland (BeKo).

The SFOE staff attends all regional conference meetings and depending on the issues under discussion, experts from Nagra and ENSI are often present as well. Media can also participate in the regional conferences. Annually there are one to four regional conferences held per region.To get sufficient understanding and information of the issues that relate to the repository project and have impact locally, conferences have set up four working groups:

• WG Surface facilities

• WG Safety

• WG Infra

• WG Regional development.

These working groups with about 15 members in each, are composed of the participants of the conference. Their mode of operation is based on the inter-action with experts that are present in the meetings providing with fact-based information on the topical issues under discussion. Working groups deliver a report about their work to the regional conference. In total, working groups in three regions can have over 100 meetings annually

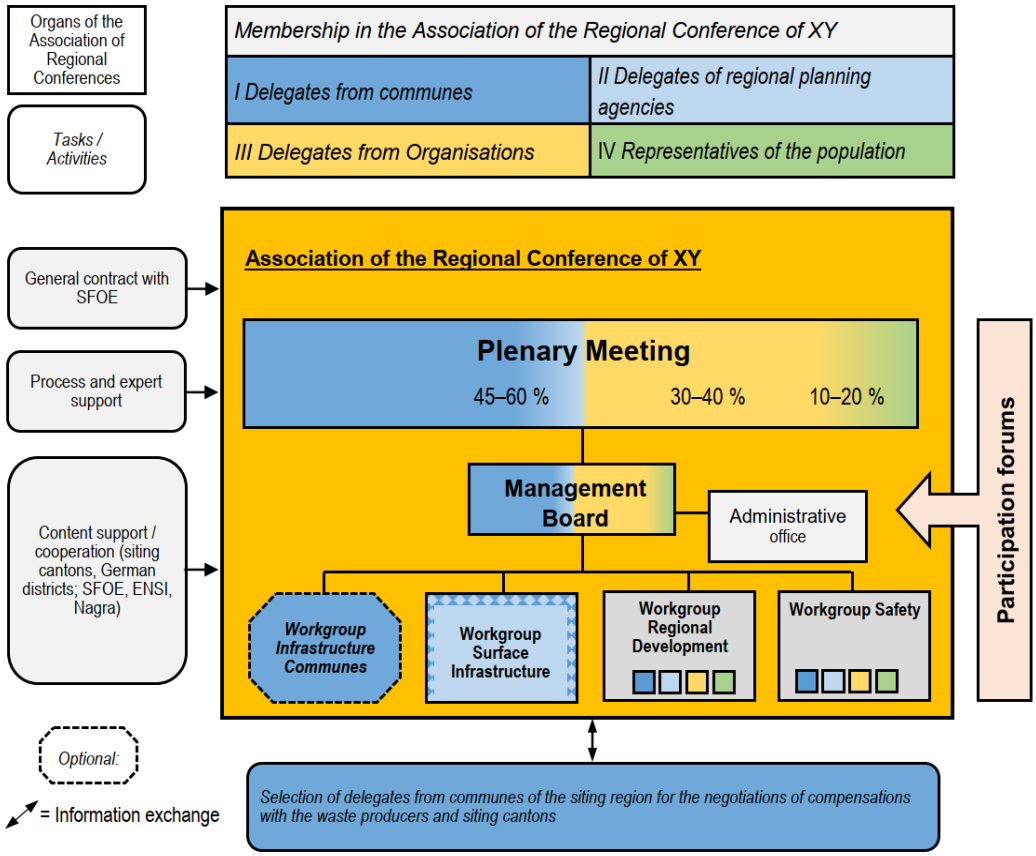

Figure 5 Organisation of regional conference in stage 3 (Source SFOE 2019)

Cantons are not members of the regional conference, but they generally participate in the relevant meetings, such as the plenary meetings of the region-al conferences. The regional conferences

and cantons collaborate with the SFOE and the implementer Nagra on specific issues such as the placement of the surface infrastructure at the affected site. The Committee of the Cantons, AdK (previously Cantonal Commission) ensures cooperation between the government representatives of the affected cantons and between the neighbouring cantons and neighbouring states concerned. The AdK can make recommendations to the Federal Government. On a national level, the site selection process is not high on the agenda of public debate. There are opponent groups who are critical towards deep repository, but they are not trying to block the process. Remarks on the communication of SFOE and Nagra in the process. In general, the SFOE informs the population of the siting regions with a newsletter on paper (once or twice yearly, depending on the milestones) and at regular information events in the siting regions. For the interested public, the SFOE publishes an electronic newsletter, blogs, flyers and other publications. All relevant reports, concepts and studies are published. The SFOE in-forms all stakeholders involved about the relevant publications.

Much of the communication with the regional conferences take place by personal contacts, in co-ordination meetings and by sending regular e-mails to the presidents and administrative office.

Independent of the sectoral plan, Nagra's communication aims at reaching all relevant stakeholders in siting regions as well as politicians. A variety of measures range from printed and online publications, newsletters sent to all households in the siting regions, guided tours to the underground rock laboratories and interim storage facility, information journeys to other European countries and active media work. Currently, Nagra is actively arranging public tours to the drilling sites.

5.4 Discussion topics

As the intrusive site investigations have been ongoing in Switzerland over 10 years, people have become accustomed to the concept of geological disposal and adopted the logic of safety therein. The experts of nuclear waste management have underlined consistently the "safety first" principle, which also steers the site selection process. If the investigations proved a site to be safe from the long-term point of view, the site should be chosen regardless of people's personal preferences. This approach is widely accepted among citizens. Understandably, the discussion has now shifted from the conceptual issues to a more detailed level.

In the regional conferences, the topical issues are first prepared in the working groups and thereafter discussed in the plenum. Regarding the surface facilities, the location of the encapsulation plant at each potential site is currently under discussion. It seems that the under-ground repository itself is easier to accept than the above ground encapsulation plant. It is still uncertain whether it will be located close to the repository (internal) or in a separate place (external), from where the encased spent fuel will be transported in a shuttle container to the repository site.

What seems uncomfortable to local inhabitants is the thought of living close to a facility where the highly radioactive spent nuclear fuel bundles are un-packed from a transport cask. The image that "the hot cell" brings into people's minds is scary. Therefore, regional conferences are opting

for an external solution, where the encapsulation plant is not locating at the same area as the repository. For instance, the region of Zürich Nordost considers, that the encapsulation plant should be located close to the Zwilag, where the spent fuel is temporarily and centrally stored anyway. People in the regions are also concerned of the impact of the encapsulation plant on the ground water reserves, especially in the protected aquifer areas. For instance, the working group of safety in Nördlich Lägern has questioned the construction of the encapsulation plant in such areas. Nevertheless, The Federal Council has stated that the legislation as such does not prevent the construction of an encapsulation plant in the protected aquifer areas. According to the Swiss legislation the waste must be retrievable from the repository during the operation and after the closure. Questions have been raised about the management and storing of the waste after retrieval: what will be done with the waste and where will it be kept above ground?

One question relates to the radiation risks of the operating deep repository and surface facilities: “If a very serious accident occurs in the deep repository or in the surface facilities, what will be the radiation exposure to the people living in the vicinity of the repository and further away in the region? Overall, it seems that people in the regions are surprisingly well knowledgeable about the final repository. Already at this phase of the project where drillings are ongoing, they are interested in the practical matters that relate to the construction of the repository. For example, in Nördlich Lägern, people are knowledgeable enough to ask about the differences in design of the repository excavated in opalinus clay or crystalline rock. These two geological environments are still alternatives for the repository host rock.

5.5 Lessons learnt

Until the beginning of the 2000s, the site investigations in Switzerland were in a constant collision with the affected public and investigations were stopped for years. The turning point in the process was the introduction and adoption of the Sectoral Plan. This was supported by Nagra’s comprehensive report on the safety and feasibility of geological disposal of HLW which was approved by the Federal Council in 2006. Deep geological disposal was confirmed as the best solution to manage radioactive wastes in the long term.

The successful application of the Sectoral Plan can be explained by the fact that the Plan is a product of cooperation of key authorities and not only of a single actor, which has enabled the broad commitment of stakeholders to the site selection process. Especially, the commitment of the Federal administration and decision-makers has been crucial for the start-up of the process.

In parallel with the Sectoral Plan, the role of cantons in the decision-making has been changed. The legislation does not allow them to reject site investigations by referendums as before the adoption of the Sectoral Plan. Now cantons are constructively involved in the site selection process and can influence the process through the government representatives of the siting cantons. From the beginning, clearly defined roles of different stakeholders have enabled effective cooperation between the implementer, authorities, communes, and the public.

The active role of the regulator has been significant in the process. ENSI has contributed to the production of the Sectoral Plan and informed public from the beginning of the site investigations. Consistent communication by the authorities and the implementer have added credibility to

geological disposal. Plenty of information has been disseminated to stakeholders at different levels of society. In addition, various advisory boards and committees have contributed to generation of safety related information.

Systematic organization of public involvement at the investigation sites has enabled constructive discussion of the repository project despite critical voices and opposition. Regional conferences and the relating working groups are forums for information exchange and for reconciling different opinions. Overall, the Swiss society has accepted the idea that the aspects of safety underline the selection of the repository site and it is up to the implementer to prove it in a formal process.

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6 Canada

6.1 Overview of the site selection process

Before the current site selection process in Canada actually started prior to the adoption of the Nuclear Fuel Waste Act (NFW Act), a disposal concept was developed by Atomic Energy of Canada Ltd (AECL) on behalf of the Federal Government in 1978. The review panel (known as the Seaborn Pan-el, for the name of its chairman) was established in 1989 and held public meetings to establish the scope of the Environmental Impact Statement (EIS) guidelines, issued in 1992. In 1994 AECL submitted its EIS, and the Panel held open houses and public hearings to examine the EIS. The Panel's report was published in February 1998. The Panel recommended a management agency to be established "at arms' length" from the waste producers. Its role would be to develop appropriate nuclear fuel waste management options, consult the general public, and finally, make a recommendation to the government. The Panel's observations on the need for broad societal acceptance of the nuclear fuel waste management policy and approach shaped the Nuclear Fuel Act (NFW Act), which came into force 2002. When passing the NFW Act, Parliament required major owners of the spent fuel (nuclear power companies) to establish the Nuclear Waste Manage-ment Organisation (NWMO).

Since 2002, the site selection process has been managed by the NWMO, with the following key dates of the process:

• 2002 -2005 Canada's plan was developed. The plan emerged through a three-year dialogue with a broad cross-section of Canadians. Possi-ble approaches for the long-term management of Canada's spent fuel were assessed, engaging specialists, indigenous peoples (First Na-tions and Métis), members of the public and interested individuals and organisations.

• In November 2005 the NWMO submitted the final report to the Minister of Natural Resources, including the preferred approach.

• 2007 The federal government, based on NWMO's recommendations, selected Adaptive Phase Management as Canada's plan for the long-term management of spent fuel and mandated the NWMO to begin implementation.

• 2008–2009 public engagement on the site selection process was undertaken. The NWMO and citizens collaboratively designed a process for selecting a preferred centralised site for the deep geological repository and the Centre of Expertise.

• 2010 the NWMO initiated step one (out of 9) of the site selection pro-cess with a programme to provide information, answer questions and build awareness.

• 2010–2013 Twenty-two communities expressed interest in learning about and potentially hosting the project. In collaboration with interest-ed communities, the NWMO conducted initial screening.

• 2012-2015 In collaboration with people in the area, preliminary studies were conducted to further assess suitability. Areas with less potential to meet project requirements were eliminated from further consideration.

• 2017 Five areas remained in the site selection process. First borehole was drilled in the Ignace area.

• 2018 The NWMO issued Reconciliation Statement collaboratively with Canada's Indigenous people. The statement recognizes the NWMO's ongoing involvement, collaboration and discussions with Indigenous (First Nations and Métis) communities and all those involved with implementing Canada's plan for the long-term management of used nu-clear fuel.

• 2021 Deep drillings start on the second remaining investigation area, South Bruce.

• 2023 NWMO plans to select the site for detailed site characterization.

• 2028 NWMO plans to submit construction license application.

• 2032 approval of the construction license application

• 2043 start of operations.

Currently, the NWMO is at the step 3 of the process with two sites remaining for intrusive site investigations, after the inquiry for the expression of interest launched in 2010. According to the plan, one of the two sites – either Ignace or South Bruce should be selected for detailed site characterization in 2023.

6.2 Legal framework

The government of Canada has jurisdiction over nuclear energy and Natural Resources Canada is the department responsible for federal nuclear energy policy. Nuclear regulation is also a federal jurisdiction which is under the specific responsibility of the Canadian Nuclear Safety Commission (CNSC), Canada's independent nuclear regulator. With respect to waste management, Canada has a national approach for the long-term management of spent fuel. The Nuclear Waste Management Organization (NWMO) is responsible for implementing the Adaptive Phased Management (APM) ap-roach that was selected by the government of Canada for the long-term management of spent fuel. Although the responsibility for implementing the nuclear waste management plan rests with the NWMO, the regulator CNSC provides NWMO with regula-tory guidance and organizes outreach activities for communities and indigenous groups to learn about the repository project.

It is important to notice that Canada is a federation and therefore provinces have their own sets of powers. Spent fuel, and most of the inventory of low- and intermediate-level waste is currently owned either by provincial utilities or by AECL. As appropriate, the CNSC engages with provincial regulatory bodies on nuclear projects.

The Nuclear Fuel Act defines the mode of operation of the NWMO with an obligation to consult the general public, and in particular aboriginal people. This aspect is also emphasized in the representation of the independent Advisory Council, which assists NWMO and ensures that the views of the public and communities of interest are considered and reflected in a thoughtful, balanced way. The NWFA requires that the affected local and regional governments and organisations of indigenous people are represented in the Advisory Council.

6.3 Involvement of stakeholders in the process on the local, regional and national level

Throughout the site selection process, NWMO has been actively engaging local communities to discuss and get information about the repository project. A commitment has been made by the NWMO that the project will only be sited at a location where a strong partnership is possible. The partnership needs to involve the community that initially expressed interest in the project, keeping in mind the interests of indigenous people (First Nations and Métis communities) and potentially others in the area. The goal of each partnership working group is to propose a framework and list of milestones (including scope, timelines, resources and budgets) for further dialogue and decision-making.

The NWMO has outlined a multi-step road map (Figure 6) to guide these partnership discussions, which focuses on exploring potential to advance the project in partnership with people in the area. The partnership working groups have no decision-making authority. They meet monthly or as agreed to by the members of each partnership working group. The partnership working groups are currently active in two remaining investigation sites in South Bruce and Ignace.

Figure 4 The road map of partnership (source: NWMO)

NWMO has an ongoing presence in communities with staff located in community offices in the siting areas. Engagement activities are ongoing in siting areas as people in the area learn about and explore the project. Activities include briefings and discussions with service groups in the community and area, participation in community and area events such as fall fairs and learning and sharing gatherings, and participation in conferences and meetings convened by indigenous organisations and municipal associations.

Independent from the NWMO, municipal council of Ignace has set up a Community Nuclear Liaison Committee (ICNLC) which convenes regularly to inform local stakeholders about the

repository project. The repository project not only arouse positive interest locally, but also opposition, especially among the indigenous people and NGOs. The local indigenous communities (First Nations and Métis) have a very sensitive relationship to land and water, which often explains their sceptic approach to the project.

NGOs are actively involved in the discussion both locally and nationally. They are organised under the auspices of the Nuclear Waste Watch, which is a national network of Canadian organizations concerned about high level radioactive waste and nuclear power. In addition to Nuclear Waste Watch, Environment north is another umbrella organization that gathers and communicates the opinions of environmental organizations (eg. We the Nuclear Free North, Northwatch, Canadian Coalition for Nuclear Responsibility) via dedicated website. The active opposition of NGOs and indigenous people towards the repository project makes the issue interesting for national media, which follows the process closely and focuses on reporting the polarization of opinions in relation to the project.

6.4 Discussion topics

As mentioned in the previous chapter, the repository project divides opinions in the site investigation communities. In South Bruce, which is located in the same area as the nuclear reactors of Bruce Power, the people who are ac-customed to and benefitted from nuclear technology have confidence on the repository project and consider the economic impacts on the community positive. However, the local indigenous community, the Saugeen Ojibway Nation is opposing the disposal and has passed a resolution “calling on governments to continue storing nuclear waste above ground until an acceptable, permanent and safe method to destroy or neutralize the waste is found.”

“The wait and see” -argument is also brought up by NGOs who emphasize the approach of “rolling stewardship” where the waste is stored above ground under supervision by successive generations. Among other things, this would enable easy retrieval and monitoring of the waste. Understandably, the wait and see approach stems from the perceptions that are sceptic to the safety of disposal. The extremely long containment time needed for the waste to be less hazardous worries the opponents. For in-stance, a stakeholder from Canadian Environmental Law Association suggested fortifying the temporary storage for a few more decades and waiting for new and better technologies to come along. With the concerns of the overall safety of the solution, come the worries about the contamination of the waterways. This is brought up by indigenous communities and by NGOs, who claim that the safety of the “burial” is lacking scientific evidence.

Transportation of waste raise concerns among NGOs, who see the risk of accidents in long distances and in numerous transport truckloads during 40 years’ operation time.

One more topic of the public discussion is related to the consent that is sought after in the process. The question is how the consent is expressed and by whom and in what geographical boundaries? Despite the critical voices, it seems that people in general understand the necessity of disposal. However, numerous stakeholders are concerned of the fairness and transparency of

the repository process itself. In February 2021, 100 public interest and community groups signed on to a joint letter setting out their expectations for a review of Canada's Radioactive Waste Policy launched by the Natural Resources Canada in 2020. In the letter, the signa-tors expressed their expectation for the review to be open, transparent, and independent of the nuclear industry.

6.5 Lessons learnt

From working with communities in the siting process, the NWMO has come to understand that the project not only requires a willing and informed host community but a supportive partnership involving various stakeholders in the area. Special attention must be paid to understanding of the history, aspirations, and world view of indigenous communities that have long traditions in the area. Building up confidence and gaining acceptance requires a dialogue driven approach, which is a necessity for the implementer to learn about the local hopes and concerns. When needed, the plans of the implementer must be aligned with the priorities and objectives of the local people. Time is needed to build up relationships and to explore safety of the project together with a pace and manner guided by the communities themselves. Long timeframes require ability to adapt and resilience, both from the implementer and from stakeholders.

Local communities expect the site selection to be open, transparent and fair. Clear decision-making process supports these objectives. Communities need the resources to learn about the project. NWMO's commitment to the involved communities suggests that they will be better off for having participated in the siting process and advancing the implementation of Canada's plan. Through working closely with communities, NWMO has identified a range of opportunities to foster local well-being and shared understanding of how the project would be implemented if the area was selected for the project. Throughout these conversations, the social necessity of the project and the importance of the current generation to carry its share of responsibility of the waste is an underlying sustained theme.

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7 Japan

7.1 Overview of the site selection process

Japan began to study geological disposal of high-level radioactive waste (HLW) in the 1970s. The Japanese HLW, mostly high-level liquid waste that arises from spent nuclear fuel reprocessing, is mixed with molten borosilicate glass to immobilise the substantial quantities of fission products and actiides remaining in the waste. In 2000, Japan enacted the Designated Radioactive Waste Final Disposal Act to specify the procedure for repository site selection, the responsible organisations and fund management for the disposal of HLW. The site selection procedure specified in the Final Disposal Act consists of three steps: literature survey, preliminary investigation stage (drillings at site) and detailed investigation stage (underground laboratory) (Figure 7).

Subsequently to the adoption of the Final Disposal Act, The Nuclear Waste Management Organisation of Japan (NUMO) was established by HLW producers to select a site for deep geological repository (DGR), and to construct, operate and close the DGR. In 2002, NUMO initiated a public invitation for volunteer host municipalities to participate in a literature survey as the first step of selecting a final disposal site. In 2007 Toyo town in Kochi prefecture applied as volunteer area for literature survey but withdrew application after strong opposition from local residents. The 2011 Fukushima Daiichi nuclear power plant accident highlighted the need to re-evaluate the technical safety basis of geological disposal facilities, and recommendations were submitted in 2012 by the Atomic Energy Comission of Japan to ensure that the latest geoscientific knowledge was incorporated into the re-evaluation.

To review the technical reliability of geological disposal on the basis of the latest geoscientific knowledge and to specify future research and development topics, a Geological Disposal Technology Working Group of the Nuclear Energy Subcommittee was created by the Ministry of Economy, Trade and Industry (METI) in 2013. This working group was mandated to evaluate the long-term safety of geological disposal based on current geoscientific knowledge and available technologies. In 2014, the group issued its evaluation results concluding that there are potential areas where a safe DGR can be located, specifying the favourable characteristics and long-term stability properties of the geological environment for safe geological repositories of HLW. In 2015, the government of Japan stipulated a new introductory step in which a set of site screening criteria was issued, to be applied in nationwide screening for identification of suitable areas for further investigations.

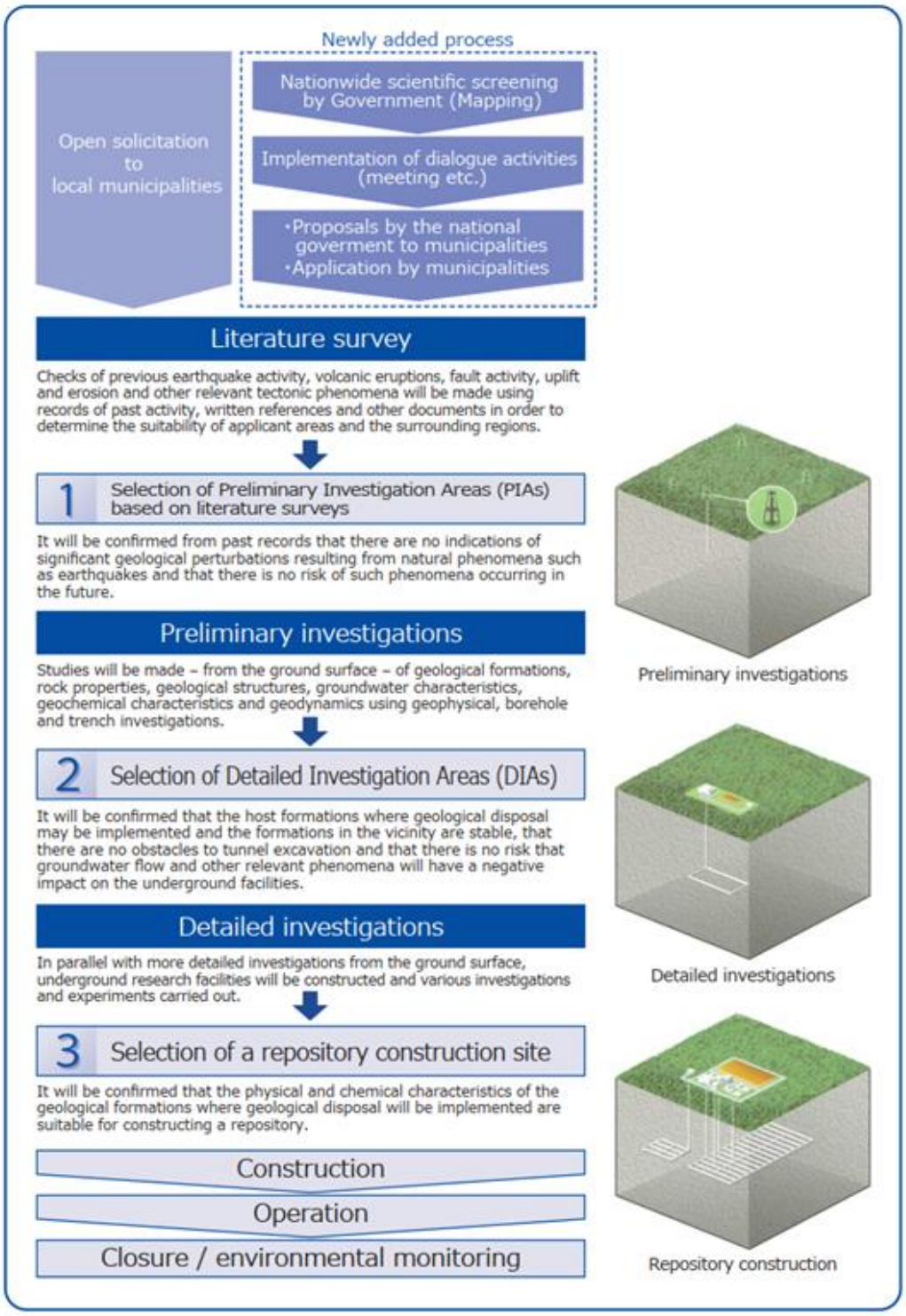

Figure 7 The site selection process in Japan (source: NUMO)

By the request of METI, OECD/NEA conducted an independent technical peer review on the site screening criteria in 2016. The International Review Team concluded that the nationwide scientific screening process was generally in accordance with international practices, but some areas remained where improvement could be made.

In 2017, the Japanese government published the nationwide map to promote better understanding of geological disposal at both national and regional levels. Utilising this map, the Japanese government and NUMO put efforts into dialogue by holding explanatory meetings throughout Japan.

Following the publication of the map and the subsequent interaction with municipalities, NUMO received favourable decision from Suttu Town and Kamoenai village in Hokkaido prefecture in the late 2020, for starting the literature survey in these communities.

7.2 Legal framework

The Japanese government is responsible for the basic policy of nuclear waste management and approves the five-year plan of final disposal pre-pared by NUMO (Figure 8). NUMO is supervised by METI, the government ministry whose tasks involve, inter alia, the promotion of nuclear energy and nuclear waste management, including the final disposal of spent nuclear fuel. In this regard, METI reviews the final disposal plans upon site selection produced by NUMO, taking into account the opinions of the local government in the affected area of investigations.

Radioactive Waste Management Funding and Research Center (RWMC) is an expert organisation, who manages the fund that finances operations of NUMO. In addition, RWMC provides with R&D services relating to the development of disposal of radioactive waste. Along with NUMO, RWMC participates in public consultation activities in an expert and advisory role. Established by a designated Act, Japan Atomic Energy Agency (JAEA), is tasked, among number of duties in nuclear sector, to conduct R&D for the treatment and disposal of nuclear waste, thus providing corresponding services to NUMO. Nuclear Regulation Authority (NRA) is an external bureau of the Ministry of the Environment, focusing mainly on the safe and secure use of nuclear energy. In regard to site selection process, NRA’s role is to review the pro-gramme and the design of the waste disposal facility in accordance with regulatory requirements. NRA will also be involved in the public consultation, especially on the local level where people may need a regulatory opinion on the repository project. In addition to the nuclear actors above, there are also other organisations in-volved in radioactive waste management in Japan. However, at this stage of the site selection process, they have a minor role and therefore they are not mentioned in this review.

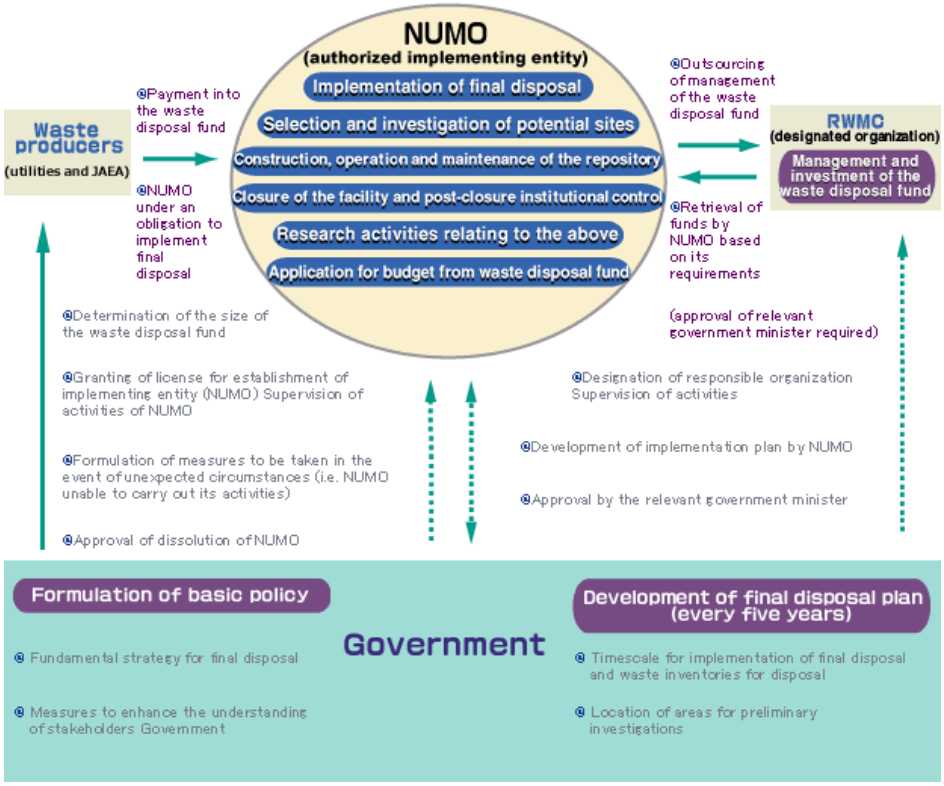

Figure 8 Organizational framework for the disposal of HLW in Japan

7.3 Involvement of stakeholders in the process on the local, regional and national level

In the early 2000s, the site selection process was solely based on the interest and voluntariness of municipalities and prefectures to participate, and no geoscientific or other criteria were applied to choose a site or sites. The strategy was changed in 2015 when the Japanese government decided on the nationwide screening to indicate site suitability in terms of geological and other features. This “white map” approach triggered a new process where NUMO started an extensive public consultation on the repository project. Since 2015, NUMO has held numerous public face-to-face meetings of different sizes across the country, in 9 major cities and in tens of smaller ones. The nationwide symposia which were held in major cities have gathered 200-300 participants per event and small group discussions about 50 people per occasion. In addition to the symposia and seminars, opinion exchange meetings of smaller size have enabled more informal discussion on the repository project. NUMO’s active campaigning for the site selection has interested also the mass media who has participated in the symposia events. At best, one campaign of symposia in 9 major cities gathered news media from almost 100 news agencies.

To facilitate learning of the younger generations, NUMO has applied different means of cooperation and communication:

• NUMO supports activities of schoolteachers for developing instruction material and teaching aids for energy and environmental education to be used by teachers who want to utilise

information on radioactive waste management and geological disposal in particular, as the subject material in social studies and science lessons.

• NUMO supports teachers to deal with geological disposal in their school classes by dispatching experts for their support.

• In universities, NUMO has supported debate classes on geological disposal and visit tours of students to underground research laboratories.

• For road show purposes, NUMO has a communication vehicle “Geo Mirai” in which geological disposal is illustrated by a mini-exhibition, also including a 3D-animation theatre.

7.4 Discussion topics

In recent years, NUMO’s active public outreach has been purposed to gain sufficient approval from the local level for literature survey. With this objective, NUMO has especially focused the discussion in public meetings on the nation-wide map displaying suitable and unsuitable sites for geological disposal. In these meetings, NUMO has encouraged local governments to organise the “dialogue occasion” (local stakeholders’ forum) which enables NUMO to promote dialogues with stakeholders in order to work together to assess technical and socio-economic issues.

Some participants of the meetings considered that NUMO should increase the opportunity to explain the necessity of geological disposal to the public before explaining safety, and some of them had concerns about risk management. Probably because of the Fukushima accident, people underlined ensuring of counter measures for unexpected events. Others felt that they still have concerns of the safety of geological disposal referring to the lack of technical capability in the implementation of the repository.

Regarding repository environments, participants had various questions including long-term stability of geological formation in terms of volcanic and fault activities; influence of natural events (e.g. earthquakes and tsunami); and effects of migration of radionuclides.

7.5 Lessons learnt

The decisive point in the progress of the site selection in Japan was the realization of the nation-wide map showing the suitability of areas for geological disposal. The adoption of the map has also helped NUMO to focus the content of the communication in public meetings and to engage municipalities to apply for literature survey. NUMO’s nation-wide campaigning to disseminate information about the site selection process has been successful. Campaigning has based on encountering people face-to-face on different platforms of interaction. NUMO has reached different stakeholders by arranging versatile events: symposia and seminars for larger audiences and opinion-exchange meetings for smaller groups. NUMO’s cooperation with schools and universities has made geological disposal more familiar with younger generation. This is important since the younger people must carry their share of responsibility for disposing of the waste in the future.

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8 Sweden

8.1 Overview of the site selection process

Research for developing long-term safe solution for high-level nuclear waste started in Sweden in 1970's when the so-called Conditions Act came into effect. The Act stipulated that new reactors could only be started if the applicant can demonstrate a completely safe method of taking care of the spent nuclear fuel. In line with the requirement of the Act, the Swedish Nuclear Waste Management Company SKB started intrusive investigations on eight sites during 1977-1985. Rather than serving for site selection as such, the purpose of the drillings (85 deep boreholes) was to acquire information from different geo-logical environments. Along with the site investigations, SKB developed final disposal technology, which culminated in the KBS-3 solution, introduced in 1983.

In the early 1990's, after country-wide screening, SKB concluded that it is not possible to designate certain regions or geological environments as suitable and unsuitable for final disposal. Instead, the study should focus on smaller areas and their surroundings.

In 1992, SKB contacted all municipalities in Sweden to find out voluntary localities for preliminary site investigations. More than ten municipalities ex-pressed their interest, and feasibility studies could be started in the municipalities of Storuman and Malå. By 1997, both municipalities had withdrawn from further investigations after local referendums.

In addition to Storuman and Malå, SKB considered that municipalities with existing nuclear installations (with power plants, interim storages, research facilities) would be potential locations for the repository, because of the existing infrastructure and available workforce. As a result, preliminary studies could be conducted in six "nuclear municipalities". By 2000 it was evident that two municipalities out of six could be selected for intrusive site investigations: Oskarshamn and Östhammar where inhabitants were largely in favour of the project and where the geological conditions seemed to meet the requirements. In addition to societal criteria, the site se-lection was based on the following criteria: land and environment (land use, nature conservation, available land for industrial operations), technology (constructability of bedrock, transportation) and safety (properties of the bed-rock such as water chemistry, mechanical conditions etc).In 2002-2008 intrusive site investigations were conducted at Forsmark (Östhammar) and Laxemar (Oskarshamn).

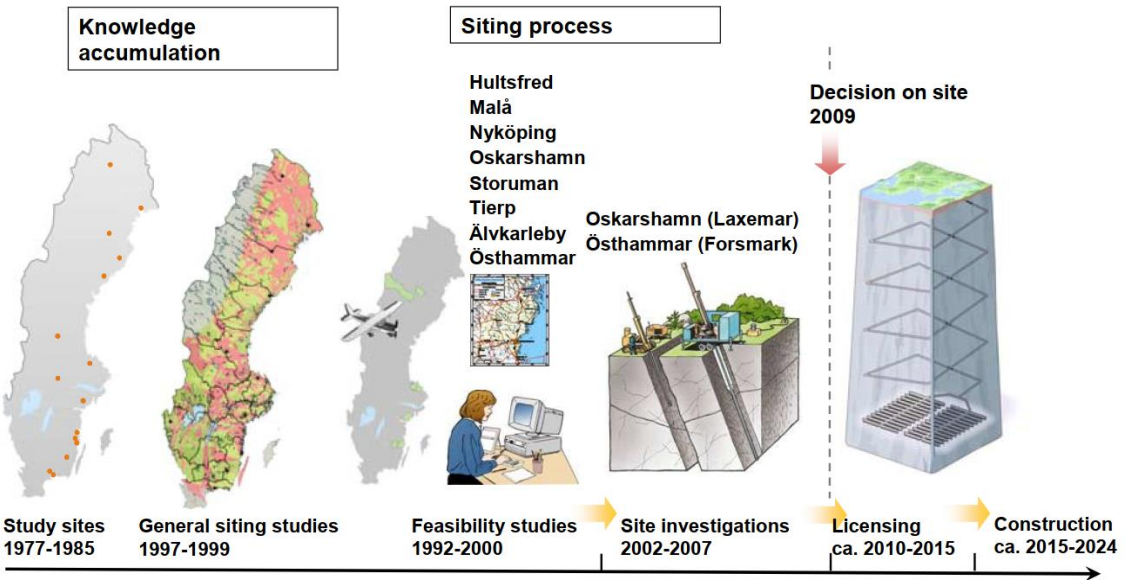

Figure 9 Site Selection process in Sweden

In summer 2009, SKB announced to choose the Forsmark site for the location of the repository. Concurrently, SKB decided that the encapsulation plant would be located in Oskarshamn. With the decisions, the municipalities were entitled to the Added Value Program (AVP), that involves money that SKB needed to invest in the municipalities for realizing the project. According to the AVP, Forsmark share of the total value of 160-215 M€, was 25 %. The money was divided in two periods, 1. before licensing and 2. after licensing. Before licensing, the added value was estimated 32,7-43,5 M€ (20 % of the total value) of which the share of Forsmark was 25 %. In addition, both municipalities received 163 500 €/year to administer the programme.

In 2011, SKB submitted the licence application to construct the final repository in Forsmark and the encapsulation plant in Oskarshamn, to the Government. In 2018, the Land and Environment Court and the Swedish Nuclear Safety Authority issued their statements on the application. The approval of the Land and the Environment Court was conditional with a request for supplementary information of the corrosion of the copper canister. Later, SKB complemented the application with this information. In October 2020, the municipal council of Östhammar decided in favour of the construction of the repository. Before that, the corresponding decision regarding the encapsulation plant was made in Oskarshamn. The final decision rests now with the Swedish Government.

8.2 Legal framework

Basically, there are five key actors that are involved in decision-making on final disposal in Sweden: the applicant (SKB, Svensk Kärnbränslehanter-ing), the Land and Environment Court (MMD), the regulator, Swedish Radiation Safety Authority (SSM), the Government and the municipalities.

SKB was established in the 1970's by the nuclear power companies to man-age all streams of nuclear waste in Sweden. The company is also tasked to dispose of the radioactive waste arising from different sectors of society (medical care, industry, research). The licensing process of the final repository and the encapsulation plant is carried under the Nuclear Activities Act and under the Environmental Code. SSM's task is to review the license application from the technical and long-term safety point of view, in line with the requirements of the Nuclear Activities Act. The role of MMD is basically to review the Environmental Impact Statement (EIS) which is part of the licensing documentation prepared by SKB.

The affected municipalities have the right to accept or reject the project. Both Östhammar and Oskarshamn have accepted the construction of the repository and the encapsulation plant respectively. The final step in the licensing is the decision of the Swedish Government which is still pending. After the Government has made its decision, the matter is handed back to SSM and MMD that will stipulate conditions for the facilities. The municipalities will also decide whether to grant building permits un-der the Planning and Building Act. In addition to the above-mentioned key actors, the Swedish Council for Nu-clear Waste has an independent expert role to advise the Government in matters relating to nuclear waste, decommissioning and dismantling of nu-clear facilities. The Council also serves as a knowledge base for other stakeholders such as concerned public authorities, the nuclear power industry, municipalities, NGOs, interested members of the public and the mass media.

An important part of the legal framework is the Nuclear Waste Fund which is similar to a pension system for NPPs: money is set aside today for financing future expenses. In addition to costs related to management of nuclear waste, the fund also covers the costs for the involvement of local communities and non-governmental organisations in the site selection process.

8.3 Involvement of stakeholders in the process on the local, regional and national level

In the following, only Oskarshamn and Östhammar municipalities are dis-cussed as examples of local involvement, since these municipalities were the only ones where site investigations were carried out in the 2000's. The reference point for local involvement is the "Oskarshamn model" which encompasses dialogue, information exchange and transparency in the Swedish NWM decision making process. In 1990, the Dialogue Project was a new initiative launched by the Swedish Nuclear Power Inspectorate (SKI, predecessor of SSM) towards a more communicative approach. In addition to the effective engagement of the municipality, the Dialogue Project showed that 1) regulators can and should participate in the early stages of a siting process and this would be possible without losing credibility as an independent reviewer of a licence application and 2) actors with conflicting interests and views can reach agreement on the basis for decisions.

As Oskarshamn already hosted nuclear power plants and the CLAB (central storage for spent nuclear fuel) the municipality was also interested to build-up knowledge on the repository project and received funding from the Government for the local competence building project (LKO). The LKO was organised in several working groups that were composed of around 10-15 people representing local politicians, neighbouring municipalities, municipal civil servants, neighbours, members of community organisations, etc.

When SKB, after 10 years of cooperation with the municipality, requested intrusive site investigations in 2000, each working group within the LKO had to write a report to the council with its recommendations regarding the decision on the site investigations in Oskarshamn. In March 2002, the municipality agreed to the site investigations but put forward 13 conditions. Correspondingly to Oskarshamn, Östhammar also organised local knowledge build up on the repository project and applied financial support from the Nu-clear Waste Fund for local involvement activities. In 2001, council of Östhammar accepted intrusive site investigations.

From the local involvement point of view, three factors have been essential to engage municipalities in the process. Firstly, the money from the nuclear waste management fund has enabled ac-tive participation and learning of the municipalities. For instance, Östhammar municipality reviewed its municipal organisation in order to increase information and hold a dialogue with the public and to increase awareness and knowledge amongst politicians. For this reason, the municipality established three different committees: the long-term safety committee, the environmental impact assessment committee and the consultative committee. The commit-tees were managed by the municipality, who decided about the experts to be invited to the meetings.

The second factor in fostering the local involvement has been the EIA procedure which has provided a forum for discussions on specific topics of the repository project. The EIA procedure was conducted along with the intrusive site investigations and enabled active local participation. More than 3,000 questions, comments and remarks were dealt with during this process and 30 meetings were held in the EIA Forum in Oskarshamn and in the EIA group in Östhammar. The third factor has been the Swedish added value programme (AVP). In 2007, Östhammar and Oskarshamn started to discuss with SKB on the need to acknowledge the effort put by the two municipalities into monitoring and evaluation of the industrial activities. An added value programme would sup-port the municipalities in partnership with the nuclear industry and create synergies. All three parties entered into negotiations for more than two years and finally in April 2009, they formally agreed to sign the programme when SKB had not yet decided on the location.

The Added Value Programme stipulated that 75 % of the additional value should be created for the benefit of the municipality where the construction of the repository would not take place, whereas 25% of the value should benefit the municipality hosting the repository. The total value of the pro-gramme is 1,5 to 2 billion SEK (around 160 to 215 million Euro). It is important to emphasise, from an accounting point of view, that value does not mean cost outlay for a project, but rather, the resulting value. The programme benefits the three parties: the industry and the municipalities. On a regional level, the relevant stakeholders are the County Administrative Boards and County councils. County Administrative Boards are regional authorities for consultation and licensing with special focus on emergency preparedness, environment (including EIA, nature and culture values) and regional development. In the County councils, municipalities are represented more directly, but they focus on business and infrastructure development. Based

on their development tasks, the regional authorities have been involved in the added value program. An important platform for regional involvement has been the EIA procedure. Over the course of the EIA process, 30 meetings were held with regional organisations, 18 of which were also open for public.

On a national level, the regulator has been actively involved in the site selection process since the introduction of the Dialogue project. The consultative role of the regulator was strengthened even more when the Environmental Code came into effect in the end of the 1990s, including stipulations on the EIA procedure and participation of stakeholders. In fact, the legislation obliged the regulator to participate in the EIA forums, increasing its presence and communication in the siting municipalities. Along with the regulator, the Swedish Council for Nuclear Waste has provided the process with independent expertise and advice. Although the Council assists primarily the Government in nuclear waste management issues, it has participated in the site selection process at different levels of decision making and organised regular seminars and open meetings for stakeholders in the process.

The EIA procedure has provided a platform for NGO´s to participate in the process. Moreover, from 2004 onwards, Nuclear Financial Act and the Nu-clear Financial regulation allowed environmental organisations to seek funding from the Nuclear Waste Fund. Based on the fund money, the Swedish NGO Office for Nuclear Waste Re-view (MKG) was created by the largest Swedish environmental NGOs. At pre-sent, the following NGOs are members of MKG: (which are mostly the same when MKG was created in 2004):

• Nature and Youth Sweden,

• Friends of the Earth Sweden,

• Oss – the local Public Opinion Group for Safe Final Storage of Radio-active Waste

• The Swedish Society for Nature Conservation,

• The Swedish Society for Nature Conservation districts in the counties of Kalmar, Skåne and Uppsala.

MKG strives to assure that the method, as well as the location, of the Swedish repository for the disposal of spent nuclear fuel and other radioactive waste meets the highest possible long-term standards for health and environment. During 2005-2011, MKG received approximately 2 million SEK (218 000 €) per year from the fund. The funding is provided for participation in the consultation and the application review process, for building up knowledge and disseminating the information within the consultation process. When speaking about the national visibility of different stakeholders in the process, KTH Royal Institute of Technology is worthwhile mentioning in this context. Like the MKG, the Institute has constantly participated in the public discussion about the repository project and exceeded the national news threshold by statements related to canister corrosion.

8.4 Discussion topics

Generally, topics of discussion have varied depending on the arenas of interaction. On a national level, the discussion is being focused on alternatives for KBS-3 solution, long-term safety of the

solution and the relating doubts on the durability of the disposal canister. On a local level, the benefits of the investment and how they impact municipal development strategies have been highlighted. Important drivers of the national discussion have been KTH and the MKG, both focusing on the corrosion issue. Communication of KTH in the corrosion issue is based on their research whereas MKG has used this research as a reference in their communication. The debate and the uncertainties brought up by KTH have affected the licensing process as the Land and Environment Court requested supplementary information from SKB to clarify uncertainties.

MKG has also questioned the KBS-3 concept suggesting that the deep bore hole method should be investigated as an alternative. Overall, the MKG is sceptical on the long-term safety of the KBS-3 and considers that the concept relies too much on artificial barriers like copper and clay for the isolation of the waste. From the local point of view, the safety issue became less topical as the site investigations approached the licensing stage. The intrusive site investigations took almost 10 years and during that time the municipalities have dealt with the issue in their respective working groups where experts were present. Gradually the confidence on the safety grew to a level where discussions shifted more and more to the practical impacts of the project, like development of the local labour market, infrastructure, and economy in general.

8.5 Lessons learnt

The Swedish example underlines clearly that successful siting is based on the locations with existing nuclear presence. Both Oskarshamn and Forsmark have hosted reactors since 1970's and 1980's respectively, and nuclear is part of their identity and everyday life. In the hindsight, it seems obvious that these sites should have been investigated from the start. In the beginning, however, the approach for site selection was different: the geological aspects were regarded as determinants for the site selection. One of the lessons that SKB learned from feasibility studies in Storuman and Malå was that the acceptance of local decision makers alone is not enough if the inhabitants are mostly against. In both municipalities, demonstrations against feasibility studies were arranged from the beginning with Green-peace Sweden actively involved, gaining a lot of national publicity for the op-position movement. After local referendums, where majority of local people were against further investigations, SKB had to give up these sites.

Instead of looking sites strictly in terms of geological criteria, SKB decided to focus on municipalities that host nuclear facilities or are closely located to these facilities. Obviously, targeting of the site selection to nuclear municipalities was not the only factor in the successful process. Early involvement of the regulator with the initiation of the Dialogue Project enabled direct contact of local people to the independent authority. The relationship between the municipalities and the regulator was even strengthened, when EIA stipulations were renewed, emphasizing the role of the regulator in the process. It is evident that the presence of the regulator in the local level has built up confidence on the safety of the KBS-3.

The role of the SKB must also be highlighted in the process. The company has had a strong local presence in Oskarshamn and in Östhammar through-out the site investigations, building up local partnership with the communities. The added valued programme is a good example of how a repository project can be incorporated into the municipal development strategies. When summing

up the remaining key elements of successful siting in Sweden, the following aspects must be brought up:

• legislation defines clear roles and responsibilities for stakeholders and sets targets for the management of nuclear waste,

• nuclear waste funding enables efficient participation of stakeholders in in the different levels of decision-making,

• transparency, open participation, and dialogue are the overarching principles of the process.

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9 Finland

9.1 Overview of the site selection process

Studies on the feasibility of geological disposal of spent nuclear fuel started in the late 1970's when the first nuclear reactors were taken into operation. The primary solution for the management of high-level waste was to ship it overseas for reprocessing without any waste coming back to Finland. However, the operation licenses of the Olkiluoto reactors were conditional with a requirement that a management plan for spent nuclear fuel should be in place before the licenses could be extended. The nuclear power company TVO drafted a program which was based on a minimum of 40 years cooling time of spent nuclear fuel before disposal. Consequently, disposal could be started round 2020 which again determined 2010 for the start of the construction and 2000 for the selection of the site. In 1983, the Government accepted the program which has served as a road map for nuclear waste management up to present.

The decision of the Government initiated screening of suitable regions and areas for disposal. In parallel, TVO started to gain knowledge relating to characterization of bedrock and drilled the first research hole in the Lavia site in South-Western Finland. The drilling experiment triggered strong local opposition and TVO withdrew from the site but gained valuable experience from geological research and public communication. After narrowing down the number of areas, the screening and field visits indicated 101 suitable locations in terms of geology and environmental factors. Despite Olkiluoto was originally ruled out from the screening as the coastline in general, it was included as the 102nd site, since the geological data gathered in connection with the construction of low and intermediate waste repository indicated the site could be suitable for HLW repository as well. Choice of Olkiluoto would also minimise transports of spent nuclear fuel in the future.

The published 101 investigation areas were subsequently examined by the Ministry of the Environment. This examination reduced the number of areas to 85 because of the anticipated plans for nature protection areas. The Finnish Radiation and Nuclear Safety Authority (STUK) also carried out a review of the site selection work. In their review STUK stated that the investigation areas selected for preliminary site investigations should include, as much as possible, a representative sample of the different geological environments. TVO contacted 66 municipalities in the focus areas to ask about their interest in site investigations. After negotiations, five voluntary municipalities, including Olkiluoto, were chosen to preliminary site investigations in 1987. After preliminary site investigations in 1992 two sites were left out from detailed investigations, due to their geological complexity. Detailed site investigations were carried out in the municipalities of Eurajoki, Äänekoski and Kuhmo.

In 1994, the Finnish Parliament amended the Nuclear Energy Act by prohibiting the export and import of nuclear waste. Spent nuclear fuel could not any longer be transported to Soviet Union from Loviisa nuclear power plant, which forced the utility owner, IVO (currently Fortum) to seek other solutions for the management of spent nuclear fuel. IVO started negotiations with TVO on the joint repository. As a result, Posiva Oy was established in 1995 to plan and implement disposal of the spent nuclear fuel arising from Olkiluoto and Loviisa nuclear power plants.

When IVO entered into the same repository project as TVO, it was reasonable to investigate Loviisa as a potential site as well. Intrusive site investigations were started at the power plant site in Loviisa in 1997. In the same year, environmental impact assessment was started in each of the four locations. Relating to the environmental impact assessment and the approaching decision on the repository site, Posiva conducted public opinion polls at investigation municipalities to consult people's attitudes towards the repository. All four municipalities where site investigations were carried out in the late 1990's, were involved in the poll. The poll was made by phone with the target of 5000 contacts. The telephone interviews were continued until 5000 interviews were gathered.The results indicated clear support for the repository in Eurajoki and Loviisa, whereas majority of inhabitants in Äänekoski and Kuhmo were against.

The final choice was made for Olkiluoto in Eurajoki since various arguments spoke for the site in comparison to Loviisa: most of the spent fuel was already in Olkiluoto, the available infrastructure and larger area gave more degrees of freedom for locating the repository, and lastly, the local inhabitants were more consistent in their support than in Loviisa. Posiva filed the application for the decision-in-principle with the Government in May 1999 to locate the repository in Olkiluoto. In order for the Government to decide in favour of the policy decision, Radiation and Nuclear Safety Authority (STUK) had to support the project and Eurajoki municipality had to approve it. Both conditions were met during the licensing process. The Government made the favourable decision in December 2000 and the decision was handed over to the Parliament. Parliamentary deliberations took four months and in May 2001, the decision-in-principle was ratified by votes 159 in favour and 3 against. Followed by the policy decision, Posiva concentrated its operations to Olkiluoto site and started to construct the underground rock characterization facility ONKALO in 2004 to verify the research results gained from site investigations and to locate the final disposal tunnels in the host rock.

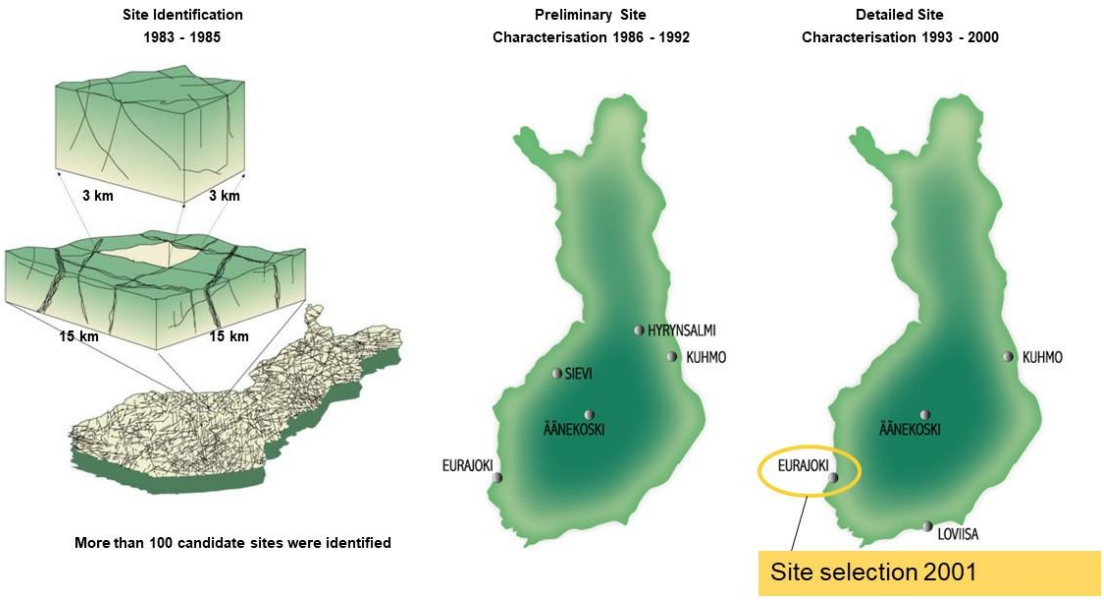

Figure 5 Site selection process in Finland

9.2 Legal framework

Like any nuclear facility in Finland, siting of a final repository for spent nu-clear fuel requires favourable Decision in Principle by the Government and subsequent ratification by the Parliament. Precondition for the Government and Parliament decision-making is that the affected municipality is in favour of the repository and the Radiation and Nuclear Safety Authority, STUK, confirms the disposal concept to meet the safety requirements. An important aspect in the legislation is the fact that a municipality has a veto right and can reject the Decision in Principle. Once approved, the municipality cannot withdraw from the process on a later stage.

According to the Nuclear Act, the next licensing phases are the Construction license and the Operating license. These are granted by the Government, but are not subject to parliamentary (political) acceptance any more. Posiva applied for the construction license in 2012 and it was granted in 2015. Posiva will apply for the operating license in 2021. In addition, the final disposal repository construction and operation requires numerous other permits and decisions according to e.g. environmental legislation, health and safety legislation, land use and construction legislation, various technical safety regulations etc. Ministry of Economic Affairs and Employment, MEAE, is the authority that processes nuclear licenses for the Government and administrates the State Nuclear Waste Management Fund. In addition, MAEA is the contact authority in the EIA procedure within nuclear sector. According to Nuclear Energy Act, the waste management obligation rests with the nuclear power companies (polluter pays principle) who have dele-gated the planning and implementation of final disposal of spent nuclear fuel to the joint nuclear waste management company Posiva.

9.3 Involvement of stakeholders in the process on the local, regional and national level

When the site investigations started in 1987, TVO established local offices in the research communities to manage investigation activities and communications, exhibitions, and stakeholder meetings. To keep the local decision-makers informed, liaison groups were formed. They served as regular forums for discussions between the municipality and TVO. The local members consisted of municipal officials and councilors. Basically. a liaison group served for two purposes: 1) in the meetings municipality representatives were briefed on the investigations; 2) communication measures were discussed and agreed upon. Start of the environmental impact assessment (EIA) in 1997 intensified local involvement. Posiva was the responsible developer of the EIA, as the company had taken over the responsibility of the siting process after 1995.

The Finnish EIA procedure is based on the respective EU-directive on EIA. However, the involvement of public and other stakeholders is more comprehensive in the Finnish practise than the minimum requirements of the Directive. In Finland, EIA legislation sets requirements for follow-up groups, public meetings, statutory public hearings etc.

EIA provided a platform for local involvement and Posiva utilised this opportunity to engage and inform people about the project.

Cooperation and follow-up groups were formed between the municipalities and Posiva. These groups considered it important to get as many as possible municipal residents to participate and to get information what they wanted in an understandable form. The target during the drafting stage of the EIA pro-gramme (1st phase of EIA, the plan on how and what to evaluate) was to activate the public to contribute specifically to scoping, which impacts to be assessed and how. Later in the impact assessment phase the target was to get feedback and in-put to the assessment work. Important target was also to reduce misunderstandings and conflicts arising from a lack of information or complicatedness of the information or lack of communication between the parties. To ensure objectiveness of the process, independent EIA consultants took part in facilitating the interaction.

The aim was also to introduce expert information and peoples' views of the project and its assessed impacts into the public debate.

To encourage participation

- people were informed of the opportunities to join in the debate,

- information was given on the planning of the project, the EIA procedure, progress of the impact assessment and the completed reports,

- an ongoing dialogue was launched between the residents of each candidate municipality,

- open discussion on the project, its impacts, and environmental impact assessment procedure took place and

- views of the adequacy of the reports about the impacts and of the acceptability of the methods used were gathered.

To give residents a better chance to have a say in the matter, a series of meetings were held, consisting of public events and advanced discussion working groups in each locality. The principal idea behind the public events was to incorporate issues of interest of the residents into the EIA programme and to encourage the residents to take actively part in the discussion and the interaction. When the programme was being drafted, two public events were organised in each candidate municipality to give residents a chance to express their opinion about the project, to ask questions about the contents of the EIA pro-gramme, and to submit initiatives for study. The participants' views on the project and its impact were gathered in the events. An independent third party chaired the events and kept record of those. The discussion working groups then dealt in detail with the material gathered from the public events with special emphasis on the impacts of the project and their perceived importance. Possible further measures regarding information dissemination and interaction during the assessment were also dis-cussed. The discussion working groups convened twice in each candidate municipality in the autumn of 1997.

Representatives from associations and NGOs were invited to participate in the discussion working groups. Actively operating NGO movements were organised in Kuhmo, Loviisa and Äänekoski.

Also associations and other groups in neighbouring municipalities were offered an opportunity to participate in the working groups through invitations in newspapers or public events.

Invitations to discussion working groups were extended to, for example, to the following parties:

- citizens' groups, such as village committees and residential as-sociations in the candidate municipalities,

- local branch members of political parties and political organisations,

- local environmental associations and environmental groups,

- other local associations and contact persons appointed by the municipalities.

Press representatives were also invited to the public events and to the discussion group meetings. All public events were covered in the local newspapers. Discussions for those small groups, which wanted such, were organised in each locality studied. During the preparatory phase of the EIA programme in 1997, Posiva organised such events for a total of 40 groups and during the EIA-reporting phase in 1998, for a total of 46 groups. The final disposal project and the anticipated impacts were presented in those events. In addition to Posiva's local involvement, the regulator STUK organised separate information meetings in the municipalities where the safety of geological disposal was discussed in particular. The involvement of MAEA on the local level was limited to the public hearings within the context of Decision in Principle and EIA procedure required by the legislation. Afterwards the MAEA was criticised by its low presence in the municipalities.

On regional level, the main officials were informed, and negotiations were held with them during the drafting stage of the EIA-programme. Various representatives from regional environment centres, heads of provincial government social administration, employment and business development centres and provincial associations participated in these negotiations. Seminars were organised for central administration representatives during the EIA to discuss about social impacts of the final repository and issues relating to transportation of spent nuclear fuel. On a national level, Posiva met politicians regularly and arranged information seminars for political parties. In the seminars, implementation of geological disposal was discussed with an emphasis on safety arguments introduced by Posiva's experts.

National NGOs were actively involved in the debate during the site selection process. Greenpeace Nordic and the Finnish Association for Nature Conservation (FANC) were perhaps the most visible, but also the Friends of the Earth and the Finnish-Swedish Association for Nature Conservation (Natur och Miljö) debated the process. Over the course of site investigations, Posiva had regular update contacts with journalists from national media and arranged visits to the investigation sites. Regarding Olkiluoto and Loviisa, a power plant tour was included in the site visit.

9.4 Discussion topics

On a local level, the discussion was generally divided into three main topics: the impact of the final repository to the image of a municipality, safety of disposal and the benefits of the project.

Concerns of the impact of the repository on the municipality image were raised in the public meetings during the scoping stage of the EIA procedure. People considered that the municipality would be stigmatised, and this would affect tourism, markets of local agricultural products, housing and real estate prices and on the overall quality of life. All these concerns were translated to research projects during assessment phase of the EIA. Safety issues were focused on transportation of spent nuclear fuel and relating accident scenarios. Also the anticipated releases from the final disposal facility and the assessment of long-term safety raised questions among the local audience.

Last but not least, the benefits of the investment interested generally the local inhabitants. Especially tax revenues and employment were discussed. The central argument of local NGOs against final disposal was related to the fairness of nuclear power: opposition movements of the affected municipalities claimed that the NPP sites and the surrounding areas gained the benefits of nuclear electricity, whilst the investigation municipalities were to receive the hazardous legacy of nuclear power – the longed lived highly radioactive waste. On a national level, NGOs and especially Greenpeace Nordic emphasized that the information on the long-term safety of final disposal was not sufficient, and that the solution involved numerous uncertainties. Therefore, the decision-making should be postponed until safer ways to deal with the waste were founded.

The arguments of the FANC were quite much in line with those of Green-peace Nordic, however not only relating to long-term safety of the solution, but to inadequate accident scenarios of the encapsulation of the spent fuel. The FANC also highlighted that the information on the suitability of Olkiluoto bedrock was insufficient and more research would be needed. Retrievability, i.e., retrieval of the disposed of canisters from the repository to above ground, became an important issue shortly before Posiva submitted the application for the decision-in-principle to the Government. This topic was raised by the Minister of Environment who insisted that retrievability should be included in the safety requirements which were under preparation of the Government. Later, when the decision-in-principle was deliberated in the Parliament, the requirement for retrievability proved to be central in the approval of final disposal among politicians. Some opponents of final disposal in the Parliament, and generally in Fin-land, considered that the decision should not be taken because a solution for nuclear waste problem would encourage to amend legislation by permitting import of foreign nuclear waste after the repository was implemented. How-ever, authorities and experts did not regard this development realistic for the licensing and other reasons.

9.5 Lessons learnt

The Government’s early commitment to final disposal in 1983 has been the primary driver of the project. Another milestone shifting Finnish society gradually towards final disposal was reached in 1994 when the amendment prohibiting the import and export of nuclear waste was ratified by the Parliament. Since then, it has been easier for local people to accept final disposal, partly because of the fact that other alternatives for waste management were practically ruled out.

In the Finnish experience, local level acceptance plays a key role when selecting a site for spent fuel disposal. This is due to the fact that the municipality has a veto right in the decision-making and a possibility to stop the site selection process. Consequently, sufficient local acceptance is required, but it cannot be created within a short period of time. To achieve local acceptance, strong local presence of the implementor is needed. Within TVO and Posiva it was seen necessary to establish local offices at investigation sites, not only for public communication, but to manage versatile field investigations. Public consultation has a role of convincing people about the safety of waste disposal, but there are also other factors that build up confidence.

Safety has been the key issue in trying to gain public acceptance for final disposal. It seems that qualified research and verified results alone do not convince people, given that the implementor is the only active source of in-formation. In the Finnish case, various stakeholders including the regulator and the licensing authority acted consistently with Posiva on communicating about safety issues. It should also be emphasised that the safety message was not transmitted by communication experts only, but by experts of final disposal. Finnish people trust and appreciate the regulator, STUK, who has actively participated the process. They have not only limited their activities to the requirements set by the legislation but gone for the extra mile in public communication and interaction. Although sufficient acceptance for final disposal was gained in the power plant municipalities, in the two other candidate sites public opinion rejected the project. Yet, similar efforts were focused on public consultation in each of the municipalities. This only shows how challenging it is to gain approval for final disposal in municipalities that do not have any previous experience of nuclear installations.

On a national level, public consultation appears to be more complicated than in the municipalities. It became evident that people in general do not have very much interest in nuclear waste management as long as somebody will handle and accept the waste. In other words, without a relevant connection to either the benefits or drawbacks of the project - as on the local level - people are not interested in the issue and their involvement remains low. In an issue as controversial as nuclear waste, it seems that there will always be dissension irrespective of the extent of public consultation. Consequently, emphasis should be placed on listening to people and valuing different opinions to create proper dialogue between the implementor and the public.

In the Finnish experience, listening to people was one of the lessons learnt and it actually introduced retrievability to decision-making. This gives us an ideal of public consultation: it aims not at gaining unrealistic consent but creating diverse discussion with different views for the use of the decision-makers. After all, the necessary decisions can and must be taken to advance the preparations for final disposal despite the obvious lack of public consent.

9.6 References

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10 Conclusions

The site selection processes in different countries under this review clearly manifest that successful implementation of geological disposal needs public involvement and participation. In all countries examined the first attempts to find a site for a final repository of spent nuclear fuel took place well before the turn of the millennium. In the 2000s the overall approach to site selection has been changed. In general, it has been understood that implementing geological disposal is not only a about technology and science but a social and political process where clearly defined steps for public consultation and decision-making are needed.

The stages of the site selection processes vary from country to country. Finland is the most advanced with the construction of the repository and the encapsulation plant underway. France has already constructed an under-ground laboratory at the dedicated site, and in Sweden the licensing of the repository site still awaits the Government approval. Switzerland has entered the last stage before the final selection of the site, Canada has started intrusive site investigations while Germany, Japan and UK are still at the initial screening stage.

Despite the differences between the countries, common factors for successful siting can be found:

• Early political commitment to the concept of geological disposal and to the implementation of the site selection process;

• Clearly defined roles and responsibilities of the implementer, authorities and the affected communities;

• Active involvement of the regulator in the process from the start;

• Transparent site selection criteria which are understandably communicated to the general public;

• Consistent communication of the implementer, authorities and decision-makers on different levels of society;

• Well-organised public participation and consultation on different levels of society, especially on the local level;

• Affected communities need resources to learn about the project and to gain sufficient knowledge for their decision making.

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