Nuclear waste

state-of-the-art reports 2004

A National Council for Nuclear Waste (KASAM) Report

Stockholm 2005

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Preface

Since the Swedish National Council for Nuclear Waste (KASAM) was established in 1985, KASAM has regularly published reports of its independent review of the state-of-the-art in the nuclear waste area. According to the terms of reference for KASAM, decided by the Government in 1992 (Dir. 1992:72) such a review must be submitted once every three years.

KASAM herewith submits its report, *Nuclear Waste. State-of-the-art Report 2004*, to the Government.

The report is the eighth in this series. The first four reports have been published in 1986 (ISBN 91-38-09767-2), in 1987 (ISBN 91-38-009938-1), in 1989 (ISBN 91-38-12264-2) and in 1992 (ISBN 91-38-12749-0). The following three reports were published in the Swedish official government report (SOU) series (SOU 1995:50, SOU 1998:68 and SOU 2001:35). English translations of the 1998 and 2001 reports were also published in the SOU-series.

None of KASAM's state-of-the-art reports can provide an entirely comprehensive view of the state-of-the-art in the nuclear waste area. This is not KASAM's aim. Instead, each report deals with current issues in the debate at the time of publication and for which there may be a need to present an accurate and accessible overview. The choice of subject areas covered is also, to some extent, affected by the competence profiles of KASAM's members. A detailed description of the structure of this state-of-the-art report is provided in an introduction.

A long-term, sustainable solution of the issues concerning disposal of spent nuclear fuel and other long-lived radioactive waste as well as the decommissioning of nuclear power plants requires co-operation between three main actors: the reactor licensees, the Government and the population of one or more municipalities where a repository or an encapsulation plant will be built. KASAM hopes that this state-of-the-art report will be studied also outside the Government offices and experts in the field, thereby facilitating the necessary dialogue between the nuclear industry, the government authorities, the municipalities, the general public and the organisations concerned.

Stockholm, June 2004

Kristina Glimelius
Chairperson, KASAM

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All of KASAM's members, apart from Inga-Britt Lindblad

who was appointed after the report had been finalised, contributed to the content of this state-of-the-art report. The following were responsible for the different chapters:

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Contents

Introduction

Nuclear Power and Energy Policy

Several examples of technical projects that have been the subject of debate and discussion, not only among politicians but also among the general public, can be found during the Post-war period. The building of the Öresund Bridge, linking Sweden and Denmark, was preceded by an extensive environmental debate. The construction of railways, cell phone masts, windpower farms and genetic engineering have all been questioned by the public and by politicians. However, none of these discussions are of quite the same magnitude as the debate that nuclear power and nuclear waste has generated, starting in the early 1970's, in Sweden and abroad.

The referendum on nuclear power, which was conducted in March 1980, resulted in a majority of the Swedish parliament setting a deadline for the complete phase-out of nuclear power in 2010.

The reactor accident in Chernobyl, former Soviet Union in 1986 brought the risks associated with nuclear power into focus. In spite of this, the Swedish phase-out decision was modified as early as by 1991 – partly in order to achieve the objective of not allowing an increase of carbon dioxide emissions from fossil fuels beyond the 1988 level. In the energy policy guidelines that the parliament decided on in 1997 and 2002, a specific year was no longer given for the phase-out of nuclear power.

One reactor at Barsebäck nuclear power plant was closed down in 1999. Since autumn 2002, negotiations have been

underway between the Government and the electricity producers with the aim of preparing an agreement to create favourable conditions for the commercially viable continued operation and successive phase-out of nuclear power. [1]

Conflicts between different perceptions of nuclear power and nuclear waste decreased in the 1990's and, today, there are other important environmental issues that have also come to the fore. In spite of this, the disposal of spent nuclear waste entails an important decision, at national level, on a technically and morally complex large-scale project.

Nuclear waste is the focus of this report as are the scientific conditions, consultations and decision-making processes that exist in order to find a safe disposal solution for the 200 to 300 tonnes of high-level, long-lived waste which are generated every year from the operation of Swedish nuclear power plants. Altogether, about 4,000 tonnes of such waste are in storage at the Central Interim Storage Facility for Spent Nuclear Fuel (CLAB) in Simpevarp, Oskarshamn municipality.

Nuclear Waste – a State-of-the-art Report

Most Swedes would probably recognize the claim that the nuclear waste issue is not exclusively a technical and economic issue. The nuclear waste issue has other concerns besides bedrock types, groundwater flow, mechanical strength and welding methods. Nuclear energy and nuclear waste issues also relate to moral and ethical values and priorities: Who is responsible for the safe disposal of high-level waste? Should we wait for new and improved technology to become available in the future? If not, which municipality and landowner should give up a site for the repository? What does our responsibility towards future generations require us to do?

[1] The negotiations were interrupted in autumn 2004 without a result. The second reactor at Barsebäck nuclear power plant was closed down in May 2005.

At the stage that we have reached on the nuclear waste issue today, we need broad and deep knowledge of the ways in which the selection of different technical solutions will affect society in the future. To choose between different alternatives and to prioritise always means that we must balance ethical, economic, technical, environmental, health-related and social conditions against each other. This is never easy, especially since knowledge of and values relating to these issues are not static. However, KASAM hopes that this overview can provide a good basis for reporting facts and presenting perspectives as well as for encouraging the public and decision-makers to ask relevant questions.

The report investigates some of the issues that are important for the continued consulting and decision-making process prior to the construction of a repository for spent nuclear fuel and other long-lived, radioactive waste. In this report, the nuclear waste issue is presented from a broad, scientific perspective, where findings from research in the humanities, social sciences as well as technology and science are presented in an accessible manner.

Nuclear Waste. State-of-the-Art Report 2004 contains nine independent chapters. These chapters have been grouped into three sections and each section deals with specific themes.

Section I ***The Nuclear Waste Issue in Sweden and Abroad*** deals with how the nuclear waste issue has so far been handled and organised. This section starts with an international overview, *Nuclear Waste Management in Some Countries.* This overview provides an indication of how, in each country, solutions are sought that are considered suitable in the country in question. The overview also clearly shows that the responsibility for nuclear waste, to a large extent, covers both private and public actors, even if this is to a varying degree. An in-depth presentation of the Swedish process is provided in the chapter – *The Municipalities – One of the Main Actors in the Nuclear Waste Issue*. Given the international overview, this chapter shows that

the Swedish consultation process is based on strong and conscious efforts to achieve local participation and mutual understanding.

Section II ***Handling the Risks of Nuclear Waste. An Overview of Methods, Problems and Possibilities*** gives an overview of knowledge to calculate and handle different risks as well as of methods to obtain data for assessments relating to the storage of nuclear waste from a scientific perspective. This section starts off with two presentations of geoscientific methods used to calculate bedrock stability and permeability: *Some Geological, Geodynamic and Geophysical Investigation Methods Used for the Siting of a Repository in Hard Rock* and *Some Hydrogeological Methods for Determining Groundwater Recharge and Groundwater Flow*. In the next chapter, *Analysis and Fractionation of Isotopes*, the possibility is discussed of taking into account the properties of different isotopes in order to determine transport rates of different radioactive substances from a repository for spent nuclear fuel or other radioactive waste so as to obtain a basis for risk assessments and a safety assessment. The next chapter, *Copper Canisters – Fabrication, Sealing, Durability*, provides an overview of the methods used for the manufacturing and control of copper canisters which are one of the engineered barriers surrounding the waste in connection with geological disposal in accordance with the KBS-3 method. The final chapter, *An Attempt at a Comparable Classification of Radioactive Waste and Hazardous Chemical Waste*, discusses the possibility of comparing the risks of radioactive waste with the risks of hazardous chemical waste.

Section III ***The Nuclear Waste Issue and the Future*** is the final section. The question of the long-term responsibility that we have for the various choices that we make regarding the handling of nuclear waste is problematised. The first chapter, *Partitioning and Transmutation – An Alternative to Final Disposal. An Issue in Focus*, examines the question of partitioning and transmutation

from a scenario perspective and investigates the extent to which this method is realistic. The final chapter, *Nuclear Waste, Ethics and Responsibility for Future Generations*, focuses on the question of our responsibility for future generations with respect to the choices that we make regarding the nuclear waste issue. The significance of various ethical approaches for the decisions that we make – not only with respect to this issue – is discussed more in depth. In this way, we, the members of KASAM, hope to facilitate a public discussion which is necessary as a basis for decisions that will have to be made in the next few years.

Section I The Nuclear Waste Issue in Sweden and Abroad

1 Nuclear Waste Management in Some Countries

1.1 Introduction

This chapter provides an overview of nuclear waste management in some countries. The overview is a shortened and updated version of the corresponding account presented in the previous Nuclear Waste State-of-the-Art Report (2001). Although the focus is on high-level waste and spent nuclear fuel (see *Table 1*), certain information on low-level waste (LLW) and short-lived intermediate-level waste (ILW) has also been included since a number of questions concerning repository siting etc. in many respects concern all types of radioactive waste. In addition, an overview of current activities concerning waste management within some of the major international organisations (IAEA, OECD/NEA, EU) is presented.

This account deals with countries with very different nuclear policies and many different waste management programmes. A number of European countries as well as Canada, Japan and the USA are presented here. Some of the countries (for example, Finland, France and Japan) have a growing nuclear power programme while most other countries have a more static or diminishing programme, as is the case in Sweden.

A brief evaluation shows that Finland, Sweden and the USA have come the furthest with respect to realising the final disposal of spent nuclear fuel, both with respect to method selection and the site selection process. France has a highly advanced and extensive research and development programme (R&D programme) for methods for the treatment, storage and disposal

of radioactive waste which will be reported in 2006. Germany, Japan, Canada and Great Britain all have advanced research programmes although much remains to be done before concrete solutions can be presented.

Table 1.1. Quantities of high-level waste (HLW) and spent nuclear fuel for disposal

Country	*Number of nuclear reactors* *	**	*Planned Operational time (years)*	*Spent nuclear fuel (t HM if no other information given)*	*HLW (according to specification below)*	*Remarks*
Sweden	11	1	Varying	ca 9 000	0	Calculated total amount for the Swedish programme
Canada	14	8	Varying	3,6 millions of assemblies (CANDU) 76 000 assemblies (other)	0	Calculated amount until year 2035
Finland	4		40–60	2 600 to 4 000	0	Calculated total amount for the Finnish programme
France	59	11		15 000	3 500 m^3	Calculated total amount from existing reactors and other nuclear facilities
Germany	19	18	Varying	9 000	22 000 m^3	Calculated total amount for the German programme. The amount includes encapsulation material
Japan	51	1		0	ca 40 000 canisters	Corresponding to accumulated amount until year 2020 (1 canister = ca 1,35 t HM)
Russia	30		30–40	n.i.	n.i.	
Switzerland	5		40 or more	ca 1 800	ca 1 000 m^3	Calculated amount for the operation time for the reactors
Great Brittain	35	10	30 to 46		ca 1 890 m^3	Calculated until year 2013
USA	103	15	Up to 40	83 500 (from commercial reactors), 21 000 (from other reactors)	640 t HM (commercial) 5 000 waste packages à 4 to 5 canisters (military)	Calculated amount from existing reactors. 105 000 t HM is expected from these including prolonged time for operation

* Reactors in operation
** Shut-down reactors
n.i. = no information
t HM = ton Heavy Metal, in this compilation equal to *tons of uranium*
CANDU = Canada Deuterium Uranium (reactor)

In many other countries, radioactive waste research is underway. Questions concerning the long-term financing of nuclear waste disposal and reactor decommissioning are also increasingly attracting international interest.

The contents of this chapter are largely based on National Profiles, which are a set of information sheets prepared by Phil Richardsson, EnvirosQuantiSci (UK) for a number of countries in the world and which are regularly updated. Additional information has been obtained from the OECD/NEA, IAEA and EU.

The information provided in *Table 1.1* is taken from IAEA-TECHDOC-1323 Institutional Framework for Long-term Management of High Level Waste and/or Spent Nuclear Fuel (December 2002).

1.2 Canada

1.2.1 Nuclear Power Programme

In early 2004, there were 22 licensed nuclear power reactors in Canada. Of these, 14 are currently in operation. One is located in Quebec, one in New Brunswick and the rest are in Ontario. The reactors are owned and operated by the federal energy utilities, Hydro Quebec, New Brunswick Power and Ontario Power Generation Inc. (OPG). The other eight reactors have been shut down.

1.2.2 Relevant Institutions

Nuclear power in Canada is regulated by the Canadian Nuclear Safety Commission (CNSC). The CNSC is a federal authority which licenses sites for radioactive waste storage and disposal and promulgates guidelines for disposal. Atomic Energy of Canada Ltd (AECL) is a government-owned company charged

with the task of developing and promoting the use of nuclear power and of selling reactors abroad.

The immediate responsibility for the management of nuclear waste in Canada rests with the waste producers. New legislation for the final management of spent nuclear fuel entered into force in 2002. Under the Nuclear Fuel Waste Act (NFWA), the Nuclear Waste Management Organisation (NWMO) was formed. The NWMO is owned by the nuclear industry and will act independently of AECL and the federal government.

1.2.3 Nuclear Waste Management

LLW and Short-lived ILW

In Canada, a distinction is made between current arisings and historic waste. Historic waste originates from past uranium milling activities. Options studies for a disposal site for current LLW are being performed by OPG and operation is planned to begin by 2015.

In order to identify an acceptable disposal site for historic waste, the Co-operative Siting Process was established in 1986. A Task Force undertook extensive public consultation and invited interested communities to volunteer for site selection. Two municipalities were finally identified in 1994, although one withdrew shortly after. Following a positive referendum vote in 1995, the remaining municipality signed an Agreement in Principle to allow work to continue, but this lapsed by the end of 1996 when the federal government refused to accept the terms of the Agreement. However, there are now two possible sites which were announced early in 2004 (Port Hope Area Initiative 2004).

Spent Nuclear Fuel and/or HLW

Canada does not intend to reprocess any of its spent nuclear fuel although a certain quantity of high-level waste will be generated from the reprocessing of fuel from research projects. Over the past 25 years, commercial spent nuclear fuel has been stored at nuclear power plants.

In the mid-1990's, AECL presented a concept for the disposal of spent nuclear fuel. The concept entails placing spent nuclear fuel at a depth of 500 to 1,000 metres in the crystalline bedrock of the Canadian Shield. The repository was originally planned to be in service by 2025 and to take some 40 years to fill, before being sealed and abandoned. However, no siting-related work was permitted before concept approval. The disposal concept was reviewed in a series of public hearings before a federally nominated panel of experts in 1996 to 1997. In March 1998, the panel recommended that although the technical aspects of the concept appeared to be satisfactory, there was insufficient public acceptance to allow siting to begin.

Among its recommendations, the panel stated that the government needed to take measures to achieve a broad public support. Furthermore, in the view of the panel, AECL should not be responsible for the management of the spent nuclear fuel. Instead, a new federal unit should be set up for this task. The unit should be solely financed by the waste producers and the board of directors should include representatives from all key stakeholders. Furthermore, a strong and active advisory council should be formed, with representatives from all interested parties. Finally, the panel concluded that the search for a specific repository site should not proceed until the measures recommended above had been implemented and a broader public acceptance of the proposed management concept had been achieved.

The Ministry of Natural Resources (NRCan) issued its response statement to the panel's report in December 1998. Whilst agreeing to the establishment of a semi-independent

agency (namely, an agency formally attached to a government department but with great freedom to act autonomously on most matters) to carry out future work on waste management and disposal, NRCan rejected the suggestion that siting work for a repository should be postponed. It also gave overall responsibility for establishing the new agency to the waste producers and owners, who will have total control over the makeup of the board of directors.

After a period of uncertainty, the Canadian parliament made a decision in 2002 which was based on the previous inquiry proposals. Under the Nuclear Fuel Waste Act (NFWA), the Nuclear Waste Management Organisation (NWMO) was formed. The NWMO is owned by the nuclear industry and it is to act independently from the AECL and the federal government. The legislation places responsibility with the NWMO to conduct a study within three years and to present a plan for the disposal of spent nuclear fuel to the federal government in 2005. An advisory group has been established to support the NWMO in its work. The results of the NWMO's most recent work have been reported (NWMO 2003). A special waste financing system has been set up.

1.3 Finland

1.3.1 Nuclear Power Programme

There are two commercial nuclear power plant sites in Finland, each currently with two reactors, one at Loviisa near to Helsinki, operated by the largely state-owned Fortum (former IVO), with two Russian-built VVER 440's and one at Olkiluoto, about 100 kilometres north of Åbo. The plant is operated by TVO, which is partly owned by the Finnish industry and the power companies, and has two Swedish-designed boiling water reactors. An application for a "decision in principle" was made to the government concerning a fifth reactor, to be built at one of the

two nuclear power plant sites. The application was approved by the Finnish government and by the Finnish parliament in 2002. It is planned to construct the reactor at Olkiluoto by a European consortium under French management.

1.3.2 Relevant Institutions

The two energy utilities are responsible for the safe management of waste and for the necessary research and development as well as for covering the costs of the whole operation. The objectives and schedules of waste management are set out in a government policy from 1983, with the regulatory basis set out in the 1988 Nuclear Energy Act and Ordinance. The Ministry of Trade and Industry (HIM) supervises waste management activities and the R&D work. It also finances research in order to maintain independent expertise. The Finnish Centre for Radiation and Nuclear Safety (STUK) is responsible for the regulation and supervision of the safety of nuclear facilities and review and assessment of waste management plans and activities. Facilities must be licensed by the government. Every year, the HIM decides the fees that the utilities must pay into the government-controlled Nuclear Waste Fund, designed to cover the future costs of waste management.

In the past, the two utilities applied different spent nuclear fuel management strategies. Fuel from Loviisa was shipped back to Russia for storage and reprocessing, whereas at Olkiluoto, the fuel was stored on site in a water pool storage facility. After the collapse of the Soviet Union, the procedure for the fuel from Loviisa changed so that this fuel is now also stored on site in the same way as Olkiluoto. According to an amendment of the Nuclear Energy Act in 1994, no spent nuclear fuel may be exported after 1996. IVO and TVO have formed a joint company, Posiva, which is responsible for all spent nuclear fuel disposal work.

1.3.3 Management of Nuclear Waste

Waste classification in Finland distinguishes between low and intermediate level waste and spent nuclear fuel which is not to be reprocessed.

LLW and Short-lived ILW

Both nuclear utilities have developed rock cavern repositories adjacent to their existing reactor sites, using vertical silos and/or horizontal caverns. These facilities were taken into operation in 1992 and 1998, respectively.

Spent Nuclear Fuel and Long-lived ILW

Following a decision in principle by the Government in 1983, which was formally ratified in 1988 in the Nuclear Energy Act and Ordinance, HIM decided in 1991 that deep disposal would be the chosen method for spent nuclear fuel.

A list of 85 possible repository sites was prepared between 1983 and 1985. After more detailed investigations, three sites were chosen: Olkiluoto (near the nuclear power plant) in Euraåminne municipality, Romuvaara in Kuho municipality and Kivetty in Äänenkoski municipality. According to the proposal in the "TILA-99 Safety Assessment", which was published in 1999, Posiva recommended a repository in accordance with a disposal concept similar to the KBS-3 concept in Sweden. The repository is to be located at a depth of 400 to 700 metres. The exact depth is to be determined by the conditions at the chosen site.

Posiva proposed that the ultimate design of the repository at the chosen site should not be decided until the start of construction. This would make it possible to take the actual geological conditions into consideration in the design and

construction work. The cost of the disposal of spent nuclear fuel is estimated at about EUR 850 million (about SEK 7,500 million).

In addition to these sites, Posiva also undertook detailed investigations near the nuclear power plant at Loviisa, on the island of Hästholmen.

In January 1998, Posiva submitted an Environmental Impact Assessment Programme to HIM. The programme was also circulated to Swedish, Estonian and Russian authorities, in accordance with the requirements of the Espoo Convention.

Following a series of public hearings in spring 1998, HIM presented its review of the programme to Posiva in June 1998. HIM required additional work to be carried out to estimate the radiological risk of a "zero alternative" (whereby the proposed facility is not built). Furthermore, HIM required that retrievability should be investigated as well as a number of alternative disposal methods. Posiva published the final Environmental Impact Assessment in May 1999 and then applied to the Government for a decision in principle concerning siting in Olkiluoto.

An international panel was appointed by STUK to review the safety assessment in Posiva's application for a decision in principle. The panel submitted its report in 1999 and, in accordance with this, STUK was recommended to conduct an additional number of review projects after the Government had made its decision in principle. The recommendation included regular reviews (every 3 to 4 years) of Posiva's research and development programme and the results achieved (as is also conducted in Sweden). The recommendation also included a review of Posiva's preliminary safety assessments as well as the application of important parts of the recommendations from independent reviews in order to increase the general public's confidence in the activity.

In January 2000, STUK issued its own report based on the panel's review and this supported Posiva's request to continue with its plans for Olkiluoto. Under the law, permission must be

obtained from the municipality for a proponent to construct a repository for spent nuclear fuel. Therefore, a referendum was held in the municipal council in the Euraåminne municipality in January 2000. The outcome was 20 votes for and 7 against a facility there.

All of the review material as well as the Ministry's summary became available to the public in spring 2000.

A decision in principle regarding a repository was made by the Government in December 2000 and the parliament made its decision in spring 2001.

In June 2002, Posiva announced its opinion to construct a tunnel for the first stage of the repository (ONKALO), which includes investigations and development work. The intention is for the investigation phase to continue until 2010 and to then construct the repository part. Deposition of the spent fuel is expected to start in 2020. In 2003, Posiva submitted an application for permission to start the construction of the facility.

In December 2003, Posiva presented a research programme for the disposal of spent nuclear fuel and nuclear waste in Finland. Such a programme will be presented once every three years in the future.

1.4 France

1.4.1 Nuclear Power Programme

At the end of 2003, there were 59 PWR reactors in France and one reprocessing facility in operation on the northern coast of Cap de la Hague. Nuclear power accounts for about 70 % of the electricity generation in France.

1.4.2 Relevant Institutions

Under legislation passed in 1975, a waste producer must arrange for the disposal of the waste, at its own cost, by a body approved by the public authorities. For this purpose, the Government set up a special organisation, the National Agency for Radioactive Waste Management (ANDRA) in 1979, within the Atomic Energy Commission (CEA). ANDRA is responsible for designing, constructing and operating long-term disposal facilities as well as undertaking all necessary studies to this end, and for promoting the application of technical specifications for waste treatment to be carried out by producers prior to storage.

ANDRA is financed by the waste producers, in particular Electricité de France (EdF), the CEA and fuel cycle companies, such as COGEMA which operates the reprocessing plant in la Hague. The activities of these companies are reviewed by the safety authorities which report to the Ministry of Industry and the Ministry of Health and a few other ministries. In 2001, the regulatory function was re-organised, so that safety and radiation protection merged under "Direction Générale de la Sûreté Nucléaire et de la Radioprotection – DGSNR". Furthermore, certain support functions were re-organised by merging the institutions responsible for research and development within the areas of safety and radiation protection, through the formation of a new organisation, "Institut de Radioprotection et de Sûreté Nucléaire – IRSN".

At present, ANDRA is not responsible for managing all of the radioactive waste, especially not the waste originating from reprocessing plants or material from defence-related work. However, in a report from 1999, a member of a parliamentary advisory group recommended that ANDRA should be given such responsibility as quickly as possible.

1.4.3 Nuclear Waste Management

In France, radioactive waste is classified into two categories – short-lived and long-lived – depending on the length of time that the waste poses a hazard. Long-lived waste is also classified as B waste (corresponds to long-lived ILW in other countries) or C waste (corresponds to HLW) and spent nuclear fuel. Most spent nuclear fuel is reprocessed.

LLW and Short-lived ILW (A Waste)

These waste categories are deposited in a near-surface facility in northeastern France.

Spent Nuclear Fuel and/or HLW (B and C Waste)

Originally, the intention was to reprocess all spent nuclear fuel. The low and intermediate-level waste (B waste), high-level vitrified waste and fission product waste (C waste) as well as spent nuclear fuel that is not reprocessed would be deposited in a deep repository after interim storage. However, in 1998, in an unpublished report to the Government, it was maintained that the future strategy had to take into account the fact that as much as one-third of the spent nuclear fuel generated in France would probably not be reprocessed as was previously anticipated. It was also suggested that France would immediately attempt to return to their countries of origin a part of the plutonium which was obtained in connection with the reprocessing of spent nuclear fuel from these countries.

Four areas with different geological conditions, such as clay, granite, slate and salt were selected for investigations and the development of a deep repository. However, all work was stopped at all four sites as a result of intensive public resistance. The Waste Act was supplemented in December 1991 and, under

this Act, ANDRA became a public service company reporting to the Ministry of Environment and the Ministry of Industry and was organisationally separated from the CEA. This measure was implemented in order to signal the independence of the organisation and to achieve increased transparency and openness.

Act No. 91-1381 defined the following three main areas, within which ANDRA would conduct research:

- Partitioning and transmutation
- Waste packaging and the effects of long-term surface storage
- Development of at least two underground laboratories in locations with different geologies.

A site should only be selected after local consultation with the participation of the general public. The law states that the identification of a site for an underground laboratory requires a public hearing and government approval. It should not be possible to propose a site for a repository until 15 years after the entry into force of the Act and, even in this case, public review and licensing is required. Furthermore, it is the responsibility of the ministries concerned to keep the parliament continuously informed of progress. It is ANDRA's responsibility to present a final status report in 2005 and a proposal for the siting of a repository in 2006.

A site for a facility – Installation Centrale d'Entreposage (ICE) – for long-term interim storage of spent nuclear fuel has not yet been selected. The facility will probably be of the pool-type design, like the Swedish facility, CLAB.

To follow progress in research within these areas and to report to the parliament, the law stipulates that a CNE (National Evaluation Commission) should be set up. The CNE holds regular hearings on the main topics. ANDRA supplements these hearings with presentations upon request. Reports are submitted to the Government on an annual basis and they are evaluated by the Parliamentary Commission on the Assessment of Scientific

and Technological Choices (OPECST). The CNE is also responsible for the organisation and submission of the overall repository project report due in 2005.

CNE consists of 12 people, of which six are qualified experts appointed by the OPECST. At least two of these are from abroad (currently from Sweden and Spain). Two experts are appointed by the Government and four by the French Academy of Sciences.

Through the legislation passed in 1991, a new position was created – a "mediator" – in order to simplify site selection and the development of underground laboratories. The member of parliament, Christian Bataille, was appointed to the position in 1992. Bataille was given the mandate to use up to 60 million francs (about SEK 80 million) per year for support to municipalities which are positive to further investigations. Bataille's task was to consult with selected politicians, with the public and with local environmental organisations. In December 1993, he presented a report, where four areas were identified for further studies, of which three had sedimentary bedrock and one had crystalline bedrock. In 1994, ANDRA announced that a number of sites had been identified as suitable. One of them was adjacent to two of the previously identified areas. Detailed site investigations were started this year and a total of 15 holes were drilled at a depth of up to 1,100 metres at three different sites.

Since the drilling was completed, meetings have been held with public hearings between February and May 1997. In December 1998, the Government gave ANDRA permission to build an underground laboratory in a clay formation under one of the selected sites, the site at Bure in northeastern France. At the same time, two other sites were eliminated for geological reasons, one with marl bedrock near to Marcoule in the department of Gard and one with granite bedrock in Vienne. According to a government decision in August 1999, permission was obtained for the construction and operation at Bure up to 2006. However, the Government also gave ANDRA the task of locating additional candidate sites with granite bedrock before

2002. In spite of the fact that 20 such sites were investigated in Bretagne and the Massif Central, the project was terminated in June 2000, largely due to excessive resistance by the public at all sites.

Excavation of the first shaft at Bure began in early September 2001. Due to an accident in 2002, work was delayed and was later resumed in April 2003. A number of geotechnical, hydrogeological and other boreholes have been drilled and instrumented so as to allow the impact on the rock of the shaft sinking process to be studied. A number of geophysical measurements are to be conducted as the work continues and these will be correlated with measurements conducted in 1999 on the ground surface. A number of investigation niches will be established on different levels as the shaft goes deeper. Some of these will be located in clay at possible repository depth.

1.5 Germany

1.5.1 Nuclear Power Programme

In November 2003, there were 18 nuclear reactors in operation in Germany. None of these were located in the former German Democratic Republic (DDR), after closure of the nuclear power plant in Rheinsburg in 1990 and of the four reactors that were in operation (and a fifth under construction) in Greifswald.

In a coalition agreement in October 1998, the Social Democrats (SPD) and the Green Party agreed on a phase-out of nuclear power in Germany. After lengthy negotiations, an agreement was signed in June 2000 (the June 2000 agreement) between the Government and the power utilities on nuclear policy. According to the agreement, all reactors are to be shut down at the end of their expected lifetimes. Each reactor will be allocated a maximum amount of electricity which can be generated, thus allowing capacity to be added to newer, more efficient reactors, thereby extending their operation and allowing

closure of the less efficient reactors. The amount of electric power agreed on roughly corresponds to an operating lifetime of 32 years. No new reprocessing contracts will be allowed and, after July 1st, 2005, all spent fuel will be subjected to direct disposal. Only reprocessing contracts effective up to that time will be honoured. A new Atomic Energy Act was passed in 2002, based on the new policy.

1.5.2 Relevant Institutions

When the Federal Office for Radiation Protection (BfS) was established in 1989, it assumed responsibility for the safe disposal of all types of radioactive waste from the Federal Institute for Science and Technology (PTB). A special company, the German Company for the Construction and Operation of Waste Repositories (DBE) was set up as a "third party" (contractor) to carry out the tasks assigned to it by BfS.

According to the new Atomic Energy Act from 2002, the waste producer is responsible for the interim storage of spent nuclear fuel at each reactor site. Applications for permission to construct such facilities have been submitted. Twelve such facilities are expected to exist by 2005 for use as storage facilities for 40 years. In the case of some of the reactors, other solutions are being planned for the storage of spent nuclear fuel.

According to the new Atomic Energy Act, the federal governments are responsible for all licensing. Previously, the intention was for all spent nuclear fuel to be reprocessed. An amendment was added in 1994 which also allowed direct disposal of spent nuclear fuel. Some utilities have already cancelled reprocessing options after 2000.

1.5.3 Nuclear Waste Management

Since the plan is to dispose of all of the waste, independent of category, in a deep repository, the waste is basically classified into two categories, namely heat-generating and non-heat-generating. According to the agreement between the coalition parties in 1998, it is enough for a single geological repository to deposit all types of radioactive waste. This repository will be located in rock, of a type that has not yet been decided, and at a site that has not yet formally been identified. This will naturally substantially affect the execution of the development programme for a repository.

LLW and ILW (Non-Heat-Generating)

Until recently, non-heat-generating waste (with alpha emitter concentrations up to 4.0×10^8 Bq/m^3) were disposed of in the ERAM facility (Endlager für Radioaktive Abfälle Morsleben) at the Bartensleben salt mine. According an order issued in September 1998 by the Superior Administrative Court of the state of Saxony-Anhalt, BfS must immediately stop further radioactive waste disposal in the eastern emplacement field of the Morsleben repository. In November 2001, BfS announced that measures had to be implemented to close the repository in a safe manner.

A licence application for a new deep repository for non-heat-generating low and intermediate-level waste (LLW/ILW) at the abandoned Schacht Konrad iron-ore mine near Salzgitter in Lower Saxony was submitted as long ago as 1982. After the longest Public Inquiry in German history – between September 1992 and March 1993 – the Lower Saxony government (headed at the time by the present Federal Chancellor) continued to refuse to grant a licence for the facility, against the wishes of the Federal Authorities. According to the June 2000 Agreement, the responsible authorities are to conclude the licensing procedure

for Schacht Konrad as legislated. BfS withdrew the application for the immediate enforcement of the licence in order to allow a court examination on the merits of the main proceedings. The Ministry of Environment in Lower Saxony granted permission to Schacht Konrad in May 2002. A number of legal processes are underway, initiated by repository opponents. According to the agreement of 2002, only a repository for all types of waste is to be built and this also means that the future for Schacht Konrad is uncertain.

Spent Nuclear Fuel and/or HLW (Heat-Generating)

Before the 1994 amendment of the Atomic Energy Act, the only alternative for spent nuclear fuel was reprocessing which took place in France or the UK. Plans to establish a reprocessing plant in Wackersdorf were abandoned in 1989 due to intense, sometimes violent, opposition.

Repatriation of existing vitrified HLW began in May 1996, following the licensing of the interim storage facility at Gorleben in Lower Saxony in early June 1995. According to the new Atomic Energy Act, the waste producer is responsible for building the interim storage facilities for spent nuclear fuel at the reactor sites. The licence applications are currently being evaluated.

Until recently, it was assumed that Germany would develop a deep repository for HLW (and possibly also for spent nuclear fuel) in a suitable salt formation. The salt dome in Gorleben was selected as the only candidate site. However, according to the June 2000 agreement, the entire disposal problem will be re-evaluated. The deep disposal method is preferred, although more types of rock must be investigated before a decision on siting is made.

As it became clear that several potential repository sites with other types of bedrock had to be investigated, BMU formed a new committee, AKEND, in February 1999, with the task of

developing a new procedure for site selection. A programme was presented in three phases in order to obtain a new siting procedure. In the first phase, proposals for the new procedure will be formulated. In the second phase, a political and legal basis for this procedure will be obtained and decided upon. The third phase will consist of implementation.

Phase 1 has concluded with AKEND, in 2002, submitting its report to the Government. Phase 2 is in progress, through discussions with different stakeholders. This discussion is expected to be completed in 2004. During Phase 3, a site selection process will be started. However, there are indications that difficulties have arisen: The waste producers want Gorleben to be included as an alternative while BMU would like to exclude it.

1.6 Japan

1.6.1 Nuclear Power Programme

Japan currently has 54 reactors in operation (2003), owned by Japan Atomic Energy Company and nine other independent electricity companies. However, several of these reactors have been closed down due to technical problems. The need for an additional 13 reactors by the year 2010 has been announced by the Japanese industry. The only breeder reactor in the country, the experimental reactor in Monju, is currently closed down due to an accident which occurred in December 1995 and which led to a loss of coolant (sodium).

1.6.2 Relevant Institutions

The Atomic Energy Commission (AEC) and the Nuclear Safety Commission (NSC) determine the basic guidelines for radioactive waste management. The AEC is responsible for the

planning and determination of basic policy, whilst the NSC is responsible for safety criteria and regulations.

The Ministry of Economy, Trade and Industry (METI) and the Ministry of Education, Culture, Sports, Science and Technology (MECCST) issues licences for waste management and disposal based on the Act for the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors. A new Special Radioactive Waste Final Disposal Act to deal with HLW disposal, was passed (2000). The Act includes stipulations that a plan for disposal should be presented every fifth year, with a complete re-evaluation after ten years. Through the Act, a new implementation organisation was also set up for work on site selection, construction, operation etc. of a deep repository. This organisation is known as NUMO. With the Act, a financing system for nuclear waste was also established.

The Japan Nuclear Cycle Development Institution (JNC) is responsible for work on advanced reactor designs, fuel cycle technology and R&D associated with HLW disposal. This organisation replaced the larger Power Reactor and Nuclear Fuel Development Corporation (PNC) in 1998, which was restructured after a number of incidents at several of its sites.

1.6.3 Nuclear Waste Management

The current Japanese programme includes reprocessing of spent fuel and utilisation of the plutonium and enriched uranium, including the development of Mixed Oxide (MOX) fuel fabrication. Previously, spent fuel has been reprocessed abroad, although an experimental reprocessing facility was in operation at PNC's Tokai site until March 1997, when there was an explosion and fire. The facility was restarted in November 2000.

A commercial-scale reprocessing facility has been under construction since 1993 at Rokkasho, in Aomori Prefecture, which is also the site of an operational LLW repository and a storage facility for returned HLW (from reprocessing abroad).

Japan Nuclear Fuel Service Co. Ltd (JNFL) manages both of these facilities.

LLW and Short-lived ILW

These types of waste are disposed of in a near-surface facility at Rokkasho in the Aomori Prefecture. The facility began operations in December 1992. The repository was co-sited with the reprocessing plant mentioned above and this is expected to start operation in 2005.

Spent Fuel and/or HLW

In its 1994 long-term plan, the AEC stated "some time in 2030 or no later than by 2045" as the time when a waste disposal facility would be granted an operating licence and taken into operation. The 1994 long-term plan repeated a previously presented plan to create, in around 2000, a special organisation to implement the disposal programme. In agreement with this and the new Waste Act, the Japanese utilities applied, in October 2000, to the Government for permission to establish such an organisation. The Government immediately approved the proposal and the Nuclear Waste Management Organisation (NUMO) was formed in October 2000, with its headquarters in Tokyo.

It is expected that a number of siting alternatives for a repository will be investigated starting in 2001. A number of sites for preliminary site investigations will be selected in 2004 and a few sites will then – in around 2010 – be selected for detailed characterisations. It is expected that the ultimate site will be decided upon in around 2025.

In August 1989, it was decided that an underground rock laboratory would be constructed at the disused Kamaishi mine (iron/copper) in the Iwate Prefecture, in spite of the strong local

opposition which is delaying the start of the project. The work was completed in March 1998 when the contract with the municipality expired.

An experimental shaft, some 150 metres deep, in a sandstone formation containing uranium and covering crystalline bedrock has also been used since 1986 in the Tono area in the Gifu Prefecture in central Japan.

Permission to construct a new underground facility in Mizunami within the same area was granted in December 1995. Surface-based investigations started late in 1997 and it is planned that the investigations will continue for up to five years. This site will take over Kamaishi's role as the most important site for research on crystalline bedrock and like the facility it has been characterised as a facility which is only used for research.

After many years of discussion between JNC, the Hokkaido Prefecture and Horonobe city, these three parties reached an agreement in November 2000 on an underground laboratory in Horonobe on condition that it would not be used for radioactive material. A detailed research programme is being prepared and investigation drilling will start shortly. The underground laboratory in Honorobe is intended to be a centre for research on sedimentary rock types, while Mizunami has a corresponding role with respect to granite.

In Japan, as in many other countries, there is public opposition to nuclear power and nuclear waste and attempts have been made to respond to this resistance by providing information and by conducting dialogue and opening up possibilities for public influence over the work of NUMO and other bodies.

1.7 Russia

1.7.1 Nuclear Power Programme

In May 2003, there were 30 nuclear reactors in operation in Russia. 11 of these were of the RBMK type, 14 were VVER reactors, 4 were BWRs and one was a breeder reactor. Four reactors have been decommissioned. Furthermore, Russia has had 118 research reactors in operation, although many have now been shut down. Apart from the nuclear power plants, there are a number of facilities for uranium mining, fuel fabrication, reprocessing, isotope production etc. Furthermore, military activities are conducted, including plutonium production and nuclear reactor-powered ships for the Northern Fleet in the Kola Peninsula and the Pacific Fleet around Vladivostok. There is a commercial reprocessing plant at Chelyabinsk (now referred to as Ozersk). Another was under construction at Krasnoyarsk (now referred to as Zheleznogorsk), but work has now been terminated. There are also a number of reprocessing facilities for spent nuclear fuel from military activities.

1.7.2 Relevant Institutions

Previously, responsibility for radioactive waste was split between four different ministries, namely

- The Ministry of Atomic Power (Minatom) had the responsibility for waste from civilian nuclear power and from the production of nuclear weapons. It was founded in 1992. There are approximately 150 companies associated with Minatom, including 15 “closed cities”, where a total of 13 plutonium-producing reactors have been operated. Some of these are still in operation. Rosenergoatom is responsible for Minatom for operation of all nuclear power plants and management of the associated waste.

- The Ministry of Defence had the responsibility for waste from nuclear-powered naval ships.
- The Ministry of Marine Transport was responsible for waste from nuclear-powered icebreakers.
- The Ministry of Construction and Housing Policies which is managing the special "Radon" facility (for the treatment and disposal of low and intermediate-level waste) was responsible for the management of radioactive waste generated in industry, medicine, research etc.

Gosatomnadzor (GAN) is the authority that regulates activities in Russia. According to the Act on Nuclear Energy, from November 1995, this authority is responsible for the licensing and inspection of all nuclear power utilities, including military utilities. According to the Act, all companies that produce and handle active waste must apply for permission for a new operating licence. In the case of certain companies, these licences are not yet ready.

1.7.3 Nuclear Waste Management

LLW and Short-lived ILW

Proposals have been made to develop a repository for military LLW in an area in northern Russia, with permafrost, and a deep repository for industrial (non-power reactor) waste near to Moscow in salt or clay. GAN explained at a later stage that the idea of constructing a repository in permafrost is being abandoned. Russia is not currently looking for a site for the disposal of LLW and ILW waste from reactor operation. Such waste is currently being stored at the nuclear power plants.

Spent Nuclear Fuel and/or HLW

From the start, Russia planned to only reprocess spent nuclear fuel from certain reactor types, namely VVER-440, VVER-1000, BN-350 and BN-600. No plans exist to reprocess RBMK fuel. VVER-440 fuel is being reprocessed in the RT-1 facility, operated by the Majak group Ozersk in southern Ural. It was taken into operation in 1948 and was used for military fuel but was modified in 1976 so that civil fuel could also be reprocessed. The construction of RT-2 facility in Zheleznogorsk for the reprocessing of VVER-1000 fuel was interrupted in 1989 and was completely stopped in 1998, for technical and financial reasons.

RBMK fuel is stored for three to five years in the reactor hall pools and then transferred to special interim storage pools at the nuclear power plants. Such interim facilities only exist at the stations in Leningrad, Kursk and in Smolensk.

Liquid waste, including HLW of different origins has been injected into deep boreholes in Ozersk, Zheleznogorsk, Dimitrovgrad and Seversk for many years.

The Institute of Geology, Ore Deposits, Petrography, Mineralogy and Geochemistry (IGEM) is responsible for developing a strategy for the treatment and disposal of spent nuclear fuel and HLW. Furthermore, the Khlopin Radium Institute in St. Petersburg has been given the task of developing a better system for waste treatment from the reprocessing in Zheleznogorsk (if RT-2 is put into operation).

Several different deep disposal concepts are currently being studied. Since the authorities do not consider that retrievability is desirable, both mining shafts and deep boreholes may be used for disposal.

Since, as before, the aim is to concentrate the activity and to site it geographically near the sites where waste is produced, interest has centred on the areas around the Zheleznogorsk and Ozersk facilities.

The Khlopin Radium Institute in St. Petersburg has investigated sites around Zheleznogorsk. Other institutes have studied basal and granite bedrock in the Baltic Shield. Of the eight sites which were originally considered suitable for further investigation, two candidate sites remained in 1996. One of these has been selected and will be further studied on condition that the activity can be financed. The work has been supported by the IAEA's Expert Contact Group and funds have been made available from PNC in Japan, DOE in the USA and authorities in Finland.

The work at Ozersk has been financed by the former USSR Academy of Sciences. A site within the boundaries of the complex was selected and four holes were drilled to a depth of at least 900 metres. The aim is to build an underground laboratory to conduct experiments and in-situ characterisation. However, recent studies show that it can be difficult to site a repository there due to uncertainties concerning the tectonic conditions. The work in this project is being conducted as part of an EU-supported PHARE programme and contains technical contributions from several organisations in the west. So far, IGEM has identified three possible disposal zones at the same time that it was dubious to the suitability of the originally selected site.

The treatment and disposal of spent fuel and other waste from repository-related industry, especially the large quantities from reactor-powered submarines, have also become an urgent problem. Much of this waste – in the from of spent fuel and different types of liquids – is stored under unsatisfactory conditions, either at the bases of the Russian Northern Fleet on the Kola Peninsula around Murmansk and Arkangelsk or at the Pacific Ocean bases near to Vladivostok. At the Northern Fleet bases, it is expected that up to 48,000 fuel elements with spent nuclear fuel have been deposited in storage facilities that are leaking and in poor condition.

In February 1998, an IAEA working group, the Contact Expert Group, reported that the waste management in the

Russian northwestern area was in such poor condition that the area had been prioritised for global co-operation projects.

Three alternatives have been examined: A new wet storage facility, a new dry storage facility or renovation of the existing wet storage facility. In the case of a dry storage facility, according to an agreement in February 1998, about USD 50 million would be placed at the disposal of Sweden, Norway, France and Russia. To this must be added EU support, which was confirmed in May 1998.

In July 1998, the USA stated that it was prepared to pay for the cost of the transport of spent nuclear fuel from Vladivostok to Ozersk since it was concerned about the inadequate safety at the existing facilities.

The Kola Mining Institute has conducted a number of studies concerning the development of underground repositories for the Northern Fleet HLW. A proposal was presented already in 1994, which included a four-year programme for a deep repository on the Kola peninsula. This would be of the conventional type and would be located in hard crystalline bedrock. An experimental facility would first be constructed although it seems as though only very limited work has been conducted so far.

In April 1999, it emerged that a US company, Non-proliferation Trust, Inc. (NPT) had been formed to develop an international interim storage facility for spent nuclear fuel at Zheleznnogorsk. This facility was intended to have a capacity of about 6,000 tonnes of uranium and a lifetime of at least 40 years. The earnings from this activity would be used to clean up Russian's military defence facilities in order to secure the handling of up to 50 tonnes of plutonium which exist and to support the defence project that is under way. However, for this project to be realised, Russian legislation must be amended to allow the import of foreign waste.

In July 2001, President Putin signed an act that allows the import of foreign spent nuclear fuel to Russia. The fuel can be stored there until 2021, when reprocessing can start in the reprocessing facility that is under construction at Zhelez-

nogorsk. The imports must be approved by a special commission set up in 2002.

1.8 Switzerland

1.8.1 Nuclear Power Programme

There are currently five nuclear reactors in Switzerland, divided into four power stations. Furthermore, there are six research reactors. A moratorium means that no new reactors will be built for the time being. However, this situation may change if a revised Atomic Energy Act is passed.

1.8.2 Relevant Institutions

In Switzerland, nuclear power producers are responsible for the nuclear waste generated. In 1972, the power utilities and the Swiss state which is responsible for waste from medical, research and industrial activities formed NAGRA, which is responsible for radioactive waste disposal and related treatment. ZWILAG in Würenlingen is responsible for the central interim storage and the Co-operative for Nuclear Waste Management Wellenberg (GNW) runs the project which aims at building a repository for LLW and ILW in Wellenberg (see below). The utilities are themselves responsible for transport, reprocessing of spent nuclear fuel and for waste preparation and interim storage at the plants.

The federal government receives support from the Federal Interagency Working Group on Nuclear Waste Management (AGNEB), from the Federal Commission for Safety in Nuclear Installations (KSA) and by the Federal Commission on Nuclear Waste Management (KNE) which, in turn, is a sub-committee of the Federal Geology Commission (EGK).

The responsible authority for radioactive waste in Switzerland in the Swiss Federeal Nuclear Safety Inspectorate (HSK), which reports to the Federal Energy Office (BEW). In turn, BEW is part of the Federal Department of the Environment, Transport, Energy and Communication (UVEK).

Due to the fact that public acceptance for the siting work is slow to obtain, the federal government has appointed several working groups over the past few years. The question of "indefinitely monitored retrievable storage" or "passively safe geological disposal" has been discussed. For this reason, the federal government discussed, in June 1999, the appointment of an expert group (EKRA) which would work with different disposal concepts for radioactive waste. This group has developed a concept based on monitored long-term retrieval storage.

EKRA came to the conclusion that geological disposal, which isolates the waste, is the only method that meets the requirements on long-term safety. However, the general public's requirements that the waste must be accessible (retrievable) must also be taken into account. Therefore, EKRA suggests a stepwise process which includes a phase of monitoring and a higher degree of accessibility before the geological repository is closed. In addition to the large-scale repository, the concept also includes a pilot facility, where a small part of the waste is placed in a small but representative copy of the full-scale facility. The facility is designed allow the waste to be retrieved from the pilot facility if its performance does not meet expectations. Naturally, the idea of a monitored long-term geological repository must be adapted to the geology at the site and to the waste types that occur in a certain repository.

1.8.3 Nuclear Waste Management

Until the repository for different types of waste has been built, most of the waste will be stored in the ZWILAG facility in

Würenlingen in Canton Aargau in northern Switzerland. ZWILAG was taken into operation in April 2000.

LLW and Short-lived ILW

Due to the high population density in Switzerland, there are no plans to construct repositories near the surface for short-lived LLW or ILW. According to the plans, this type of waste will be disposed of in bedrock in a suitable rock formation at a depth of several hundred metres and with repository access possibilities via a horizontal tunnel. NAGRA found a suitable site in 1993, namely Wellenberg in Canton Nidwalden in central Switzerland. The municipality accepted the project in two different referendums in 1994 with 63 % and 70 % of the votes, respectively. In spite of this, a referendum in the Canton – concerning the mining concession required by law in the Canton – led to a vote of rejection.

Since this, the geological suitability of the site has once again been evaluated, which was also confirmed by the Federal Safety Inspectorate. GNW decided to limit its application in the first step, to include an extended period of monitoring and to apply a stepwise process for repository closure. Bearing in mind this, the federal government started a new discussion with the Cantonal government. The discussion led to an agreement in June 2000.

According to the agreement, an expert group from the Canton (KFW) was established to prepare and subsequently monitor the project. The KFW started its work in July 2000. After a series of negotiations with GNW, with NAGRA (which functions as a scientific and technological competence centre from GNW) and with the Nuclear Safety Inspectorate (HSK), the modifications that would be achieved in the project were agreed. These were described by GNW in a report that was submitted in November 2000. In December 2000, KFW stated that it expected that the report was satisfactory and the Cantonal

government stated that it was willing to receive a new application from GNW for a mining licence, limited to the research tunnel.

However, in September 2002, a referendum in Canton showed that there was strong resistance, also to this project. The Government therefore explained that Wellenberg was no longer under consideration and that no new attempts to site a repository at Wellenberg would be made.

Spent Nuclear Fuel and/or HLW

For about one-third of the spent nuclear fuel, the utilities have a contract with reprocessing facilities in France and Great Britain. However, a new Atomic Energy Act does not allow any reprocessing to be conducted beyond the contracts that already exist. Vitrified HLW will be returned to Switzerland for interim storage in ZWILAG and ZWIBEZ (storage facility adjacent to the Beznaureaktorn). The first transport from France arrived in 2001. Spent nuclear fuel will also be put in interim storage at the two facilities just mentioned, pending disposal.

Swiss law requires that radioactive waste should be permanently disposed of in a geological repository. As a condition for the continued operation of existing nuclear power plants or the construction of new plants, a Government ruling of 1979 called for a project demonstrating the feasibility of the safe disposal of all waste generated in Switzerland to be submitted by 1985. This project, Project Gewähr, was submitted to the federal government by 1985.

In June 1988, the project was approved. The project was based on the use of a crystalline host rock, was approved by the Government. Although the safety case and the technical feasibility of repository construction were fully accepted by the safety authorities, the authorities did not consider that the existence of a sufficiently extensive body host rock with the required properties for making the safety case was adequately shown. Since Project Gewähr was based exclusively on

crystalline bedrock, the safety authorities requested that future work should also include other alternatives.

NAGRA follows a strategy with three phases. Phase 1 comprises regional studies based on a series of deep boreholes with accompanying geological general studies. Phase 2 comprises a detailed characterisation (from the ground surface) of small areas. Phase 3 includes underground investigations.

Crystalline Basement Alternative

The regional fieldwork (Phase 1) was completed in 1989 and the report was presented in 1994. The most important parts of the report include a summary of geological information and a performance assessment.

At the end of 1994, NAGRA applied for federal permits to conduct two site investigation programmes, one for opalinus clay in Zürcher Weinland and one for crystalline basement in Böttstein/Leuggern. The programme proposals were examined by the federal authorities and their experts.

An underground laboratory in crystalline basement – the Grimsel facility in central Switzerland – has been in operation since 983. When this laboratory was constructed, a horizontal tunnel system was constructed from an existing hydro power facility at the Grimsel pass. An extensive test programme including geology, rock mechanics etc. has been conducted since 1984 with wide international participation.

Opalinus Clay Alternative

The Opalinus Clay (OPA) had been considered as a potential host formation prior to Project Gewähr, in 1979. Desk studies carried out in 1986/87 had also evaluated six other potential sedimentary formations and the options were narrowed down to two final candidates, namely the OPA and the Lower Freshwater

Molasse (USM). The latter can reach a thickness of up to 4 km and contains units of high clay content and low permeability. *(Molasse is a sedimentation of soft rock types along a newly formed mountain chain).*

Two areas were selected for studying OPA. These, like the crystalline basement areas are in the northern parts of Switzerland. As a part of the Phase 1 programme, a regional two-dimensional seismic study, extending over 230 kilometres, was conducted from 1991 to 1992.

Based on these investigations, in 1994, a preliminary evaluation of the sedimentary alternatives was conducted in co-operation with the authorities. USM was given second priority and, since then, has been considered as a reserve option. The eastern OPA area was given first priority. After additional selections in the region, the area at Zürcher Weinland in the Zürch Canton was identified for further investigation.

These further investigations (Phase 2) comprised a three-dimensional seismic study of an area of about 50 km^2 and a deep borehole at Benken. In Zürcher Weinland, sedimentary rock types are almost horizontally contained and the opalinus clay is of an adequate thickness (100-200 metres) at a suitable depth (400-900 metres below the surface). Since these sediments were formed, the region has almost not been exposed to any tectonic movement at all and the original sedimentation are still undisturbed, which means that the site seems to be an ideal candidate site.

Another important information source with respect to the properties "in situ" at the opalinus clay and clay in general is the work conducted at the Mont-Terri rock laboratory in the Jura Canton within the framework of an international project under the management of Switzerland's hydrological and geological surveys. This facility is located near to an investigation tunnel (for a motorway) which intersects the clay at a depth of about 300 metres.

The Next Milestone in the Swiss HLW Programme

The next milestone in the Swiss HLW programme will be the conclusion of a project called "Project Entsorgungsnachweis". The aim of the project is to be able to demonstrate the feasibility of disposal of HLW in Switzerland. This means that it must be possible to show that there are sufficiently large rock volumes with suitable properties for constructing a repository, and that the requirements on safety and constructability can be met. Due to the good accessibility from the ground surface and the positive results so far obtained, this project will be conducted focusing exclusively on constructing a repository in the Opalinus Clay. However, this does not mean that crystalline basement has been excluded as an alternative for the ultimate construction of a repository for HLW.

The most important reports from Project Entsorgungs-nachweis will, together with other relevant information, be submitted to the safety authorities for evaluation. A decision from the authorities regarding how to proceed is not expected until around 2006 at the earliest.

1.9 United Kingdom

1.9.1 Nuclear Power Programme

The UK currently operates 19 Magnox reactors, 14 advanced gas cooled reactors (AGRs) and one pressurised water reactor (PWR). British Energy Generation is responsible for the operation of the AGR and PWR reactors. British Energy Generation comprises the formerly state-owned companies, Nuclear Electric and Scottish Nuclear Corporation. These companies merged in January 1999. The Magnox reactors are still state owned and operated by Magnox Electric which, in turn, was taken over by British Nuclear Fuels Ltd (BNFL) in 1998. BNFL has announced that it intends to successively by

2012, shut down the Magnox reactors. BNFL and British Energy have also started a study on the phase-out of the AGR reactors.

1.9.2 Relevant Institutions

The regulatory authority in the UK is the Nuclear Installations Inspectorate (NII), assisted by the Environment Agency (EA) and the Ministry of Agriculture, Fisheries and Food. Since July 1997, NII has also been responsible for regulating waste held on sites operated by the Ministry of Defence. In Scotland, the EA's responsibility has been assumed by the Scottish Environmental Protection Agency (SEPA).

The Government is advised on waste management issues by the Radioactive Waste Management Advisory Committee (RWMAC), whose members are appointed by a minister. These come from the nuclear industry, academia, public bodies (health authorities etc.) and, more recently, a number of independent experts have been appointed. In 2003, a new Committee on Radioactive Waste Management (CoRWM) was appointed to advise the Government on issues relating to disposal of radioactive waste. It seems that both of these committees will exist in parallel but with different foci of activities.

A major commercial reprocessing facility run by BNFL exists at Sellafield. A smaller facility is located in Dounreay in northern Scotland (where the now shut down experimental breeder reactor was located). The operation of the Dounreay facility was managed by the United Kingdom Atomic Energy Authority (UKAEA), built to reprocess specialist fuels and highly enriched uranium from research reactors. The facility in Dounreay will successively be taken out of operation.

Currently, spent nuclear fuel from the AGR and Magnox reactors are placed in pools at the nuclear power plants to cool off. This will also apply to the fuel from the pressurized water reactor at Sizewell. The fuel will then be transported to Sellafield for a long period of interim storage and possible reprocessing.

Dry storage of Magnox fuel has only been conducted at one of the plants. Design problems led to the corrosion of the fuel canisters.

The Thermal Oxide Reprocessing Plant (THORP) in Sellafield was taken into operation in 1994 and its purpose is to reprocess about 7,000 tonnes of spent oxide fuel (from AGRs, PWRs, LWRs etc.) by the year 2005.

The Government has taken the initiative to clarify the responsibility for existing spent nuclear fuel and nuclear waste, "Managing the Nuclear Legacy". A new authority, the Liabilities Management Authority, has been created. The authority will be responsible for waste from previous activities at BNFL, UKAEA etc. A new organisation, National Decommissioning Agency, will start to work in 2004 on issues concerning the nuclear power plant decommissioning.

1.9.3 Management of Nuclear Waste

LLW and ILW

The responsibility for short-lived LLW and HLW lies with the producer of the waste. The Nuclear Industry Radioactive Waste Management Executive (called UK Nirex), is responsible for the disposal of long-lived ILW (since 1982), future LLW and short-lived ILW. NIREX was formed in 1981 by all of the companies in the nuclear power industry and each of these is represented on the board. Nirex has never been responsible for HLW.

A commercial repository near to the ground surface for LLW and short-lived ILW has been operated by BNFL in Drigg, near Sellafield, since the 1960's. Nirex originally proposed that, when this repository was full, disposal should be continued near to the ground surface for these types of waste at another site and that an abandoned anhydrite mine for a deep repository for long-lived waste should be used as a repository for long-lived ILW.

However, due to opposition from the local population, the mine project was abandoned in 1985.

When three other sites were proposed in 1986 for an LLW repository near to the ground surface, as a complement to the originally exclusive candidate, there was once again intense local opposition with extensive civil disobedience. These site proposals were abandoned in 1987, just prior to the general elections. It was then suggested that a disposal solutions should be found for all LLW and ILW. This proposal was then soon modified and the alternative deep proposal for long-lived ILW was taken up again, while LLW and short-lived ILW would be sent to Drigg.

After two years of nationwide mapping, two sites for further investigation were selected in 1991, both near the existing nuclear facilities at Sellafield and Dounreay. A list of a further ten sites were established but these have not been published.

The investigation work focussed on Sellafield in 1993 and over GPB 250 million was used for characterisation from the ground surface. In 1992, Nirex announced its attention to construct a Rock Characterisation Facility (RCF). This would allow a limited development and experimental activity to be conducted before a large-scale repository could be constructed. Nirex requested permission to start construction of the RCF in 1994. However, this request was rejected after a hearing in 1995. The inspector granting the licence announced that Nirex had not been able to convince him that their geological interpretation was correct. Furthermore, he considered that the design was poor and not well thought through. Nirex immediately stated that they would withdraw from Sellafield but retained the right to return in the future.

In November 1997, the UK House of Lords Select Committee on Science and Technology, HoL) announced that an extensive, independent hearing would be conducted concerning all issues relating to the handling of nuclear waste, including the future role of Nirex. The verbal hearing started in February 1998 and the final report was published in March 1999.

The report concentrated on the development of waste management in phases, especially for LLW and ILW and resulted in a proposal to at least develop a repository for long-lived ILW. The report also emphasised the need, within 15 to 25 years for a facility near the ground surface as a replacement for Drigg.

Spent Fuel and/or HLW

According to current plans, domestic HLW is to be stored at Sellafield for cooling for 50 to 100 years, after which time the Government is to make a decision concerning how it will be disposed of. In the past, the only certainty as regards disposal was that it would involve deep disposal, in a rock type yet to be determined, at a site yet to be determined.

Until 1981, investigation work was conducted with trial drilling and other research for a possible disposal. A certain investigation into crystalline basement and sedimentary rock occurred at the end of the 1970's, including detailed studies close to Dounreay. This system was abandoned due to wide opposition on the part of the public and now only general research is conducted. Concepts concerning waste disposal at great depths were once again included in proposed legislation which was abandoned by the Government in 1995, although no special programme was presented. A timetable for the development work for the repository was presented to the Government in 1999 although no significant work has so far been conducted.

As was previously mentioned, a new committee was appointted, "Committee on Radioactive Waste Management", CoRWM, in 2003. This committee is to provide advice to the Government on questions concerning the final disposal of radioactive waste and prepare a programme. The programme is to be presented in 2005.

1.10 USA

1.10.1 Nuclear Power Programme

The USA currently has 104 nuclear power reactors in operation, located at over more than 80 sites. In 2001, the Department of Energy, DOE) invited the nuclear power facilities to show their interest in the construction of new nuclear power plants in the USA (which would be the first for more than 25 years). Several companies have evinced interest in this.

1.10.2 Relevant Institutions

In the USA, nuclear waste disposal is paid for by the nuclear power producers. However, the responsibility for implementing the disposal of spent nuclear fuel and HLW lies with the DOE, and more specifically, the Office of Civilian Nuclear Waste Management (OCRWM). According to contracts with the nuclear utilities as a result of the 1982 act on nuclear policy (Nuclear Waste Policy Act, NWPA), the OCRWM was to have managed and disposed of the nuclear utilities' spent fuel for final disposal in January 1998.

The Nuclear Regulatory Commission (NRC) is the main regulatory authority for the disposal of HLW. With respect to transport of HLW, the NRC shares the responsibility with the Department of Transportation (DOT). The US Environmental Protection Agency (EPA) plays an important role in that it promulgates general regulations that set standards, also for the disposal of HLW.

1.10.3 Nuclear Waste Management

Since commercial reprocessing of spent nuclear fuel was stopped in 1977, HLW from non-military sources is only a fraction of the quantity of waste for which a management solution must be

found. More than 95 percentage by volume originates from military-related reprocessing under the DOE's jurisdiction and is stored in tanks at different sites under DOE control pending vitrification. Two facilities were taken into operation in 1996, one of which is located in South Carolina and the other in New York State.

In the USA, waste which contains small quantities of plutonium and other long-lived radionuclides is called transuranic or TRU waste. The waste must contain more than 100 nanocurie per gram (corresponding to 3,700 Bq/g) of transuranic elements (namely, substances with atomic weights that are higher than those of uranium) with half-lives exceeding 20 years to be classified as TRU waste. All other waste, including spent nuclear fuel, is either LLW or HLW.

LLW

In the USA, the waste producers are responsible for the management of LLW and the federal states are responsible for waste disposal. Co-operation between individual states has been established in certain cases and in many states attempts have been made to find suitable sites for disposal facilities. The latest development is that a commercial facility (Envirocaire) for toxic waste in Utah recently received permission. This facility may only receive naturally occurring and class A LLW. An application for permission to also receive class B and class C waste has been preliminarily accepted but final permission has not yet been applied for by the company (2003).

TRU Waste

Since 1999, the DOE has been disposing of TRU waste from nuclear power production in the Waste Isolation Pilot Plant

(WIPP) in New Mexico at a depth of about 650 metres in a salt formation.

Spent Nuclear Fuel and/or HLW

Spent nuclear fuel from civil nuclear reactors is currently stored at nuclear power plants. The available pool area is not adequate for the volumes that are likely to be generated in all existing and planned reactors in operation (estimated quantity, about 87,000 tonnes). If we assume that no repository is in operation, an additional 80,000 tonnes of storage capacity will be needed in 2030. At present, there are about 35,000 tonnes stored at the different nuclear power plants and the quantity is increasing by about 2,000 tonnes per year. In 2046 the quantity of spent nuclear fuel could be about 105,000 tonnes.

As indicated in Section 1.10.2, according to the 1982 Act on Nuclear Power Policy, the DOE would be able to receive spent nuclear fuel from 1998. In 1993, when the federal states and nuclear utilities realised that the goals that were written into their contracts with the DOE would not be realised in time, a series of legal processes started. The aim was to force the DOE to take responsibility to start receiving spent nuclear fuel for disposal in 1998 and to try to find ways of obtaining damages if the DOE did not take responsibility. After a number of legal processes, it emerged in 2000 that if the utilities and the DOE could not reach an agreement, the DOE would have to carry out legal processes in at least 20 different cases to establish the damages that would have to be paid. These damages can (according to calculations conducted in March 2003) amount to a total of several tens of billions of USD if a repository is never constructed.

During 1998, 1999 and the first part of 2000, an attempt was made to get the senate to introduce new legislation which would entail an amendment of the original nuclear waste policy situation (NWPA) from 1982. Several proposals have also been

put forward concerning constructing a central interim storage facility for spent nuclear fuel. The pressure on the utilities to construct their own interim storage facility at the nuclear power plants would therefore be reduced. The bill also proposed removing the upper boundary of 70,000 tonnes of capacity at the proposed repository.

A site selection process for the repository had previously been initiated where a large number of sites and geological media were included as possible candidates. However, through an amendment to the NWPA (1987), the instruction for the site selection procedure was eliminated. This meant that a number of sites had to be investigated, before a final candidate site could be appointed. The DOE could thereby select a site in Yucca Mountain, Nevada near to the DOE's investigation site, as the only candidate.

Through the 1987 amendment (NWPAA) to the NWPA, the Office of the Waste Negotiator was also established with the task of locating a site that affected parties could voluntarily make available for the siting of Monitored Retrievable Storage Facility (MRS). In addition, the Nuclear Waste Technical Review Board, NWTRB) was established to evaluate the scientific and technical work that the DOE was conducting on the disposal of spent nuclear fuel and HLW, including transportation issues and the waste canister design.

The latest conceptual design for an underground repository in Yucca Mountain includes one primary area that is crossed by parallel emplacement drifts that will be used for final disposal. The repository will be constructed in a geological formation comprising lithophysal welded tuff, some 300 metres above the water table.

Through surface investigations, it has been possible to identify and characterise most of the properties of the ground structure. Extensive research is underway at the Exploratory Studies Facility (ESF) which is a spiral-shaped tunnel construction completed in 1997. The main project is the Drift-Scale Heater

Test, in which rock temperatures of up to 200ºC. The experiment is not expected to be completed before 2004.

Other work focuses on testing, analysis, models and designs that are needed as a basis for supporting the suitability of the site. The current timetable anticipates licensing in 2002-2005, construction in 2005-2008 and commissioning in 2010.

The actual design is somewhat different from the design that was presented as a basis for a preliminary evaluation in 1998 (Viability Assessment). At that time, a strategy was presented, based on an average temperature load, according to which the waste containers were located near to each other. The heat from the fuel would raise the temperature of the surrounding mounted to over 100ºC. Water, which would otherwise corrode the containers and expose the waste in the short term, would boil away. The DOE is now planning to study a strategy, based on low temperature loads which is recommended by NWTRB. In this case, heat production is about 25 % of the amount envisaged in the previous concept (about 40 kW/hectare).

It is proposed that the repository should be kept open and available for 100 years from the time when the waste is deposited. Future generations would therefore make decisions concerning backfilling and closure. The repository is therefore referred to as a "monitored, geological repository".

Through a decision in congress and by the president, in 2002, it was decided that Yucca Mountain would be accepted as a repository site. The DOE will now apply to the NRC for permission to construct the repository. The NRC's approval is required before construction can start and for the subsequent operation of the repository. The NRC is preparing for an extensive review which will include a number of review groups.

1.11 International Organisations

1.11.1 Nuclear Energy Agency, NEA

At OECD/NEA, the Radioactive Waste Management Committee, (RWMC) is supervising the work within the nuclear waste area. The work is mainly divided into three areas, each of them supervised by a Working Party:

- The Integration Group for the Safety Case (IGSC).
- Forum on Stakeholder Confidence (FSC).
- Working Party on Decommissioning and Dismantling (WPDD).

In addition to these groups, there is also a Co-operative Programme on Decommissioning Projects (CPD) and a Regulators Forum.

The RWMC has initiated discussions on a common approach to issues such as retrievability, the benefit of underground laboratories, stepwise decision-making, etc. The RWMC has also organised international peer reviews which have reviewed various national programmes. On behalf of the Swedish Nuclear Power Inspectorate, such a group reviewed SKB's SR-97 safety assessment in spring 2000.

The Integration Group for the Safety Case (IGSC) works in a discipline-oriented way on technical safety for repositories with questions such as, for instance, the development of performance assessment and how this can be used to communicate technical information and develop confidence between concerned stakeholders, how safety assessments may be used as a basis for decision-making, scenario development etc.

The purpose of the FSC is to formulate questions on the decision-making process and its structure, on the organisation and on trust as well as to develop principles for how different stakeholders can be involved.

The WPDD's task is to work with policy issues on decommissioning and dismantling. Experience from the Co-

operative Programme on Decommissioning Projects (CPD) and other projects is compiled and reported.

In CPD, more than 20 years of experience from decommissioning and dismantling of nuclear facilities has been collected. In total, around 40 projects are included. In addition to the exchange of experience and technical collaboration, the CPD also publishes reports on radiological data from the dismantling of reactors.

Based on information from consultants and experts in the member countries, the NEA has published a number of status reports on the state-of-art in deep geological disposal. The material is based on work in different countries over the past ten years.

"Progress towards the Geological Disposal of Radioactive Waste: Where Do We Stand?", published in 1999 (ref. 2, also translated into Swedish in 2000, see list of references at the end of this chapter) formulates a number of claims on which the specialists in the area appear to agree. These include:

- Deep geological disposal is the most appropriate means of long-term management of the various disposal options considered.
- Significant progress has been made in relevant scientific understanding and in the technology required for geological disposal in the past ten years.
- The technology for constructing and operating repositories is mature enough for deployment.
- The time-scales envisioned in the past for the implementation of geological disposal were too optimistic.
- There is a high level of confidence among the scientific and technical community engaged in waste disposal that geological disposal is technically safe.
- However, the broader public does not necessarily share the high level of confidence of the scientific and technical community.

- There is a need for continued high-quality scientific and technical work.
- There is a need for a consistent policy and strict regulatory licensing, with clear decision points which also allow for public dialogue.

The report points to a number of specific areas where it suggests that significant progress has been made over the past ten years in terms of the technical activities required to implement disposal. These are:

- The development and construction of facilities for the treatment and interim storage of waste.
- Experience from laboratory and field experiments, including studies of natural analogues.
- Construction and operation of underground rock laboratories.
- Experience in site characterisation.
- Development of the design of engineered barriers.
- Improved safety assessment methods.
- Improved co-ordination between site characterisation, design and safety assessment.
- Development of regulatory frameworks, including requirements, on safety and radiation protection reporting.

In a report from the Forum on Stakeholders Confidence (Strategic Directions of the RWMC Forum on Stakeholder Confidence, May 2002), the importance of the decision-making process and certain basic elements are emphasised:

- A clear strategy for a long-term solution and support from the Government and policy-creating organisations, based on responsibility and needs.
- A flexible decision-making process which incorporates influence from the public and the needs of those concerned.
- Involvement from all of those concerned, including municipalities and authorities.

- A well-structured process for dialogue/interaction between industry, authorities, politicians and the general public.

1.11.2 International Atomic Energy Agency, IAEA

In 1995, the IAEA published "Principles of Radioactive Waste Management". This is the IAEA's main document in the Safety Standards Series. Since this time, the IAEA has put considerable effort into developing the principles presented in the document. A consensus statement has been prepared by the member states on safety issues in all important areas relating to the management of radioactive waste. This important document is also a basis – with respect to technical issues – for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management), which was adopted at a diplomatic conference in 1997.[1]

The International Conference on the Safety of Radioactive Waste Management was held in Córdoba, Spain, in March 2000 within the framework of the IAEA's safety programme for 2000. The main purpose of the conference was to facilitate an open dialogue between different interested parties – scientists and representatives from waste producers, for companies responsible for waste management, for units with regulatory functions and for the general public. Conclusions and recommendations from the conference were compiled in a document that was submitted to the IAEA's Board of Governors General Conference in September 2000. The document contains a proposal for the development of a form of Roundtable on Stakeholder Consensus. The following text has been taken from the document.

> The evolution, under the aegis of the IAEA, of a "de facto" international radiation and nuclear safety regime was noted. In the area of radioactive waste safety, this regime consists of the "Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management" (which, it is hoped, will

[1] Sweden ratified the Convention in 1999. The Convention entered into force in 2001.

enter into force soon), the body of international waste safety standards published by the IAEA and other international organisations, and the IAEA's mechanisms for providing for the application of those standards.

Progress has been made in the development of technology and disposal alternatives for the radioactive waste, but further R&D work is still necessary. Regardless of which alternative a country finally chooses for high level and long lived waste, it will be necessary to continue the development and assessment of deep geological disposal. This type of alternative will most certainly be utilized in the future.

International co-operation is important for reaching a common understanding among technical experts and the general public and support for the national programs. The following tools are especially important in this aspect:

- "Joint Convention", an important legal instrument that presupposes engagement on a high level of the contracting parties concerning safe management of radioactive waste
- International standards, already existing
- International systems that will help to implement the standards

The first review conference for the "Joint Convention" has now taken place and some of the conclusions are summarized below:

- The main purpose of the convention is to support the safe management of radioactive waste and spent fuel
- The convention has already contributed to this, e.g. by the work to produce the national reports that has helped in identifying needs for increasing nuclear safety
- The need to develop long term plans for waste management and disposal is underlined
- The need for planning for decommissioning of nuclear facilities is also underlined
- The need for consultation between stakeholders in the process is underlined.

1.11.3 The European Commission

In September 2000, responsibility for nuclear safety issues in the European Commission was largely transferred from the Environment Directorate (DG-Env) to the Transport and Energy Directorate (DG-Tren), although radiation protection matters will be unaffected.

Research work on Radioactive Waste Management and Disposal has been part of the European Atomic Energy Community (EURATOM) for more than 25 years, supervised by the Research Directorate. This is part of the general research and technological development (RTD) programme of the EC. The programme covers activities in major fields of science and technology, organised in five-year framework programmes. The programme is performed through 'shared-cost' contracts by national laboratories of the Member States of the European Union (EU) with financial support from the EC (normally up to 50 % of the total costs) or through and in conjunction with the Joint Research Centres (JRC).

Since the publication of KASAM's state-of-the-art report in 2001, the sixth framework programme (2002-2006) has started. The sixth framework programme will contribute to creating a "European Research Area (ERA). The European area for research is a vision of the future of European research, an internal market for science and technology. The aim is to promote state-of-the-art research, competition and innovation through improved co-operation and increased co-ordination between all of the different levels. Economic growth is increasingly dependent on research and individual countries can no longer, on its own, solve many of the problems that industry and society is faced with today or which can be predicted for the future. At a summit meeting Lisbon in March 2000, the heads of states and governments called for a better use of Europe's research work. This would be achieved through the creation of a European area for research activities. The framework programme

is the financial instrument that is to contribute to the realisation of the European area of research.

So far, the framework programmes have almost exclusively been conducted with the help of projects for research co-operation. This was highly effective when the project started, but has two disadvantages:

- Most often, co-operation in the project consortium ceased when the project was finished.
- In many cases, the projects were not large enough to achieve a "critical mass" and to have more far-reaching effects from the research standpoint or from the industrial or economic standpoint. In order to remedy this and to contribute to the creation of a European area for research activity, two new instruments have been created which will be applied in the sixth framework programme, namely, the network of excellence and *integrated projects*.

The principle behind both of these instruments is to finance coherent programmes for research rather than many small projects while, at the same time, the European research consortia will be allowed as much freedom and flexibility as possible.

The aim of the *network of excellence* is to integrate the activities of the network partners in stages in order to promote virtual research centres. *Integrated projects* consist of very large projects which will lead to goal-oriented research with clearly defined scientific and technical objectives for the critical mass that is required.

The sixth framework programme will include research on the disposal of radioactive waste in the sub-programme, Fuel Cycle Safety, and the total available budget is EUR 60 million.

Research priorities for radioactive waste are

1. Research on geological disposal.
   a. Improvement of basic knowledge and development and testing of technology.
   b. New and improved tools.
2. Partitioning and Transmutation (P&T) as well as methods that lead to smaller waste quantities in connection with nuclear energy production.

1.12 Conclusion

All countries described in this chapter share the fact that increasing attention has been paid to issues relating to the treatment and disposal of spent nuclear fuel and nuclear waste from the operation of nuclear reactors, by both representatives from society's institutions (parliament, governments, regulatory authorities) and by the nuclear industry. This applies in countries with a growing nuclear programme (such as Finland, France and Japan) as well as in countries, such as Sweden, which have a more static or declining programme.

In most of these countries, there is a common view to how nuclear waste issues should be solved, even if concrete technical solutions, timetables etc. are different. This joint approach is manifested through the Joint International Convention on Nuclear Waste which most countries with a substantial nuclear power programme as well as countries without their own programmes have ratified. Sweden was one of the first countries to ratify the Convention.

An overall evaluation shows that Finland, Sweden and the USA have come the furthest in realising the disposal of spent nuclear fuel, both with respect to choice of technology and site selection. In France, a highly advanced and extensive research and development programme is underway on methods for the treatment, storage and disposal of radioactive waste. The final

report for the programme will be submitted in 2006. Germany, Japan, Canada and Great Britain also have advanced research programmes although much remains to be done before concrete solutions can be presented. In many other countries, research on radioactive waste is also underway. Issues relating to the long-term financing of nuclear waste management and the de-commissioning of reactors are attracting increased international interest.

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Abbreviations

General

AGR, advanced gas-cooled reactor
PWR, pressurized water reactor
LLW, low level waste
ILW, medium level waste
HLW, high level waste
MOX (mixed oxide fuel), mixed fuel containing both uranium- and plutonium oxide
R&D, research and development

Canada

OPG, Ontario Power Generation Inc.
NFWA, Nuclear Fuel Waste Act
CNSC, Canadian Nuclear Safety Commission
NWMO, Nuclear Waste Management Organisation
AECL, Atomic Energy of Canada Limited
NRCan, Ministry of Natural Resources Canada

Finland

Fortum (earlier IVO, Imatran Voima), state-owned power enterprise
VVER, Russian type of reactor
TVO, utility, owned by Finnish industry and power enterprises
STUK, Radiation safety central (Finnish authority for nuclear safety and radiation protection)
ONKALO, the first stage of the deep repository (used for R&D)
Posiva, Finnish company (corresponding to SKB in Sweden)

France

ANDRA, organisation responsible for disposal (corrresponding to SKB in Sweden)
EdF, Electricité de France (state-owned company with a main responsibility for electric energy supply in France)
CEA, Commissariat à l'Energie Atomique (a state organisation responsible for the development of nuclear energy)
COGEMA, (a state organisation operating the reprocessing facilities in la Hague)
DGSNR, Direction Générale de la Sûreté Nucléaire et de la Radioprotection
IRSN, Institut de Radioprotection et de Sûreté Nucléaire
ICE, Installation Centrale d´Entreposage (a planned central facility for the intermediate storage of spent fuel)
CNE, Commité National d'Evaluation (national commission for the evaluation of nuclear waste research activities)

Germany

BfS, the federal radiation protection authority
PBT, federal institute for science and technology
ERAM, Endlager für Radioaktive Abfälle, Morsleben, final disposal for LLW and ILW
BMU, the federal ministry for the environment
AKEND, committee responsible for proposing a new procedure for site selection

Japan

AEC, Atomic Energy Commission
NSC, Nuclear Safety Commission
METI, Ministry of economy, trade and industry
MECSST, Ministry of education, culture, sport, science and technology
NUMO, an organisation responsible for work on site selection, construction, operation etc. of a deep geologic repository
JNC, an institute responsible for work related to advanced reactors and nuclear fuel cycle technology and research and development related to disposal of HLW
JNFL, Japanese Nuclear Fuel Ltd

Russia

Minatom, Atomic power ministry
GAN, Gosatomnadzor" (nuclear power authority)
RBMK, Russian reactor type
VVER-440, VVER-1000, BN-350, BN-600 Russian reactor types
IGEM, Institute for Geology, Ores, Petrografy, Mineralogy and Geochemistry
CEG , Contact Expert Group (expert group within IAEA)
PHARE, a support program financed by EU
NPT, Non Proliferation Trust, Inc. (an American enterprise)
(NPT, Non-Proliferation Treaty, an international agreement)

Switzerland

NAGRA, organisation responsible for final disposal of nuclear waste (corresponding to SKB in Sweden)
ZWILAG, a company responsible for central intermediate storage of spent fuel
AGNEB, Federal advisory group for nuclear waste
KSA, Federal commission for nuclear safety
HSK, Swiss Federal Nuclear Power Inspectorate
EKRA, an expert group for development of a disposal concept for radioactive waste
GNW, an organisation corresponding to SKB in Sweden

UK

BNFL, British Nuclear Fuels Ltd
NII, Nuclear Installations Inspectorate
EA, Environment Agency
SEPA, Scottish Environmental Protection Agency
RAWMAC, Radioactive Waste Management Advisory Committee
CoRWM, Committee on Radioactive Waste Management
UKAEA, United Kingdom Atomic Energy Authority
THORP, Thermal Oxide Reprocessing Plant in Sellafield
LMA, Liabilities Management Authority
National Decommissioning Agency, a new organisation for issues related to decommissioning and dismantling of nuclear reactors
UK Nirex, Nuclear Industry Radioactive Waste Management Executive, works with issues related final disposal of long lived ILW and LLW and for short lived ILW

USA

DOE, Department of Energy
OCRWM, Office of Civilian Nuclear Waste Management (part of DOE)
NWPA, Nuclear Waste Policy Act
NRC, Nuclear Regulatory Commission
DOT, Department of Transportation
WIPP, Waste Isolation Pilot Plant i New Mexico
NWTRB, Nuclear Waste Technical Review Board

OECD/NEA

RWMC, Waste Management Committee
IGSC, Integration Group for the Safety Case
FSC, Forum on Stakeholder Confidence
WPDD, Working Party on Decommissioning and Dismantling

International organisations

IAEA, International Atomic Energy Agency
OECD/NEA, OECD Nuclear Energy Agency
EU, European Union

2 The Municipalities – One of the Main Actors in the Nuclear Waste Issue

2.1 Introduction

Disposal of nuclear waste is an issue that deeply affects the local community. In this chapter, KASAM would like to:

- Direct the Government's attention to the issues that are of particular importance for the municipalities concerned and which are also of importance for the quality of the entire decision-making process, as well as to KASAM's views on these issues.
- Describe how the municipalities concerned – Östhammar, Oskarshamn and Hultsfred – are handling the issues relating to site investigation and consultation for a planned repository and an encapsulation plant for spent nuclear fuel.
- Document the sequence of events in these municipalities. This documentation is a continuation of the report on the municipalities' work during the Swedish Nuclear Fuel and Waste Management Co's (SKB) feasibility studies and which is presented in the reports: "A Site for Final Disposal of Nuclear Waste? – Feasibility Studies in Eight Municipalities" (SOU 2002:46) and "Nuclear Waste – Democracy and Science" (SOU 2004:99), both in Swedish.

2.2 The Nuclear Waste Issue – a Joint Concern for Industry, the State and the Municipalities

In Sweden, issues concerning the disposal of nuclear waste requires co-operation among three main actors: The nuclear industry, the state and the municipalities.

A basic principle of Swedish environmental legislation is that anyone who causes environmental damage is responsible for paying for the measures that are needed to prevent and correct the damage caused ("polluter pays principle"). This is specified in Chapter 2 of the Environmental Code (1998:808). The previous Environmental Protection Act was also based on this principle. According to the same principle, the Act on Nuclear Activities (1984:3) states that the reactor owners are responsible for waste from the activity. *The Swedish Nuclear Fuel and Waste Management Co (SKB)*, which is jointly owned by the reactor owners, fulfils this responsibility in practice.

The state supervises the reactor owners to ensure that they take their responsibility. The state acts through the regulatory authorities (primarily the Swedish Nuclear Power Inspectorate – SKI – and the Swedish Radiation Protection Authority – SSI), and in certain cases, through the Government. The Swedish Riksdag (parliament) has established the laws that apply, for example, with respect to consultation and decision-making processes prior to the construction of nuclear facilities – as is the case with other hazardous activities.

The facilities that are necessary in order to manage the waste will be located in one or more Swedish *municipalities*. The municipal right of self-determination, which applies to the siting of industries and to the use of land in Sweden, means that the opinion of the municipalities is decisive with respect to the siting of the planned nuclear waste facilities. The municipalities, with their democratically elected representatives and their inhabitants, are therefore the third main actor.

The strong position of the municipalities is expressed in Chapter 17 of the Environmental Code. These regulations mean

that a municipality can prevent the Government from allowing the siting of a facility for the interim storage or final disposal of nuclear waste in the municipality ("municipal veto right". The Government may, under certain circumstances, allow a certain siting of such an activity to take place even if the municipality says no. However, the right to override a municipal veto cannot be used if there is another site within another municipality that can be assumed to accept the repository. Thus, as can be seen, it is hardly practically possible for the other two actors – the industry and the state – to resolve the issue of the final disposal of nuclear waste without the municipality's permission. Therefore, there are strong reasons for KASAM to follow and take note of how the municipalities concerned act in connection with the site investigations and the different consultations that SKB is now conducting.

2.3 Where Are We in the Siting Process?

With the aim of finding a suitable site for the final disposal of spent nuclear fuel, SKB conducted feasibility studies in the 1990's in eight municipalities: Storuman, Malå, Älvkarleby, Tierp, Östhammar, Nyköping, Hultsfred and Oskarshamn. These feasibility studies resulted in SKB's proposal to conduct in-depth site investigations with trial drilling at three sites, namely Forsmark in Östhammar municipality, Simpevarp in Oskarshamn municipality and an area north of the population centre in Tierp municipality. The latter siting alternative also involved Älvkarleby municipality due to the need for transport to Skutskär harbour. SKB also proposed in-depth investigations, without any further trial drilling, with respect to one siting alternative, which has been the subject of previous trial drilling, in Nyköping municipality. (See SKB's report *Integrated Account of Method, Site Selection and Programme prior to the Site Investigation Phase* "RD&D Supplement", December 2001.)

In late 2001 and early 2002, a broad majority of the municipal councils in Östhammar and Oskarshamn, responding to a request by SKB, voted "yes" to SKB's proposal to initiate site investigations. On the other hand, Tierp and Nyköping municipalities were opposed to further investigations. Therefore, of the proposal originally put forward by SKB, only the area in Forsmark in Östhammar municipality and the Simpevarp area in Oskarshamn remained as feasible site investigation areas (maps of the areas concerned are provided in Sections 2.5.2 and 2.6.2).

SKB's investigations at both of these sites started in 2002. Based on the results from the first trial drilling in the initial site investigation phase, SKB proposed an adjustment of the "Simpevarp" site, including the Simpevarp peninsula. The Simpevarp peninsula, which is now of interest for site investigations (actually "the Simpevarp-Laxemar area"), comprises two areas, namely an area around Simpevarp and the neighbouring Laxemar area. The region around the Simpevarp peninsula comprises an area that was included in the original proposal, namely the Simpevarp peninsula, as well as an area that was not included from the beginning, namely the Ävrö and Hålö islands and some of the sea surrounding these areas. Through a decision in September 2003, the municipal council in Oskarshamn voted "yes" to this adjustment of the site to be investigated.

An initial stage of the site investigations at Forsmark and Simpevarp is expected to have been completed during the first half of 2005. SKB expects that further site investigation in these areas will provide information for an application to be submitted at the end of 2008 to the Government for licensing under the Environmental Code and the Act on Nuclear Activities with respect to a repository for spent nuclear fuel.

SKB is also working on preparing a basis for applications for government licensing in accordance with the Environmental Code and the Act on Nuclear Activities, with respect to an encapsulation plant for spent nuclear fuel. SKB is primarily planning to construct this facility adjacent to CLAB (Central Interim Storage Facility for Spent Nuclear Fuel) in Oskarshamn.

An alternative siting in the Forsmark area is also being studied at the same time. SKB expects to submit the licence applications for the encapsulation plant in 2006.

SKB's long-term planning is based on the assumption that the Government will make a decision in 2010 concerning the licences that are needed and that an encapsulation plant and a repository for spent nuclear fuel will be taken into operation in 2017. In such a case, all of the spent nuclear fuel from the current nuclear power programme in Sweden would be deposited in the 2050's and, once this is done, the repository would be closed.

An overall timetable, which also includes the site investigations that are in progress, is provided in *Figure 2.1*.

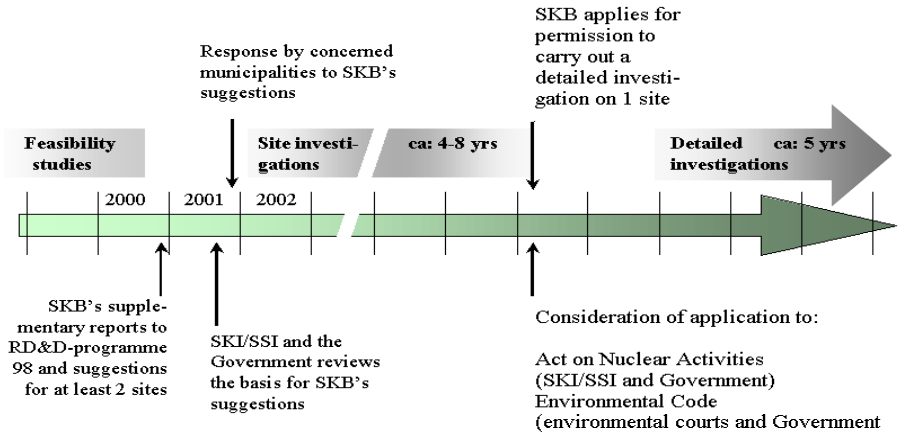

Figure 2.1. Siting: What happens next?

No site investigations are in progress in Hultsfred municipality, one of the six other municipalities where SKB has conducted feasibility studies, and none have been planned. However, neither SKB nor the municipality has completely rejected the possibility of conducting site investigations at a later stage, depending on the results of the site investigations conducted in the Forsmark and Simpevarp areas. Therefore, it is reasonable to consider Hultsfred municipality as a "reserve candidate" for possible site investigations in the future. This is the reason why Hultsfred municipality is also included in this presentation.

2.4 Expectations and Anxieties in the Municipalities Concerned

To obtain the necessary information for drafting this section, representatives from KASAM visited the Östhammar, Oskarshamn and Hultsfred municipalities in November 2003 to conduct interviews with key individuals in each of these municipalities. These interviews were followed up by informal contacts with politicians and municipal officials. Based on experience from these contacts, the section is divided into three themes.

Firstly, the questions surrounding nuclear waste management that the municipal leaders consider to be particularly important for the phase, which has now been initiated, with site investigations and increased consultation in accordance with the Environmental Code. Views held in the municipalities concerning issues relating to the allocation of responsibilities between the municipality and other actors with respect to nuclear waste issues are then presented. Finally, the views of the municipal leaders, with respect to the impact that the work on nuclear waste issues has had on work within other municipal areas of responsibility, are presented.

2.4.1 Important Issues for the Municipal Leaders

The issues that are currently important to municipal leaders differ depending on the municipality – on one hand, Östhammar and Oskarshamn and on the other hand, Hultsfred. However, the pictures that emerge of how the two first-mentioned municipalities are handling the issues are far from identical.

Even if there are certain differences between *the municipalities of Östhammar and Oskarshamn*, it should be emphasised that the two municipal leaderships have in recent years developed a closer co-operation with each other. There is reason to assume that the aim of this co-operation is to strengthen the position of both municipalities in relation to the proponent.

The initial steps of this co-operation were taken in autumn 2003. The following two factors appear to have been decisive.

- At this time, both of the municipalities attained a stronger role in the siting and Environmental Impact Assessment (EIA) processes by entering as a party in the expanded consultation on EIA, in accordance with Chapter 6 § 5, initiated by SKB at that time, with respect to the repository and encapsulation plant.
- After the 2002 election, new individuals in the position of municipal executive board chairman represented both of these municipalities, as of 2003, even though the party affiliation remained the same, namely social democratic, as the previous representatives. These new executive board chairmen seem to have a common view of the value of co-operation in their situation in order to handle the nuclear waste issue.

The budding co-operation between the two municipal management groups was outwardly manifested for the first time at an international conference on nuclear waste that SKB, in co-operation with the International Atomic Energy Agency (IAEA) and the OECD/NEA (OECD's Nuclear Energy

Agency) arranged in Stockholm in December 2003. In a speech given by the Chairman of the Oskarshamn municipal executive board, who also expressly spoke on behalf of his colleague in Östhammar, the Chairman summarised the issues that the leading politicians in the site investigation municipalities consider to be most important.

The speech emphasised the similarities between both municipalities with respect to geographical position, size, municipal service, industry structure and experience of nuclear activities. The following joint position statement was given for both municipalities with respect to their involvement in the nuclear waste issue (the points have been slightly reformulated compared with the original and, where relevant, direct quotations are marked).

- We are two municipalities with extensive experience of co-operation with the nuclear industry.
- We do not accept the idea that the present interim storage of spent nuclear fuel should take the form of a more permanent solution – we must actively work towards ensuring that a final solution to the nuclear waste issue is found.
- We have participated in initial feasibility studies, conducted extensive work on local democracy and we have the full support of our inhabitants to now participate in site investigations.
- Through our strong position in the decision-making process, we have ensured, and will continue to ensure, that the issues that we raise are investigated and that the basis for decision-making includes a detailed investigation of the local perspective.

As a "good platform" for work over the next few years, six points were formulated:

- Safety is the overshadowing issue – for us as decision-makers and for our inhabitants.

- In order for us to contribute to a solution of the nuclear waste issue, the process must be transparent. All information must be "on the table" throughout the process. It is only if we work in this way that we will be able to build confidence for the actors and for the results that are achieved.
- As municipalities, we must actively take part in and influence this work. Our work cannot be paid for by our taxpayers but must be compensated for – as is now the case – from the Nuclear Waste Fund.
- Our inhabitants and environmental interest groups who are involved in the nuclear waste issue are a resource in our work. We who live in the municipalities best know our own district and know what we want for our future. Our environmental interest groups raise difficult questions that must be answered.
- Our competent authorities, the Swedish Radiation Protection Authority (SSI) and the Swedish Nuclear Power Inspectorate (SKI), are our independent experts. It is the authorities that have to evaluate the industry's proposals and inform us whether or not the proposals meet the requirements regarding safety.
- Before we know whether the safety requirements have been fulfilled, we cannot speculate regarding compensation or positive effects from the construction of a repository in one of our municipalities. We do not allow such discussions to disturb us in our work of critically evaluating, investigating effects or safeguarding safety. These discussions have to wait until we know the outcome of the industry's choice and the outcome of the results of the evaluations made by the competent authorities.

Providing that the industry's timetable is followed, in about five years' time, we shall have to adopt a position on the final disposal method to be used in Sweden and on where the repository should be located. As municipalities, we see the following "challenges" that lie ahead:

- It is "completely decisive" that the industry should be able to show that a safe repository can be built and that the authorities, through competent review work and their own analyses, also reach the same conclusions.
- Other challenges entail ensuring that:
  - The industry's ambitions to follow its timetable do not lead to short cuts and data and analyses of a poor quality.
  - The authorities are given the resources that they need and that they can obtain the necessary competence to fully review and evaluate the industry's licence applications – we are "very concerned" that the Government, in its general drive to cut costs, is not giving the Swedish Nuclear Power Inspectorate (SKI) and the Swedish Radiation Protection Authority (SSI) the funds that they need.
  - We can initiate the investigations and studies necessary to ensure that our inhabitants and we, as decision-makers, have an adequate basis for decision-making.
  - We obtain "full guarantees to ensure that we can never be forced to receive nuclear waste from other countries against our will".

The following must occur "before we, the municipalities, can accept a repository":

- We must be convinced that the nuclear waste issue can be resolved in a safe manner – we are very dependent on our regulatory authorities.
- We must prepare a complete and exhaustive basis for decision-making that also contains a municipal perspective for an option to say "yes" or "no". This basis for decision-making must contain an Environmental Impact Statement (EIS), with all of the positive and negative impacts described in detail. This EIS must also contain exhaustive socio-economic and social scientific investigations.
- Negative effects must be limited.

- An "overwhelming majority" of our local inhabitants must support a decision.

In a joint press release in February 2004, both municipal executive board chairmen stated that the final disposal issue has many aspects "that for both municipalities are similar at the same time that there are local differences with respect to political traditions as well as natural conditions." The press release further showed that the representatives of both municipalities had discussed questions relating to the further content of the consultation process, the decision-making process, the resources of the regulatory authorities and the Environmental Impact Assessment (EIA). Furthermore, they had planned to arrange joint seminars on "joint knowledge-related issues for the municipalities concerning final disposal".

2.4.2 View of the Allocation of Responsibilities among the Municipality and Other Actors

In the conversations held with the municipal leaders, they consistently expressed the view that the nuclear waste issue is given far too low priority among politicians operating at the national level. This criticism is generally directed to both ministers and members of parliament. The leaders also consider that there is a lack of interest in this issue among the members of parliament from their own counties. Furthermore, in the view of the leaders, the media, in any case at the national level, gives the issue far too little attention and neighbouring municipalities ought to show greater interest.

The municipal politicians also stated that the general lack of interest in the nuclear waste issue makes it difficult for them to handle these issues in the municipality. The nuclear waste issue is specifically of national importance. Therefore, in the view of the local politicians, it is not acceptable that, in reality, the response-

bility for the handling of the issue should be delegated to the local level.

The municipal leaders further explained that the participation of the local politicians is a necessary condition to gain support for the idea of siting a repository somewhere in Sweden. In order for the local politicians to be able to assume such a responsebility, politicians at the national level also need a visible commitment. The municipal leaders reiterated the municipalities' veto right in connection with forthcoming licensing by the Government. In the view of the councils, the nuclear waste issue must be handled in such a way by industry, the regulatory authorities and politicians at the national level that local opinion is confident in the solutions proposed. The implementation of site investigations is currently considered to be strongly supported by the inhabitants of Oskarshamn and Östhammar municipalities. However, the interviewees pointed out that this current level of support is no guarantee for the state of opinion when the time comes to evaluate a licence application for the construction of a repository at a specific site.

As reported in detail below (Sections 2.5.3 and 2.6.3), *Östhammar* and *Oskarshamn* have organised their work during the site investigation phase in different ways. The organisation that has been selected in Oskarshamn could give the impression that the local government leaders consider that the municipality should assume a particularly large responsibility as an actor in the nuclear waste issue. In Section 2.9.1, similarities and differences between the attitudes in both municipalities are discussed in this respect.

Based on an agreement between SKB and *Hultsfred* municipality concerning a contact programme (see Section 2.7.2), an ambitious programme of seminars on the nuclear waste issue has been conducted since 2003. The seminars target the general public. What expectations does the municipal council in Hultsfred have for the near future?

It can be seen from the above (see Section 2.3) that Hultsfred municipality would not be subjected to a site investigation, in

accordance with the proposal put forward by SKB in the RD&D Programme Supplement. However, in the opinion of the local government leaders, if SKB had proposed a site investigation in Hultsfred municipality, a broad majority of the municipal council would have voted "yes". Nevertheless, the municipality is satisfied to act as a reserve municipality for the time being, since the view is that there are strong reasons why SKB should more closely investigate the type of bedrock, which occurs in the municipality. However, the leaders emphasise that a possible initiative by SKB in this direction would probably require the municipality to provide extensive information to the inhabitants.

2.4.3 Nuclear Waste Issues and Areas of Municipal Responsibility

In connection with the conversations with the municipal leaders in Östhammar, Oskarshamn and Hultsfred municipalities, the question was raised of the impact that the nuclear waste issue had had on the work in other areas of municipal responsibilities. This question can be further divided into two questions as follows:

- To what extent does one use – or intend to use – the experience from the handling of the nuclear waste issue in the municipality in connection with the handling of other complex issues?
- Have the efforts that the local politicians have put into the nuclear issue since the mid-1990s detracted from the handling of other municipal issues?

The responses to these questions are related to how the nuclear waste issue is perceived. Formulated somewhat provocatively, it could be said that the choice is between considering the nuclear waste issue to be primarily a technically complex waste management issue or an issue that also includes significantly

broader aspects. This second view is characterised by the fact that the issue, in addition to its technical complexity, is of such dimensions that finding a satisfactory solution also requires the types of considerations to be made that usually belong to the realms of ethics, morality and democracy.

The interviews conducted give the impression that, Oskarshamn municipality, more than Östhammar, emphasises that experience from the handling of the nuclear waste issue in the municipality can be applied to increasing the involvement of the local community in the handling of other complex issues in the municipality. The municipal leaders in both municipalities considered that their way of handling the nuclear waste issue had led to increased confidence in politicians and in their will/ability to handle other difficult issues as well. The same view is held in Hultsfred. In all of the three municipalities, it was believed that the involvement in the nuclear waste issue had not led to the neglect of any other important issues. During a separate interview with the former municipal executive board chairman in Oskarshamn, the chairman mentioned that he had been criticised to that effect, especially by party colleagues. However, he did not consider that the criticism was justified.

2.5 Sequence of Events 2002–2004 in Östhammar Municipality

2.5.1 Facts about the Municipality

Östhammar municipality is located in Uppsala County, on the coast of the Gulf of Bothnia/northern part of the Åland Sea, and has almost 22,000 inhabitants. About 4,700 people live in the central district of Östhammar and, in four other population centres, about 8,800. In the 1970's and 1980's, the number of inhabitants increased in connection with the construction of Forsmark nuclear power plant. The nuclear power plant is located on the coast, about 20 kilometres north of the

population centre of Östhammar and about 5 kilometres from the border with Tierp municipality. In recent years, the number of inhabitants has fallen somewhat. In summer, several thousand holiday homeowners and tourists come to the municipality.

The largest employer is the municipality with about 1,800 employees. The dominant industrial company and the next largest employer is Sandvik Coromant in the population centre of Gimo with about 1,600 employees. The only other major industrial company is Forsmark Kraftgrupp AB with about 750 employees. Forsmark nuclear power plant comprises three reactors, of which the last was taken into operation in 1985. SKB's repository for low and intermediate-level waste (SFR) is also located in the Forsmark industrial site. Radioactive waste from all of the Swedish nuclear power plants is disposed of at the repository.

Östhammar municipality suffered from the closure of a number of industrial activities in the 1980's and 1990's. The number of those employed in agriculture, forestry and construction has also decreased considerably. In 2000, about 1,400 people commuted to work in the municipality, while about 2,800 commuted to work in the opposite direction.

The Social Democratic Party has long been the leading political party in the municipality. However, during the 1998 election, the party lost its former majority status but maintained a dominant position. After the 2002 election, a political majority comprising the Social Democratic Party, the Left Party and the Green Party governed the municipality. Since the 2002 election, the distribution of the 49 mandates on the council has been as follows (the distribution of the mandates for the previous period is provided in brackets): Centre Party 9 (8), Liberal Party 3 (2), Christian Democratic Party 2 (2), Green Party 2 (2), Moderate Party 8 (9), Social Democratic Party 21 (22), Left Party 2 (4), a local party called Solidaritet & Samverkan (Solidarity & Co-operation) 2 (-).

2.5.2 Council Decision to Allow SKB to Conduct Site Investigations in Forsmark

In December 2001, the municipal council decided (with a vote of 43-5, one member abstaining from voting) to allow SKB to conduct the site investigation in Forsmark, providing that an agreement could be reached with SKB regarding the conditions for the investigation. The council handled the issue of the content of the agreement in February 2002. The proposed agreement that the council approved (with one reservation) has been published in a report, SOU 2002:46 p. 146 f.).

The site to be investigated is shown on the map in *Figure 2.2.*

Figure 2.2. *Site investigation in the Forsmark area (Swedish Nuclear Fuel and Waste Management Co, SKB).*

2.5.3 The Municipality's Organisation for Following the Site Investigation Work

The reference group, which existed in Östhammar during the feasibility study period,[1] decided, in June 2002, to adopt the name, *Reference Group for the Site Investigation in Forsmark (Östhammar)*. During autumn 2002, the municipal leaders discussed a change in the organisation. The discussions resulted in a decision, in January 2003, by the municipal executive board. The board decided to create two groups – a reference group and a preparatory group.

The purpose of the *preparatory group* was to prepare issues to be presented to the municipal executive board for decision-making. The group comprises 7 members (chairman, Social Democratic Party and 1 additional member from the Social Democratic Party as well as 1 member each from the Moderate Party, the Centre Party, the Christian Democratic Party, the Green Party and the Left Party). The political majority in the municipality (Social Democratic Party, Left Party and Green Party) have the majority in the group. In addition, one member has been co-opted to the group from Tierp municipality. The group has both members and alternates. The task of the group is to decide on and implement day-to-day matters.

The preparatory group also has the task of preparing matters for the *reference group* to handle. The reference group is described as "a new interface for the municipal executive board in its contacts with the public and the political organisation" The reference group comprises the members of the preparatory group (7 members and 7 alternates) as well as a representative for each of the parties represented (8 representatives), two representatives for Tierp and Älvkarleby municipalities (4 representatives) as well as currently, 3 representatives from NGOs which are interested in the disposal issue (EFÖ, NSF and

[1] For an account of the work carried out by Östhammar municipality during the feasibility study phase, see the report SOU 2002:46, pp. 133–151.

OSS)[2]. The total number of members is thus currently 29. Both members and alternates have been appointed for Tierp and Älvkarleby municipalities.

In April 2003, the preparatory group reported to the executive board that the group was waiting for "detailed terms of reference and clarification from the executive board with respect to its own and the reference group's activities." The report outlined future activities. It was also mentioned that both groups "when necessary will use the available expert resources during the site investigation phase", and that it could be appropriate to arrange one or two seminars per year, together with for example, KASAM, SKB, SKI, SSI and Oskarshamn municipality, and to continue with the previous information work on targeting the Gimo and Forsmark upper secondary schools as well as to publish a brochure on the site investigation in summer 2003. In August 2003, the municipal executive board decided to adopt and establish the "proposal as the goal for activities during the coming year."

In September 2003, the executive board also appointed a local *EIA group* for SKB's site investigation in Forsmark. The task of the group is to capture and pass on to the executive board issues that should be taken up during the expanded consultation that SKB had started to implement at that time. This group included the chairmen and vice-chairmen of the municipal executive board, of the preparatory group, of the municipal environmental committee and of the municipal building committee (a total of 8 people), as well as the municipal officials most directly concerned (5 individuals, namely, the administrative head of the municipality, the environmental co-ordinator, the environmental director, the city architect and the municipality's project manager for nuclear waste issues).

[2] The abbreviations mean the following: EFÖ = Energy for Östhammar, SNF = local chapter of the Swedish Society for Nature Conservation, OSS = Opinion Group for Safe Final Disposal – Östhammar.

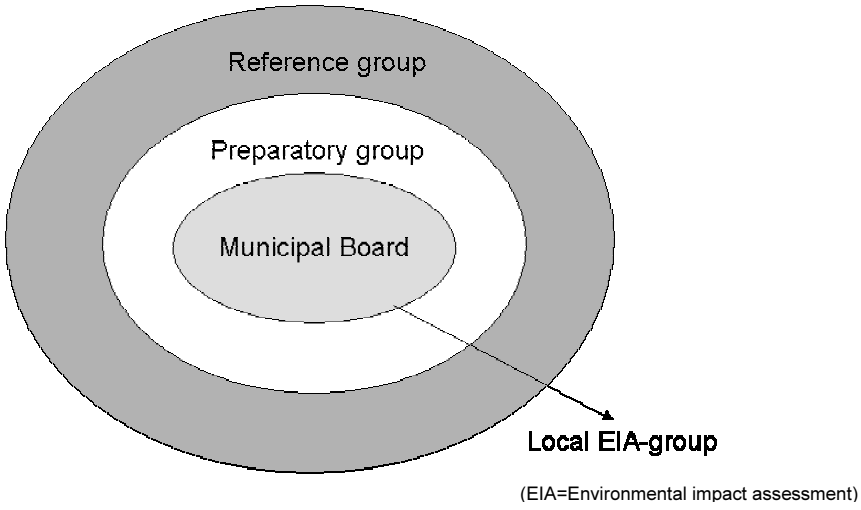

Figure 2.3. Organisation of Östhammar municipality to follow the site investigation and participate in increased consultation (Östhammar municipality).

The current municipal organisation for handling the site investigation and the consultation process is illustrated in *Figure 2.3*.

2.5.4 Examples of Issues relating to the Site Investigation that Have Been Dealt with by the Municipal Organisation of Östhammar

At the beginning of 2003, the municipal executive board of Östhammar had decided how the municipality should be organised in order to follow SKB's site investigation work (cf. Section 2.5.3). A small *preparatory group*, consisting exclusively of "politicians" has the task of preparing questions that should

be put to the executive board for decision-making. The preparatory group also had the task of preparing issues for handling in a *reference group* of about thirty people, comprising "politicians" and representatives from NGOs interested in the disposal issue. During autumn, a special EIA group was appointed.

In 2003, the preparatory group convened on seven occasions and the reference group, on three. So far, the EIA group has not held any meetings.

A recurrent feature of the reference group's meetings has been information from SKB on the ongoing work. Information has also been provided concerning measures that the preparatory group has adopted or discussed. The members of the reference group have also received information on seminars and other forms of competence-building that have been considered of interest. Copies of documents given to the preparatory group are also regularly sent to reference group members. The extent to which discussions in the reference group have affected the position adopted by the preparatory group is not evident from the minutes.

Under the auspices of the preparatory group, a seminar was organised, in May 2003, on the following theme: "A Municipal Matter of National Concern in an International Perspective". Furthermore, a school project was completed, where pupils from Forsmark school prepared information material on the disposal issue for distribution to other pupils at the school. The preparatory group also commissioned an up-to-date version of a brochure that had been previously prepared and that had been distributed to the municipality's permanent inhabitants and holiday homeowners. The plan of activity that was established for 2004 states that the intention is to provide information to the public in the municipality's population centres with the participation of environmental NGOs, SKB, SKI and SSI as well as to organise study circles. Specific information will be provided to certain schools. The group also expects to participate in the seminars and conferences arranged during the year by various

actors as well as in the expanded consultation that SKB intends to conduct. At the end of 2003, the preparatory group made a decision regarding applications for grants for activities that two local groups (the Opinion Group for Safe Final Disposal, OSS and Energy for Östhammar, EFÖ) intend to conduct in 2004.

The minutes from the preparatory group's meetings give the impression that, so far it has not been relevant to discuss, within the group, whether the municipality needs to react to the information that SKB has provided about the site investigation. However, it can be noted that the preparatory group has taken the initiative to arrange a training day on EIA-related issues at the beginning of 2004.

In the light of discussions held between the chairmen of the municipal executive boards in Östhammar and Oskarshamn municipalities at the end of 2003 (cf. Section 2.4.1), the members of the preparatory group met with representatives for the site investigation organisation in Oskarshamn municipality. The meeting considered co-operation during the site investigation phase. As has been described above, the meeting resulted in a joint press release. One concrete result was the decision to arrange joint seminars. The first seminar took place in Oskarshamn in April 2004 and dealt with alternatives to the KBS-3 method. A seminar is being planned for autumn in Östhammar on the topic of SKB's community development programme.

2.6 Sequence of Events 2002-2004 in Oskarshamn Municipality

2.6.1 Facts about the Municipality

Oskarshamn municipality is located in Kalmar County on the Baltic Sea coast parallel to northern Öland and has just over 26,000 inhabitants. 18,500 of these inhabitants live in the town of Oskarshamn. In the 1970's the population increased

somewhat in connection with the establishment of nuclear power on the Simpevarp peninsula, about 30 kilometres north of the town of Oskarshamn. Since 1994, the number of inhabitants has decreased by 100-200 people every year, depending on reduced employment in the industrial sector.

The largest employer is the municipality with about 2,400 employees. The dominant company and next largest employer is Scania with about 2,100 employees. The second largest industrial company, with about 900 employees, is OKG AB. The company owns Oskarshamn nuclear power plant, which has three reactors, of which the last was taken into operation in 1985. SKB's Central Interim Storage Facility for Spent Nuclear Fuel (CLAB), where spent fuel from all of the Swedish nuclear power plants is stored, is also located on the industrial site.

In 2001, about 2,350 people commuted to work in the municipality, while about 1,350 commuted to work in the opposite direction.

The Social Democratic Party has been the leading political party in the municipality for a long time. However, in the 1998 election, the party lost its earlier majority status but maintained a dominant position. Since the 2002 election, a political majority comprising the Social Democratic Party and the Left Party has led the municipality. Since the 2002 election, the distribution of the 49 mandates on the Council (there were 51 mandates in the previous period), has been as follows: Centre Party 3 (2), Liberal Party 3 (1), Christian Democratic Party 6 (6), Green Party 1 (1), Moderate Party 7 (9), Social Democratic Party 23 (22), Left Party 8 (10).

2.6.2 Council Decision to Allow SKB to Start Site Investigations on Simpevarp

In March 2002, a practically unanimous municipal council in Oskarshamn[3] to allow SKB to start investigations at the site that SKB had indicated which comprised the Simpevarp peninsula and an area west of that area. The decision carried thirteen stipulations and clarifications (see SOU 2002:46, p. 232 ff). As described in a previous section (Section 2.3), in September 2003, the council voted "yes" to a minor adjustment to the boundaries of the site.

The site for investigation is shown on the map in *Figure 2.4*.

2.6.3 The Municipality's Organisation for Following the Site Investigation Work

The municipality's work on following the site investigation[4] is being conducted within the framework of the *LKO Local Competence Development in Oskarshamn – Nuclear Waste Project*, which was originally started in 1994. The municipal executive board acts as a steering committee for the *LKO Project*, while the *municipal council* acts as the "client" of the project and has the task of making decisions on issues of major importance.

The current organisation is based on the situation during the feasibility study phase, where the focus was on a number of working groups, which were attached to the LKO Project. Prior to the site investigation phase, the municipality considered that the organisation that had applied during the feasibility study phase needed to be adapted to the new conditions. In November 2002, the council adopted the current organisation.

[3] One member moved to have the matter reviewed once more, but when that motion was rejected by the council, no other motions were put forward.
[4] An account of the municipal organisation in Oskarshamn during the feasibility study is provided in the report, SOU 2002:46, pp. 209-237.

Figure 2.4. Site investigation in the Simpevarp area (Swedish Nuclear Fuel and Waste Management Co, SKB).

The purpose of the LKO Project is to provide an adequate basis so that the council can make a decision in the event that an application is submitted for permission to construct a repository/encapsulation plant. The aim is for all issues of importance to be thoroughly investigated in the information that is provided. This means that the LKO Project should:

- Continuously follow the safety issues and SKB's site investigation in Oskarshamn.
- Ensure that SKB, the authorities and the Government comply with the council's site investigation stipulations.
- Initiate investigations into issues that arise during the site investigation phase.
- Enhance the competence of citizens within the nuclear waste area.
- Elicit questions and viewpoints from the municipality's inhabitants and neighbours.
- Maintain international contacts in order to follow developments within the nuclear waste programmes in other countries, with an emphasis on local participation.

The work is mainly being conducted "within the framework of a developed EIA". In this process, SKB is responsible for promoting the consultation and for conducting investigations, taking into account the fact that the municipality is one of the most important parties in the consultation. In its description of this work, Oskarshamn municipality states that the co-operation with Östhammar municipality needs to be developed in order to co-ordinate parts of the EIA process, for example, with respect to the description of alternatives.

One official is employed full-time within the LKO Project as project manager. In addition, an official works part-time on supporting the Misterhult group (see below) with a local development programme. Three experts also assist the project on a consultancy basis. Additional experts are hired when necessary.

Within the framework of the LKO Project, there is a *development group* and *four working groups* (see below). The task of the development group is to develop the project work and the "Oskarshamn model", to co-ordinate activities in the project, to prepare matters to be handled by the municipal executive board etc. The group comprises the chairman and vice-chairman of the municipal executive board, the four chairmen of the working groups, the former chairman of the executive board as well as experts and officials who are connected to the project – a total of 12 people. Therefore, in practice, the work is conducted in close co-operation with the municipal executive board. The chairman of the executive board represents the municipality in the consultation process with concerned parties that SKB must conduct, under the Environmental Code, and which is conducted within the framework of the *EIA Forum for Studies of Final Disposal Systems for Spent Nuclear Fuel in Oskarshamn Municipality* (see below).

Work in the LKO Project is mainly conducted through the four working groups. The task of each group is to follow three or more of the stipulations in the council decision from March 2002 (Section 2.6.2). Other important tasks of the groups as well as the designations of the groups are presented below.

Safety Group

- Responsibility for issues concerning safety and radiation protection in connection with encapsulation, transport and final disposal.

Misterhult Group

- Responsible for ensuring that the Misterhult local programme is defined and also participates in the implementtation and follow-up of the programme.
- Follows local environmental issues in the EIA.

Municipality Group

- Responsible for issues relating to physical planning, infrastructure and socioeconomic investigations.
- The group has a responsibility for co-ordinating the EIA.

Community Group

- Responsible for social scientific issues.
- Responsible for co-operation with neighbouring municipalities.
- Responsible for ensuring that regional issues are investigated in the site investigation programme.
- Follows the results of surveys and conducts its own surveys when necessary.
- Follows up the national issues.

The municipal executive board appoints all of the members of the groups. The development group proposes members, with the exception of individuals who are "politicians". Such individuals are directly appointed by the executive board. However, the composition of members of the four working groups is different. The chairman and three members of the *safety group* represent political parties. The other members are from the Döderhult chapter of the Swedish Society for Nature Conservation, the municipal rescue services and the environmental and health care administration. The *Misterhult group* focuses on the inhabitants living closest to the investigation site. Members were recruited to the group when the LKO Project advertised a meeting and individuals who were interested in joining the group. The group now comprises about 15 people who are attached to various NGOs and societies in the area that comprises old Misterhult parish. The group has itself proposed its chairman (one of the inhabitants living close to the investigation site). Two of the members represent political parties. The task of the *municipality group* is to ensure that the municipality's officials are have a good insight into and understanding of the issues. The administrative

director of the municipality has been appointed as chairman. The group primarily comprises officials from different municipal administrations. Three members represent political parties. The chairman and two other members of the *community group* represent political parties. The other members are from the child and youth welfare department, arts and cultural amenities department, Nova higher technical education centre, the Döderhult chapter of the Swedish Society for Nature Conservation and the Regional Council in Kalmar county.

In 2003, the working groups convened a total of just over 30 times. A large number of meetings have also been planned for 2004.

The current organisation for handling the site investigation and consultation process can be illustrated as shown in *Figure 2.5*.

Figure 2.5. *Municipal organisation for following the site investigation and participating in expanded consultation in Oskarshamn (Oskarshamn municipality).*

2.6.4 Examples of Site Investigation-related Issues that Have Been Discussed in the Framework of the Municipal Organisation in Oskarshamn

The way of working with final disposal issues that has been developed in Oskarshamn municipality means that the issues that, according to Section 2.8.3, have been brought to light in the EIA forum have almost without exception been discussed beforehand in one of the four working groups. The groups prepared work plans for 2004, which also include general descriptions of activities in 2003. Examples of issues that are of concern in the different groups are provided below. It should be added that the work in the LKO Project is reported to the municipal council twice every year.

Safety Group

The group is to specifically monitor eight of the 13 stipulations that the council formulated in its decision of March 2002 to allow the site investigation to be conducted. In 2003, when the group convened on eight occasions, special attention was devoted to SKB's wishes concerning a certain expansion of the area for the site investigations to also include areas adjacent to the Simpevarp peninsula. This issue led to the group arranging a special, official hearing, in September 2003, of SKB and the authorities with respect to these plans. Other issues dealt with in the hearing included

- the future responsibility for a repository after closure,
- the sealing of boreholes near a repository and their importance for the safety assessment,
- the decision-making process – establishing how the requirements of the Environmental Code and the Act on Nuclear Facilities are interlinked,
- the meaning of the concepts "best site" and "sufficiently safe site",
- retrievability,

- the need for the authorities to have adequate resources to satisfy the requirements on competence for regulatory review.

On the group's initiative, a seminar was conducted in April 2004 together with Östhammar municipality, where the question of alternatives to the KBS-3 method was discussed.

Misterhult Group

In 2003, during which time the group met on 13 occasions, work started on a local development programme for the Misterhult area. The responsibility for conducting this development programme rests with SKB, although the work of the programme is based on a broad participation and commitment from those living close to the investigation site, NGOs and organisations. In autumn 2003, the group arranged a seminar for the inhabitants of old Misterhult parish in order to elicit proposals for developing the community centre.

Municipality Group

The group convened on eight different occasions in 2003. The main focus of work was preparations for increasing information to municipal employees on the nuclear waste issue. Measures included a survey, which was conducted among municipal employees to investigate the need for information.

Community Group

The group has had six meetings in 2003. Work focused on contributing to obtaining a basis for discussion for the social science studies that SKB is planning to undertake. The group's tasks include specially monitoring the decision-making process and, for this reason, an environmental lawyer has been attached to the group. Before 2004, the group expects to develop the co-

operation with lower and upper secondary school pupils, to prepare information material about the LKO Project which is specially adapted to young people as well as to develop contacts with other municipalities in the region.

As reported in Section 2.5.4, a close co-operation has started between the LKO Project in Oskarshamn and the corresponding organisation in Östhammar municipality.

2.7 Sequence of Events, 2002-2004 in Hultsfred Municipality

2.7.1 Facts about the Municipality

Hultsfred municipality (Kalmar county) is located in the interior of Småland, on the border of Oskarshamn municipality to the east and has about 14,700 inhabitants. About 5,400 people live in the population centre of Hultsfred. Since 1994, the number of inhabitants has decreased with just over 2,000 people, due to reduced employment in the industrial sector and to the migration of young people to other areas where higher education is available.

The municipality is the largest employer with about 1,500 employees. The dominant company and next largest employer is OKG with about 360 employees. Apart from these two, only small-scale employers are located in the municipality. The economy of the municipality is strained.

In 2001, about 1,000 people commuted to the municipality while about 1,150 commuted to work in the opposite direction.

Since 1994, the Social Democratic Party has formed a majority, together with the Left Party. Since the 2002 election, the distribution of the 49 mandates on the municipal council has been as follows (the distribution of the mandates for the previous period is provided in brackets): Centre Party 9 (8), Liberal Party 2 (1), Christian Democratic Party 6 (7), Green Party – (-), Moderate Party 4 (5), Social Democratic Party 21

(19), Left Party 5 (7), a local party called Medborgarpartiet, skola, vård och omsorg (Citizens' Party, school, health care and welfare) 2 (2).

2.7.2 The Municipality and the Final Disposal Issue

The proposal presented by SKB at the end of 2000 concerning which sites would be included in the site investigations did not include a site in Hultsfred municipality. As has been reported elsewhere[5], the company's attitude meant that both the local government leaders and the municipal feasibility study organisation expressed disappointment that SKB had adopted a position on the matter without awaiting the outcome of the municipality's handling of the preliminary feasibility study report. In spring 2001, an agreement was signed between the company and the municipality concerning some concluding activities. The agreement stated that if Hultsfred municipality were considered for site investigations in the future, SKB would submit a new request for permission to the municipality and a new political process would then be started.

In June 2001, the municipal executive board approved a plan for the municipality's further work on the nuclear waste issue in 2001. In a document to the municipality in December 2001, SKB emphasised that "there is no overriding reason to write off any siting alternatives, such as Hultsfred, at present" and stated that, in 2002, the company intended to conduct certain geohydrological investigations in the municipality as well as continue with certain information work.

In January 2002, the executive board's working committee decided on a plan of activities, budget and organisation for the municipality's information work on the final disposal issue during the next year. Representatives from the municipality have since participated in various activities that KASAM, SKI, SSI,

[5] A detailed account of the sequence of events in Hultsfred municipality during the feasibility study phase is provided in the report, SOU 2002:46, pp. 239-254.

other municipalities as well as SKB arranged on the nuclear waste issues.

In December 2002, SKB presented a "contact programme" for Hultsfred municipality. The programme was based on an agreement with the local government leaders. In the contact programme, SKB emphasised again that there were no important reasons to write off any of the alternatives that were not prioritised for site investigations and continued: "It is important to ensure that SKB continues to have freedom of action if unforeseen events should occur during the site investigation phase. Therefore, SKB would like Hultsfred municipality to remain in the programme even if there are currently no plans to conduct site investigations in the municipality." The programme meant that SKB would continue to have a local office in the municipality, although with limited opening hours.

Since December 2002 and during 2003, meetings have been arranged regularly (about once a month) under the auspices of the municipality, on different topics relating to the nuclear waste issue. In November 2003, the municipality was the host of an "exchange of opinion between authorities, the company, municipalities and citizens about the society-related process for the deep disposal issue."

During the feasibility study phase, the municipality created an organisation focussing on a number of working groups, comprising individuals representing political parties as well as private individuals who had voluntarily expressed their interest in the issues. The number and areas of responsibility of the groups gradually changed in 2001-2002. In February 2003, a *contact group*, in accordance with a decision by the municipal executive board, replaced them. Half of the members (seven people) represent all of the parties that have members on the council. The remaining seven members are people who have shown a particular interest in the issues and have participated in the previous working groups.

At the same time, the municipal executive board established the following guidelines for the activities of the contact group:

- The individual members should be able to act as an interface with the citizens.
- Information work would have a social and democratic focus.
- The municipal work would be characterised by knowledge, insight and participation.
- The municipality would choose suitable supplementary training and information in order to develop comprehensive knowledge when alternatives to the information provided by industry and the authorities are required.
- Local information should be adequately distributed. The citizens and their elected representatives would be mentally well prepared and informed of the content and consequences of a possible siting of a deep repository in the neighbouring municipality (Oskarshamn) and of a possible site investigation in Hultsfred municipality.
- The environmental NGOs and other local NGOs should be given the opportunity to participate in the municipal process.

2.8 Consultation under the Environmental Code

2.8.1 Requirements on Consultation

The final disposal and encapsulation of spent nuclear fuel requires government licensing under both the Environmental Code and the Act on Nuclear Activities. The requirements on consultation prior to this licensing are presented in the regulations on EIS and other assessments used as a basis for decision making in Chapter 6 of the Environmental Code. The Environmental Code also places requirements on consultation prior to the site investigations. SKB must take the initiative for consultation as described below.

2.8.1.1 Consultation Prior to Site Investigations

Consultation prior to the site investigations must be held with the county administrative board in accordance with Chapter 12 § 6 of the Environmental Code. This consultation concerns activities or measures that can essential effect the natural environment. Issues relating to the impact on the cultural environment are also to be dealt with in this context.

The purpose of the site investigations is to ensure that SKB obtains the necessary information in order to submit an application to the Government for permission to establish a repository for spent nuclear fuel at a certain site.

2.8.1.2 Consultation Prior to the Preparation of Licence Applications and EIS

SKB is now conducting investigations at the Forsmark and at Simpevarp sites (see also Sections 2.8.2.2 and 2.8.3.2). In connection with this, the project planning has reached such a degree of detail that SKB has started the consultation in accordance with Chapter 6 of the Environmental Code.

Consultation prior to the preparation of applications for a government licence to construct a repository or an encapsulation plant, along with the required EIS, should be conducted in accordance with Chapter 6 of the Environmental Code. The consultation should be held at an early stage with the competent regulatory authorities, municipalities, the public and organisations. The consultation should be conducted in two phases.

These regulations mean that SKB, as the proponent, must take the initiative to and conduct these consultations with those parties who are in different ways concerned. Therefore, it is SKB that formally "owns" the issue and has the role of providing an impetus for the work within the framework of the existing regulations. The role of the county administrative board is to

provide advice to SKB prior to various consultations with the ultimate aim of ensuring that the consultation is conducted in the spirit of the regulations. At the same time, the county administrative board's task is to make the decisions that are necessary to enable SKB's work.

In the first consultation phase – "early consultation" – SKB must consult with the county administrative board and individuals who it can be assumed are specifically concerned, namely, people living in the vicinity and landowners. Prior to the consultation, SKB must submit information on the siting, scope and design of the planned activity as well as on the anticipated environmental impact.

After this early consultation, and as a result of the compulsory decision of the county administrative board that the activity can be expected to result in a "significant environmental impact", SKB must hold "an expanded consultation with EIA". SKB must consult with the other government authorities, the municipalities, general public and organisations that are assumed to be concerned. Furthermore, in addition to the siting, scope, design and environmental impact of the planned activity, the consultation must also include the content and form of the EIS.

In December 2003, SKB invited twenty government authorities to an information meeting on SKB's planning reports "Scope, Boundaries and Investigations for Environmental Impact Statements (EIS) for an Encapsulation Plant and Repository for Spent Nuclear Fuel. Version 0 – Basis for Expanded Consultation" concerning the repository in Forsmark and Simpevarp (see Sections 2.8.2.4 and 2.8.3.4). The authorities were also invited to comment on the reports.

2.8.2 Consultation in Uppsala County

2.8.2.1 Preparatory Consultation in Uppsala County

In connection with SKB starting feasibility studies in Östhammar municipality, an organisation had been created for consultation and exchange of information between the county administrative board, SKB, municipalities concerned and government authorities etc. under the auspices of the county administrative board in Uppsala county. These consultations were based on a government decision in May 1995 where the county administrative boards concerned were given the responsibility of co-ordinating contacts with municipalities and government authorities that were necessary for SKB to be able to prepare a basis for an EIS. They were also given the responsibility of ensuring that the municipalities concerned by the site selection process could follow SKB's site selection studies etc. closely. The organisation for consultation was called *The County Administrative Board's Reference Group on Issues concerning a Possible Siting of a Repository for Spent Nuclear Fuel in Uppsala County*. Up to and including 2002, the reference group convened about twice a year, for regional consultation on the final disposal of spent nuclear fuel[6].

2.8.2.2 SKB's Consultation Prior to the Site Investigation in Forsmark

In December 2001, SKB submitted to the county administrative board in Uppsala County an application for a consultation prior to the initial site investigations. This consultation primarily concerned the impact that the site investigation work could have on the natural environment and did not concern issues relating to the risk of environmental impact in connection with the

[6] An overview of the work conducted in this reference group and in a *working group* attached to this group, is presented in the report, SOU 2002:46, pp. 269-271.

construction of a repository at the site. In its decision of February 14, 2002, the county administrative board found that SKB's application contained sufficient information for a consultation on the initial site investigations but not sufficient information for a complete site investigation. The decision meant that SKB was able to start initial site investigations on condition that certain measures were taken.

2.8.2.3 Early Consultation Prior to an Application and Environmental Impact Statement for a Repository and Encapsulation Plant in Forsmark

In 2002, SKB held an *early consultation in accordance with Chapter 6 § 4 of the Environmental Code* with the county administrative board of Uppsala County and individuals who were assumed to be specifically concerned by a repository in the Forsmark area. A consultation report was prepared by SKB and submitted to the county administrative board in July 2002. Based on this report – as well as statements of opinion on the report from the Swedish Nuclear Power Inspectorate, the Swedish Radiation Protection Authority, the National Board of Housing, Building and Planning, the municipal executive board and the environment and health board in Östhammar municipality – the county administrative board decided in December 2002 that a deep repository in the Forsmark area could be "expected to result in a significant environmental impact".

In autumn 2003, SKB had also conducted an early consultation concerning a possible encapsulation plant for spent nuclear fuel in Forsmark. Based on the consultation report prepared by SKB, the county administrative board decided in January 2004 – after statements had been issued by the Swedish Nuclear Power Inspectorate, the Swedish Radiation Protection Authority, the National Board of Forestry in Mälardalen, the local safety committee at the nuclear facilities in Forsmark and the environment and health board in Östhammar municipality –

that also such a facility could be "expected to result in a significant environmental impact".

Both of the decisions by the county administrative board in Uppsala meant that SKB would continue to follow the regulations concerning expanded consultation with EIA in accordance with Chapter 6 § 5 of the Environmental Code.

2.8.2.4 Expanded Consultation Prior to Submitting an Application with EIS for a Repository and Encapsulation Plant in Forsmark

SKB currently conducts *expanded consultations on EIS in accordance with Chapter 6 § 5 of the Environmental Code*, for a repository and an encapsulation plant for spent nuclear fuel with siting in the Forsmark area and in the Simpevarp area.

At the last meeting in November 2002 with the county administrative board's *reference group concerning a possible siting of a repository for spent nuclear fuel in Uppsala county*, a working group was given the task of presenting a proposal for work procedures for the continued regional consultation work. The working group comprised representatives for SKB, Östhammar municipality, the Swedish Nuclear Power Inspectorate, the Swedish Radiation Protection Authority and the county administrative board. Based on the group's proposals, a first meeting was arranged in September 2003 with a body called *Forsmark consultation and EIA group*. On this occasion, the group decided on work procedures to conduct its activities.

The document regulating the forms of work states that the group "was formed on the basis of the responsibilities of the county administrative board, the most closely concerned central authorities and the municipalities" (primarily in accordance with the Environmental Code and the government decision of May 1995) as well as "SKB's responsibility in accordance with the regulations in Chapter 6 of the Environmental Code." The

subject of the negotiations is *an encapsulation plant and repository for spent nuclear fuel in Forsmark, Östhammar municipality*.

Representatives from SKB, Östhammar municipality, the Swedish Nuclear Power Inspectorate, the Swedish Radiation Protection Authority and the county administrative board in Uppsala are members of the consultation and EIA group for Forsmark, in accordance with the work procedures and in the same way as with the previous reference group. Representatives from other parties can be co-opted when necessary. The county administrative board in Uppsala is responsible for chairing the group's meetings and for the final minutes. Joint meetings with the corresponding organisation in Kalmar County can be arranged. The document on the group's forms of work also states that it is SKB (the proponent) that is responsible for preparing an EIS. The document also states that the group:

- Consults "on information and consultation issues prior to the construction of a repository for spent nuclear fuel as well as on the scope, design, site adaptation and environmental impact of the planned activity as well as on the content and structure of the EIS to be attached to the licence for the construction and operation of the repository. The consultation should also, in a corresponding manner, deal with the siting of an encapsulation plant at Forsmark."
- Is only an advisory body. The participants in the group are not bound to make decisions in accordance with the consultation group's views. The issues that are dealt with are raised the participants themselves.
- Must work to ensure that the basis for the EIS for the repository and for the encapsulation facility is adequate in terms of reliability, comprehensibility and relevance.
- Usually convenes in Uppsala. Some meetings can be public and should take place in Östhammar municipality. What occurs in the meeting should be reported in minutes along with the conclusions reached and justifications that the group has found. The minutes are administered by the

county administrative board and adjusted by all of the organisations that have participated in the meeting. Agenda proposals are prepared by SKB, although the participants in the consultation notify SKB of topics to put on the agenda.

In September 2003, SKB presented a preliminary version of a report with the title, "Scope, Boundaries and Investigations for Environmental Impact Statements (EIS) for an Encapsulation Plant and Repository for Spent Nuclear Fuel. Version 0 – Basis for Expanded Consultation." At the same time, a corresponding report concerning the consultation in Oskarshamn was presented, see Section 2.8.3.4. SKB has asked for views on the content of both documents from a number of authorities, organisations etc., that are assumed to be concerned.

The Forsmark consultation and EIA group has so far convened twice. January 2004 was the most recent meeting. During the first meeting in September 2003, a number of status reports were dealt with, in addition to the issue of work procedures. Furthermore, a working group was set up with the task of presenting a work programme for further work.

During the second meeting with the Forsmark consultation and EIA group, SKB provided information on the ongoing investigations in Östhammar and in Oskarshamn as well as on the planning of forthcoming consultations. Other participants presented status reports on various issues.

2.8.3 Consultation in Kalmar County

2.8.3.1 Preparatory Consultation in Kalmar County

On the initiative of Oskarshamn municipality, a body was created in 1994 for consultation between the municipality, county administrative board in Kalmar county, SKB, the Swedish Nuclear Power Inspectorate and the Swedish Radiation Protection Authority concerning the plans for an expansion of the

Central Interim Storage Facility for Spent Nuclear Fuel (CLAB), located next to Oskarshamn nuclear power plant's facilities on the Simpevarp peninsula. In 1996, the consultation also included issues relating to a repository in Oskarshamn municipality. From 1997, this consultative body was called *The EIA Forum for Studies of Final Disposal Systems for Spent Nuclear Fuel in Oskarshamn Municipality (commonly referred to as the EIA forum in Kalmar county)*[7]. The work in the EIA forum has been characterised by the fact that the municipality has seen this body as a forum where the municipality puts questions concerning the plans for the final disposal of nuclear waste to SKB and to the regulatory authorities and where the municipality demands answers to its questions. The objective of the work within the LKO Project has been to obtain a basis for action within the framework of the EIA forum.

2.8.3.2 SKB's Consultation Prior to the Site Investigation in Simpevarp

In April 2002, an application was submitted to the county administrative board in Kalmar County. In the decision of June 19, 2002, the county administrative board stated that it did not have any objections to SKB conducting initial site investigations on the Simpevarp peninsula. The county administrative board added that the information in the application did not provide a sufficient basis for consultation on a possible complete site investigation and that "a continued process with consultation must be conducted as the site investigation continues in other parts of the candidate site." This decision also meant that SKB could start the initial site investigations under certain conditions.

[7] For an overview of the work conducted in the EIA forum in Oskarshamn, see the report, SOU 2002:46, pp. 271-272.

2.8.3.3 Early Consultation Prior to an Application and EIS for a Repository and Encapsulation Plant in Simpevarp

The early consultation for a possible repository in the Simpevarp area started somewhat differently than that for the Forsmark area. At the request of Oskarshamn municipality, SKB started, as early as in January 2002 – before the municipality in March 2002 decided to "allow" the proposed site investigation – an initial consultation meeting with specifically concerned parties and the county administrative board. A consultation report was prepared by SKB after the meeting and submitted to the county administrative board in Kalmar County. When the municipality, the Swedish Nuclear Power Inspectorate and the Swedish Radiation Protection Authority had submitted statements of opinion on the report, the county administrative board decided, in January 2003, that a deep repository for spent nuclear fuel at the proposed site on Simpevarp could be expected to result in a significant environmental impact.

Early in 2003, SKB also conducted an early consultation with specifically concerned parties and the county administrative board in Kalmar County concerning a possible encapsulation plant for spent nuclear fuel. The intention is to site the encapsulation plant adjacent to CLAB. On the basis of SKB's consultation report and on the basis of statements of opinion on the report submitted by Oskarshamn municipality, the Swedish Nuclear Power Inspectorate and the Swedish Radiation Protection Authority, the county administrative board decided, in September 2003, that such a facility could also "be expected to result in a significant environmental impact."

Both decisions of the county administrative board in Kalmar County mean, in the same way as corresponding decisions in Uppsala County that, also with respect a siting in Oskarshamn municipality, SKB will have to follow, in the future, the regulations for expanded consultation with EIA, in accordance with Chapter 6 § 5 of the Environmental Code.

2.8.3.4 Expanded Consultation Prior to an Application and EIS for a Repository and Encapsulation Plant on Simpevarp

SKB is currently conducting *an expanded consultation with EIA in accordance with Chapter 6 § 5 of the Environmental Code*, for a repository and an encapsulation plant for spent nuclear fuel to be sited in the Forsmark area and in the Simpevarp area.

In response to a request from Oskarshamn municipality, SKB arranged, already in January 2002 – before the municipality decided to "allow" the proposed site investigation in March 2002 – an initial consultation meeting with specifically concerned parties and the county administrative board. In different contexts, Oskarshamn had emphasised its intention to also continue to work actively on the nuclear waste issues and emphasised the sound experience that had been gained through the work within the framework of "the EIA forum."

At a meeting with the EIA forum in May 2002, the parties had decided to conduct a review of activities. An evaluation and a proposal for changes in the forms of activity were presented and discussed in a total of three meetings during the period from October 2002 to March 2003. The end product comprised two documents: a "rules of procedure" and a "basic document".

According to the rules of procedure, representatives from SKB, Oskarshamn municipality, the Swedish Nuclear Power Inspectorate, the Swedish Radiation Protection Authority and the county administrative board in Kalmar county participate in the *EIA Forum on Questions Relating to the Final Disposal System for Spent Nuclear Fuel in Oskarshamn Municipality* ("EIA forum in Oskarshamn"). When necessary, additional representatives from authorities, organisations and neighbouring municipalities can be co-opted. Initially, it is established that SKB is responsible for preparing the EIS, which must be attached to an application to construct facilities. The rules of procedure also state that SKB "is to prepare a separate consultation report which provides possible answers to questions asked and possible

measures that SKB is adopting and that the consultation has occasioned." Otherwise, the rules of procedure mainly state that the EIA forum:

- Consults on the EIS (documents) for the facilities and on the EIA (the process that results in these documents).
- Is consultative and none of SKB, the municipality or the government authorities is bound to make decisions in accordance with the recommendations of the EIA forum. The participants themselves raise the issues that are dealt with, and they have the right to put forward requests with respect to studies and investigations.
- Through its composition, is to work towards ensuring that the basis for decision-making for each facility is adequate with respect to reliability, comprehensiveness and relevance.
- Usually convenes in Oskarshamn. Certain meetings should be open to the public. Initiatives should be taken, at relevant intervals, to arrange a joint meeting with a corresponding organisation in northern Uppland. Minutes should report what has been discussed at the meeting and the conclusions and justifications that the EIA forum has reached. The county administrative board administers the minutes, although SKB "provides secretarial assistance". The minutes are adjusted by each organisation that is represented. Prior to each consultation occasion, "SKB is to ensure that the representatives submit matters for the agenda."

The *basic document*, which is dated May 16, 2003, is a document which, according to the preface, "aims to provide a holistic view of the different consultations that will be held between SKB and different actors, to describe how consultations within the framework of the EIA forum in Oskarshamn municipality will be conducted and co-ordinated with other consultations as well as to provide a view of how the consultations in the EIA forum are linked to Oskarshamn municipality's activities on the nuclear waste issue". Furthermore, it is stated that the intention is to

prepare a *scoping report*. The scoping report presents "the investigations that the parties request so that the EIS will provide the basis for decision-making that each individual party will need. The scoping report will, therefore, provide SKB with advice on the contents of the EIS…" In September 2003, SKB presented a preliminary version of a "scoping report" entitled "Scope, Boundaries and Investigations for Environmental Impact Statements (EIS) for an Encapsulation Plant and Repository for Spent Nuclear Fuel. Version 0 – Basis for Expanded Consultation in Oskarshamn"). A corresponding report concerning consultation in Forsmark was presented at the same time, see Section 2.8.2.4. SKB has requested viewpoints on the content of both documents from a large number of authorities, organisations etc. that are assumed to be concerned.

The information given in the basic document is provided under the following headings:

- Repository project
- Licensing process for nuclear facilities
- Consultation
- Municipality's activities
- EIA forum in Oskarshamn

The document also contains three appendices. These provide an account of SKB's consultation process, the meaning of "good EIA practice" as well as an account of the development of Oskarshamn's LKO Project.

In practice, the EIA forum in Oskarshamn was conducted in accordance with the intentions of the rules of procedure from the beginning of 2003. Up to and including March 2004, five meetings had been held in accordance with the new rules of procedure (March, May, September and December 2003 as well as March 2004). At all of these meetings, SKB and other participants had provided detailed information on current issues. Discussions have also been conducted concerning preliminary versions of the scoping report. In addition, Oskarshamn

municipality put detailed questions to SKB and to the authorities. The matters or questions that the municipality initiated at these three meetings are reported below. The choice of topic is a good illustration of how the municipality uses the EIA forum to obtain clarification on various issues.

March 20, 2003

1. Status report from the municipality
2. County administrative board's decision on expanded consultation
3. The forum's rules of procedure and basic document
4. Public hearing on the choice of the P2 area in Misterhult
5. SKI and SSI's information project
6. Earlier question on investigation into health consequences, response from SKB?
7. Planning of the EIA forum meetings, annual plan with different topics
8. Question concerning Claes Thegerström's (President of SKB) participation in the county administrative board's board

May 26, 2003

1. International solutions to the nuclear waste issue
2. Is the timetable for the encapsulation plant realistic?
3. Results from the well inventories
4. Traffic on the Laxemar-Kråkelund road
5. Information: municipality - SKB

September 30, 2003

No list of questions from the municipality is included in the minutes. However, from the municipality's status report it can be seen that further explanations were required from SKB regarding the question of expanding the investigation area and that the municipality wished to include some municipality-specific questions in the survey questionnaire directed to municipality inhabitants that SKB conducts each year.

December 11, 2003

1. Siting work for canister fabrication
2. SR-can – request for report in Swedish

3. Expanded consultation – How does SKB intend to give insight into the expanded consultation?
4. EIA forum meetings – are all meetings open?
5. Consultation reports for previous meetings in the EIA forum. When will they be published?
6. Question to the county administrative board: the municipality's report with a request for limiting the speed limit at the junction between the Kråkelund road and the coastal road. How much progress has been made in the handling of the matter?
7. Question to SSI: Request for a report on the results from the work on general recommendations, feedback from the focus groups etc.

March 24, 2004
No questions from the municipality at this time.

2.9 KASAM's Comments

The previous sections show how the municipalities deal with questions in connection with SKB's site investigations and consultation on the final disposal issue. Site investigations are being conducted in the Forsmark area (Östhammar municipality) and in the Simpevarp area ("the Simpevarp-Laxemar area") (Oskarshamn municipality).

In this section, KASAM comments on what has occurred in the contacts with representatives from Östhammar, Oskarshamn and Hultsfred municipalities. Finally, some conclusions that KASAM believes should be drawn from these comments are presented.

2.9.1 Östhammar and Oskarshamn – Different but Similar?

In Östhammar and Oskarshamn, different organisational models have been developed for how each municipality participates in the expanded consultation and for how each municipality follows SKB's site investigations. In both cases, these models are

based on how each municipality had organised its work to follow SKB's feasibility studies. The question is whether these different organisational solutions reflect differences in terms of each municipality's view of how active it should be as an actor in the final disposal issue. KASAM's perceptions are presented below.

Up to autumn 2003, the municipal politicians in *Östhammar*, to a greater extent that in Oskarshamn, seemed to have put their trust in the assumption that the site selection process and allocation of roles among important actors (SKB, central and regional authorities and the municipality) would function well. The municipality's representatives acted on the basis of the assumption that it was SKB that "owned" the issue and, therefore, there was no reason for the municipality to become more active until the company presented different proposals. There was – and there still is – basic confidence in SKB among the majority of the municipal politicians. These politicians mean that the company listens closely and takes into account the views that the municipality's representatives present in different contexts. The municipal politicians consider that the inhabitants have a good understanding of the issues and that the citizens of the municipality have considerable confidence in SKB. Furthermore, in their opinion, a large majority of the inhabitants also have confidence in their elected representatives. Taken as a whole, this has resulted in the view that the municipality should act in a "reactive" manner.

During the feasibility study phase in *Oskarshamn*, the prevailing approach towards SKB was more "proactive". This was not due to a lack of basic confidence in SKB. However, the view held – and still held – by the municipal leaders is that the municipality is in a unique situation with respect to the disposal issue. The unique aspect is that spent nuclear fuel from all of the nuclear power plants since 1985 is successively being transported to the *Central Interim Storage Facility for Spent Nuclear Fuel* (CLAB), which is located next to Oskarshamn nuclear power plant. The municipality has been positive to the establishment of this facility for interim storage for a limited period of time,

about 40 years. However, at the same time, the very establishment of CLAB means that the municipality has the problem inside its boundaries. When SKB, in the early 1990's raised the question of expanding CLAB and of constructing an encapsulation plant next to CLAB, the municipal leaders reached the conclusion that they could not settle for allowing other actors to have the responsibility of reaching a satisfactory solution to the final disposal question.

From the mid-1990's, the municipal leaders placed the question of feasibility studies high on the agenda and gave impetus to the work of establishing forms for consultation between the important actors. On the initiative of the municipality, "the EIA Forum for Studies of Final Disposal Systems for Spent Nuclear Fuel in Oskarshamn Municipality" was created. The discussions in this forum were based on the ideas behind the regulations on consultation concerning the preparation of EIS, which were successively introduced in the 1990's. However, it was only when the Environmental Code was introduced in 1999 that a well-thought out system was created for consultation and for the preparation of EIS prior to major industrial facility siting projects.

The municipality developed its own extensive project organisation and sought to bring about the broad participation in this organisation by both elected politicians and representatives for various interest groups in the municipality. The costs were covered by funds that the Government made available from the Nuclear Waste Fund. The purpose of this project organisation was to ensure, at an early stage in the process, that different aspects of the project would actually be investigated satisfactorily. Another purpose of the project organisation was to promote and pursue different issues in the "EIA forum". Thus, the consultations in the framework of this forum did not occur as a result of formal requirements in accordance with the regulations of the Environmental Code, not even when the Code had entered into force. However, the municipality considered that the idea behind consultation on EIS provided an

opportunity to be an active actor. The expression "EIA – our platform" eventually came to be one of the mottos used by the municipal representatives when describing their activities.

When SKB initiated site investigations in Forsmark and Simpevarp, the planning of the project reached such a level of implementation that the regulations of the Environmental Code on different types of consultation could be applied. An agreement has been reached with respect to new forms of consultation, co-ordinated by the two counties, to replace the previous consultation bodies at county level. These agreements show that SKB has the responsibility to conduct an expanded consultation in accordance with the Environmental Code and to obtain a basis for the EIS. Each county administrative board concerned is responsible for chairing the consultation. In the regional consultation forums participate, along with SKB, the county administrative board and the municipality, the Swedish Nuclear Power Inspectorate and the Swedish Radiation Protection Authority. There is a desire, primarily from both county administrative boards, for the discussions in both of these to be conducted somewhat in parallel and to result in similar approaches, if possible.

In Oskarshamn municipality, the type of project organisation that was established during the feasibility study phase has been kept, although it has been adapted to the issues that are now of interest (cf Section 2.6.3). Questions and proposals are directed to SKB to a significant degree. A number of working groups work intensively to penetrate different issues. The viewpoints of the groups then provide a basis for the municipality's stance in the discussions that are continuously conducted with SKB within the framework of the "EIA forum in Oskarshamn", which was created in 2003. Requirements are placed on SKB to conduct investigations on different issues. The work is resulting in an extensive documentation which is also made available to citizens via the municipality's website. The fact that SKB formally "owns" the issue during the consultation phase does

not mean that the municipality has in any way renounced its ambitions to exercise a major influence over SKB's work.

In Östhammar municipality, less extensive preparations were initially made, compared with Oskarshamn, prior to the meetings with "the Forsmark consultation and EIA group", which was created in 2003. Nevertheless, the municipal leaders and other elected politicians in Östhammar have shown considerable commitment to the regional consultation. However, the approach is different from Oskarshamn's, which is something that may perhaps lie behind the wording of a previously mentioned joint press release from both municipalities in February 2004 (Section 2.4.1), where "differences … in political traditions" are mentioned.

The co-operation and common approach shared by Oskarshamn and Östhammar municipalities gives the overall impression that the similarities between both municipalities now outweigh the differences. The differences that exist are more a matter of form than content.

2.9.2 Site Selection in Certain Possible Scenarios

The strategy behind the site investigations now being conducted by SKB seems to be that the results should lead to the conclusion that one of the sites is more suitable than the other and that the company will propose the more suitable site as a site for the repository, while the other will be regarded as an alternative. Representatives from SKB have expressed the view, on different occasions, that the company will propose two sites in any event, although it will also state a preference for one of the two sites. SKB has promised that two *complete* site investigations will be conducted.

However, KASAM lacks – a view which has also been put forward during conversations with the municipal leaders concerned – an in-depth discussion, on SKB's part, regarding how the company should act if the results of the ongoing site

investigation show that one of the two areas currently being investigated does not appear to be suitable. Questions can be raised on the basis of a number of scenarios.

Scenario 1

The Forsmark site proves not to be suitable. Should SKB then primarily conduct a site investigation within a suitable site in Östhammar municipality, possibly within the Hargshamn area, which has been identified by SKB in its study as a potential site for investigation? Or should SKB look for new site to conduct site investigations, outside the boundaries of the municipality? Perhaps in Hultsfred, where at least one site was identified during the feasibility study? Or in another part of Oskarshamn than the current site investigation (the feasibility study identified three candidate sites in Oskarshamn for investigation)? Or in another municipality with different geological conditions (cf KASAM's statement of June 2001 on the desirability of greater geological breadth in connection with site selection for site investigations[8])?

Scenario 2

Investigations in the Simpevarp area ("Simpevarp-Laxemar site") show that this site is not suitable. Should SKB then, primarily focus on conducting a site investigation further west in Oskarshamn municipality, within the two other sites in the municipality identified in the feasibility study or should SKB go outside the municipality boundaries? Perhaps to Hultsfred? Or to the Hargshamn site in Östhammar municipality? Or to some other municipality with other geological conditions?

[8] See pp. 14-16 of KASAM's statement to the Government on June 14, 2001 on SKB's Supplement to RD&D Programme 1998 – Integrated Account of Method, Site Selection and Programme Prior to the Site Investigation Phase (RD&D Supplement).

Scenario 3

None of the two ongoing site investigations results in the conclusion that a repository should be constructed at these sites. Should SKB, under such circumstances, primarily attempt to conduct site investigations at other sites identified in the feasibility studies in the three municipalities, Östhammar, Oskarshamn and Hultsfred? Or should some other municipality with other geological conditions be investigated?

2.9.3 Availability of the Necessary Competence at the Regulatory Authorities

One of the issues that often recurred during the conversations with the municipal representatives was the concern that the government authorities are not being given adequate resources to fulfil their task in terms of a competent regulatory review of SKB's proposals. The municipalities take the view that they are dependent, and must be dependent, on the expertise of the regulatory authorities. Using their own expertise to review and evaluate SKB's proposals is not possible – the municipalities and their citizens are quite simply entitled to depend on the regulatory authorities conducting a competent review and evaluation of the proposals submitted by the nuclear industry.

The concern for the availability of competence in the future does not only apply to the authorities. The municipalities also make demands on the Government, the cabinet office and ministries. The municipalities' representatives expect that the members of the Government, to a greater extent than has been the case so far, will allocate time to be briefed on the issues before they are forced to make decisions with far-reaching consequences. As far as the cabinet office and ministries are concerned, there is considerable concern over the relatively large turnover of the few officials that handle issues relating to the final disposal of nuclear waste.

The review of the application for a licence to construct a repository for spent nuclear fuel and the review of the attached EIS is an important step in the decision-making process. The review aims to show that the repository can be considered to comply with the requirements on safety, that the EIS complies with the requirements of the Environmental Code and that the basis for decision-making is credible and adequate. The necessary foundation for a qualitatively adequate basis for decision-making is laid through the consultation and investigation process that SKB is now leading. Past Swedish, Nordic and international experience of decision-making processes and EIAs with respect to major and technically advanced projects indicates that there is a very great need for a quality assessment of the basis for decision-making as a whole and that this quality assessment is an important part of the decision-making process.

2.9.4 Competition between the Municipalities?

An interesting question is whether there is any type of competition between the two municipalities where the site investigations are currently underway. Does either of the municipal leaderships see the establishment of a repository for spent nuclear fuel within the municipality as something desirable – providing that they can be convinced that the safety issue has been resolved?

The chairmen of the municipal executive boards have emphasised, on different occasions, that there is no competition in the relationship between the two municipalities. However, as an outside observer, it is difficult to completely shake off the impression that there are, or could be, aspects of competition. Each of the municipal leaderships seems to be of the opinion that SKB should select a new site for investigation, primarily within their own respective municipalities, if it should be found that the sites currently under investigation are unsuitable. However, at the same time, the management groups of both

municipalities seem firmly determined to act in such a way that SKB cannot play one municipality off against the other. According to the municipalities' representatives, it is the requirements of principle regarding the selection of a site, in accordance with Chapter 2 of the Environmental Code, which is the determining factor.

2.9.5 Consultation under the Environmental Code

KASAM has the impression that SKB has a high level of ambition for the expanded consultation. The company is demonstrating considerable openness and will to receive and thoroughly consider the viewpoints that other consultation participants put forward. Such an attitude is probably also a prerequisite for the general public and the representatives of the municipalities concerned to have the necessary confidence in the activity. Otherwise, it would probably not be possible to realise "the nuclear waste project" within a reasonable period of time.

However, in KASAM's view, it must be emphasised that the EIA and consultation processes are time-consuming. It is important for the high level of ambition to be sustained, even if the process takes a long time. KASAM assumes that the county administrative boards concerned feel responsible for assisting SKB – although the responsibility for an adequate consultation ultimately rests with the company. If the company, at suitable time intervals, allows an independent party to assess the quality of and to evaluate the ongoing consultation process, the possibility of sustaining the current high level of ambition will probably increase. Achieving an independent review and evaluation is also in the interests of the two site investigation municipalities.

2.9.6 Conclusions

The comments from the municipalities concerned, which have been reported in Sections 2.9.1-2.9.5, have led KASAM to draw the following conclusions:

- The Government should, in good time, ensure that the competent authorities (SKI, SSI, county administrative boards etc.) have adequate resources prior to the further consultations and reviews of SKB's applications for a repository and an encapsulation plant for spent nuclear fuel. The municipalities do not have the necessary resources to evaluate the type of comprehensive and advanced applications that are expected to be submitted on this issue. The municipalities and the Government will be completely dependent on the competence that SKB and that the regulatory authorities, primarily SKI, SSI and the county administrative boards have on this matter (Section 2.9.3).
- There is cause for SKB to conduct a more in-depth discussion on how it should act if the results of the ongoing site investigations are not favourable, in one or both site investigation municipalities (Section 2.9.2).
- The consultation process is a decisive factor for the EIS instrument to fulfil its purpose, both from the standpoint of the environment and democracy. The purpose of the consultations is to decide what the EIA will cover and to provide a basis for the evaluation of forthcoming licences along with EIS, safety assessments etc. In order to sustain the current high level of ambition in the expanded consultation, SKB can allow an independent party to assess the quality of and to evaluate the ongoing consultation process (Section 2.9.5).
- In order to be successful, the ongoing consultation process, in accordance with Chapter 6 of the Environmental Code assumes a strong commitment of the municipalities involved. An active participation in the site investigation process will

contribute to developing this commitment. Such a commitment currently exists among the municipality's elected representatives and among the inhabitants that choose to concern themselves with these issues (Section 2.9.1).

- A repository and an encapsulation plant will contribute to increasing employment, which is naturally of interest to the municipalities. The establishment of the nuclear power plants in Forsmark and Simpevarp between the 1960's and 1980's is a clear example of what the establishment of major industries can mean for the development of the municipality concerned. Therefore, it cannot be excluded that some sort of competition could arise between the municipal leaderships of Östhammar and Oskarshamn, even if they are firmly determined to act in such a way that SKB cannot play one off against the other (Section 2.9.4).

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