Consultations according to the Environmental Code

Compilation 2006

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First consultation report submitted

A major step forward was taken in 2006. It was the year when the licensing process started for the final repository system for the spent nuclear fuel. In November we submitted – on schedule, thanks to the dedicated efforts of many employees – our first application to SKI. One of the many appendices was a consultation report. Meanwhile the consultations continue, with sights set on the applications we plan to submit to SKI and the Environmental Court in 2009 for the final repository under the Nuclear Activities Act and for the entire final repository system under the Environmental Code.

It has now been five years since we at SKB, after many years of preparations, started the first formal consultations in preparation for the applications under the Environmental Code and the Nuclear Activities Act for permits to establish an encapsulation plant and a final repository for the spent nuclear fuel from the Swedish nuclear power plants. The site investigations in Forsmark (Östhammar Municipality) and Simpevarp/Laxemar (Oskarshamn Municipality) are in their final phase.

We who are in charge of SKB's work with applications, environmental impact assessments and consultations look back on 2006 as an intensive, educational and successful year. In parallel with major efforts in the preparation of our first application, which also includes SKB's first EIS under the Environmental Code, the consultations continued. As in previous years, we held a number of meetings and activities in the two site investigation municipalities and the two concerned counties during 2006. Nearby residents, organizations and decision-makers in the two municipalities, concerned county administrative boards, regional associations, SKI, SSI and KASAM, as well as the environmental organizations that receive funding from the Nuclear Waste Fund, continue to follow our work with interest. During the year – as a result of suggestions from or in dialogue with other consultation partners – we tried some new (and some proven) approaches to get more people to participate in the consultations.

Some examples are:

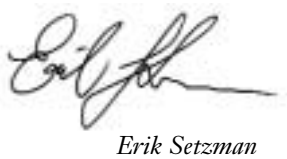
- an independent moderator now generally presides over the consultation meetings,
- presentations on topical, requested or particularly important themes immediately prior to the consultation meetings leave more time for questions and discussion at the meetings,
- open house days, particularly for part-time residents, were tried during the summer,
- all meetings in 2006 with the Oskarshamn EIA Forum and the Forsmark Consultation and EIA Group were open to all interested persons,
- the information furnished via the SKB web and on the Internet was expanded and improved.

The changes were largely received positively, but we were again forced to accept the low attendance from part-time residents. There are also differing opinions concerning the forms for and usefulness of the open regional meetings.

The questions from the consultations in 2006 are presented in this compilation. Many had to do with the premises for and purpose of the disposal of the spent nuclear fuel, the presentation of alternatives – above all to the KBS-3 method, and then in particular "deep boreholes" – and the consequences for the environment in a broad sense. The number and diversity of questions is otherwise impressive, as usual.

During 2007 we plan to begin the consultations under the Espoo Convention via the Swedish Environmental Protection Agency with the Baltic Sea States that during 2006 expressed an interest in participating. It is my firm conviction that all of this will contribute to a safe long-term solution with a minimum of damage and detriment on the sites where the encapsulation plant and the final repository are located.

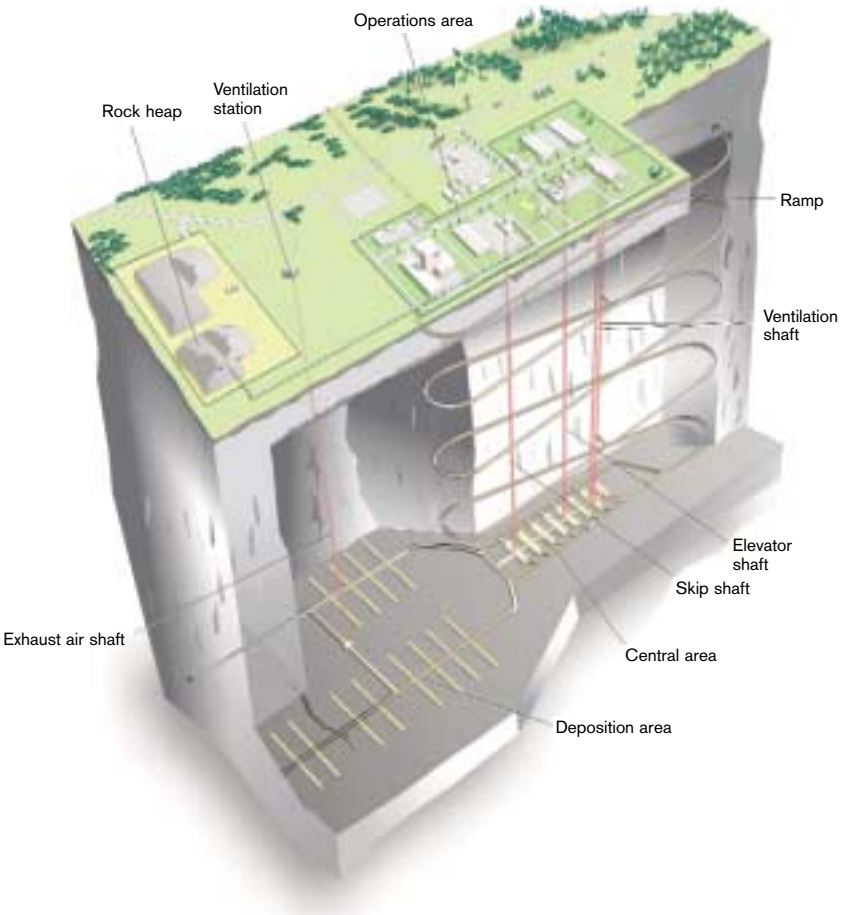
Finally I would like to take this opportunity to express my gratitude for all the interesting viewpoints we receive. I hope we will meet again and that even more people will take the opportunity to participate in the consultation process and express their opinions. The consultations will continue until 2009. Your viewpoints are important, so be sure to continue to take part and make your voice heard!



Erik Setzman
Head of the EIA Unit

The nuclear fuel project

The nuclear power utilities in Sweden merged in the 1970s to form Svensk Kärnbränslehantering AB (SKB, the Swedish Nuclear Fuel and Waste Management Co). Our mission is to manage and dispose of the spent nuclear fuel and radioactive waste from the Swedish nuclear power plants. Disposal must meet all requirements on safety for man and the environment.



Example of design of a final repository according to the KBS-3 method.

SKB's proposal is that the spent nuclear fuel will be disposed of according to the KBS-3 method. This involves encapsulating the fuel in copper canisters with cast iron inserts and depositing the canisters at a depth of 400–700 metres in the bedrock, where stable mechanical and chemical conditions prevail. The canisters are surrounded by bentonite clay, which constitutes a buffer against minor rock movements and prevents corrosive substances from getting in to the canister. The clay also effectively absorbs radionuclides that are released if the canister is damaged.

The KBS-3 method requires an encapsulation plant, where the spent nuclear fuel is encapsulated, and a deep hard rock facility (a final repository), where the canisters are deposited.

The scientific and technical basis for the method has been frequently developed and reported to the regulatory authorities and the Government every third year in our RD&D programmes (Research, Development and Demonstration). The strategy of geological final disposal according to the KBS-3 method has been approved repeatedly.

Purpose of the nuclear fuel project

The general requirements and premises for management and disposal of spent nuclear fuel are set forth in Swedish legislation and in international agreements and conventions which Sweden has pledged to abide by. The most important requirements in Swedish legislation are the environmental requirements in the Environmental Code, the safety requirements in the Nuclear Activities Act with associated regulations, and the radiation protection requirements in the Radiation Protection Act with associated regulations.

On this basis, SKB has defined the purpose of the nuclear fuel project:

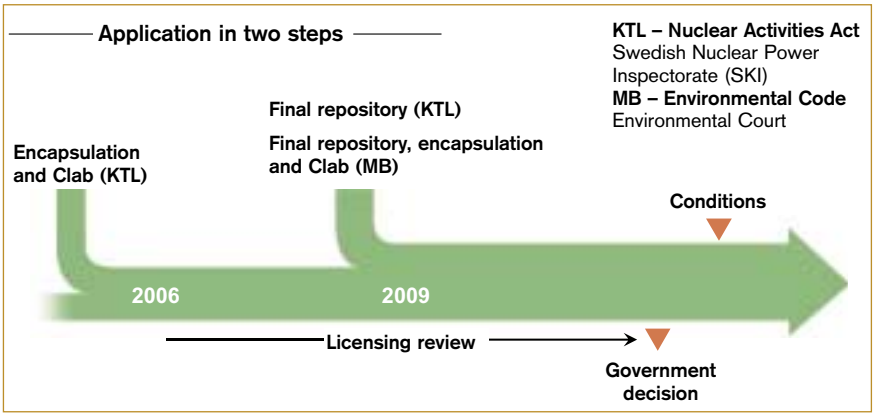
SKB's purpose is to build, operate and close a final repository with a focus on safety, radiation protection and environmental considerations. The final repository is being designed to prevent illicit tampering with nuclear fuel both before and after closure. Long-term safety will be based on a system of passive barriers.

The final repository is intended for spent nuclear fuel from the Swedish nuclear reactors and will be created within Sweden's boundaries with the voluntary participation of the concerned municipalities.

The final repository will be established by those generations that have derived benefit from the Swedish nuclear reactors and designed so that it will remain safe after closure without maintenance or monitoring.

Applications

Today the spent nuclear fuel is being temporarily stored in Clab (central interim storage facility for spent nuclear fuel), which is situated in Oskarshamn Municipality. In November 2006, SKB submitted an application under the Nuclear Activities Act for a permit to build and own an encapsulation plant for spent nuclear fuel and to operate it integrated with Clab, which entails a review of the permits for Clab. An environmental impact statement (EIS) was appended to the application.



Schematic plan of the licensing process.

Site investigations are being conducted in the municipalities of Oskarshamn and Östhammar as a basis for the siting of the final repository. In 2009 SKB plans to apply for a permit under the Nuclear Activities Act for the final repository. At the same time, SKB will apply for permits under the Environmental Code for the encapsulation plant, Clab and the final repository. The same EIS will be appended to both applications.

The EIS for the application in 2006 focuses on the encapsulation plant, while the EIS for the applications in 2009 will cover the entire final repository system.

Consultations

The consultation procedure for applications under both the Environmental Code and the Nuclear Activities Act is regulated by Chapter 6 of the Environmental Code. The consultations are supposed to deal with the siting and design of the activities as well as the form and content of the EIS. Consultations are held with the County Administrative Board, various government agencies, and those municipalities, citizens and organizations that can be expected to be affected.

The consultation process commenced in 2002 and will continue until the permit applications are submitted. Since both the encapsulation plant and the final repository for spent nuclear fuel are included in the system for final disposal of spent nuclear fuel, SKB has chosen to coordinate the consultations. As from 2007, the consultations also include Clab. An account of how the consultations have proceeded and what questions have been raised is provided in the consultation report, which is appended to the EIS.

Previously held consultations are compiled in *Extended consultations according to the Environmental Code*, *Compilation 2003*, *2004* and *2005*. This is the compilation of the 2006 consultations.

SKB's consultations

SKB's goal with the consultations is that everyone who wants to get involved is given an opportunity to do so. This applies to both private citizens and organizations as well as local and national authorities and agencies. Consultations also give SKB an opportunity to benefit from the knowledge and viewpoints of the participants.

Disposal of the spent nuclear fuel is a large project in which studies, site investigations, design work etc. have been conducted for many years. It is not possible to consult about everything involved in the project on a few isolated occasions. SKB has therefore tried to arrange consultations on different themes as the relevant studies have been completed. Questions and discussions at a consultation meeting are not limited to this theme, but focus on the participants' questions and viewpoints. All matters pertaining to interim storage, encapsulation and final disposal of spent nuclear fuel can be brought up.

Consultation report for the encapsulation plant

An environmental impact statement (EIS) was appended to the application under the Nuclear Activities Act which SKB submitted in November. An appendix to the EIS contains a consultation report. The consultation report was limited to the consultation activities that have to do with the encapsulation plant and have taken place up to and including November 2005.

The consultations prior to applications under the Environmental Code pertain to the encapsulation plant, Clab and the final repository for spent nuclear fuel. These consultations will continue until 2009, when SKB plans to apply for permissibility and permits under the Environmental Code for the entire final repository system. The consultations prior to the application under the Nuclear Activities Act for the

final repository and prior to the supplements to the current application under the Nuclear Activities Act that pertain to Clab will also continue up until 2009. The entire consultation process and the viewpoints that have emerged from it will be summarized in the consultation report that will be appended to the joint EIS in 2009.

Consultation meetings in 2006

Two public consultation meetings were held in Östhammar, on 1 June and 12 August. Two public consultation meetings were also held in Oskarshamn, on 31 May and 13 August.

The consultation meetings in May and June were preceded by presentations that dealt with:

- the siting work conducted by SKB
- the principal results of a recently completed study on supraregional groundwater modelling,
- the ongoing work concerning other methods for disposal of spent nuclear fuel,
- the conclusions of a recently completed study concerning society's future capability to manage the spent nuclear fuel.

The discussions at the meetings and viewpoints submitted in writing mainly had to do with alternatives to the KBS-3 method.

Both meetings in August were open houses and were held in the summer to give part-time residents a chance to participate. The theme at these meetings was the same as at the consultation meetings held in May and June.

Regular meetings are held in the municipalities of both Oskarshamn and Östhammar with representatives of the local county administrative board and municipality plus the Swedish Nuclear Power Inspectorate (SKI), the Swedish Radiation Protection Authority (SSI) and SKB. The county administrative board chairs the groups' meetings. Meetings with the EIA Forum in Oskarshamn were held on two occasions during the year: 22 March and 20 September. Meetings with the Forsmark Consultation and EIA Group were held on three occasions: 10 March, 2 June and 28 September. In addition, the groups held a joint meeting on 6 December. All meetings were open to the public.

Site investigations, consultations, environmental impact statement

The site investigations have been under way for five years. The purpose is to gather the data needed for the evaluation of the suitability of the sites for a final repository for spent nuclear fuel. Does the site satisfy the fundamental safety requirements? Are the construction-related conditions fulfilled?

The work of surveying the sites and of identifying the disturbances which the final repository system can give rise to and what consequences they would entail continued in 2006. An environmental programme was prepared during the year

that will ensure by means of objectives and requirements that the facilities and their operation have a limited impact on human health and the environment. Viewpoints from the consultations are also taken into consideration in the continued work of planning and designing the facilities.

Both the structure and content of the EIS will be progressively defined and adjusted in response to what has emerged in the consultations, as well as in design, investigations and studies for the planned facilities. SKB has met with the regulatory authorities, the county administrative boards and the municipalities and presented a plan for the structure of the applications in 2009. It is our intention to describe KBS-3, with vertical deposition and alternative versions of this method, in the EIS. Other methods and strategies for final disposal of the spent nuclear fuel that have been studied within the framework of SKB's research activities, according to the requirements in the Nuclear Activities Act, are planned to be described in an appendix to the application. However, it is not a question of some previously promised account being omitted, but merely where the account will be in the application documents in 2009.

Planned consultation meetings

From now on we plan to hold public consultation meetings in Oskarshamn and Forsmark, as well as meetings with the Oskarshamn EIA Forum and the Forsmark Consultation and EIA Group. Prior to each public consultation meeting, SKB prepares background material with a given theme. Presentations are held on the theme before the actual consultation meeting.

If an activity is likely to have a significant environmental impact in another country, the Swedish Environmental Protection Agency shall, according to the Espoo Convention, "inform the competent authority in that country about the proposed activity or measure and give the concerned country and the affected public an opportunity to take part in a consultation procedure concerning the application and the environmental impact assessment." The Swedish Environmental Protection Agency has sent an enquiry to the countries around the Baltic Sea and received the reply that Finland, Russia, Lithuania, Poland and Germany wish to participate in consultations, Estonia and Latvia wish to participate as observers, and Denmark wants to be kept informed.

The consultations prior to the permit applications under the Nuclear Activities Act for the final repository and under the Environmental Code for the encapsulation plant, Clab and the final repository will be concluded during 2009.

Overview of consultation activities 2007–2009

- ❑ Public meetings once or twice a year in Oskarshamn and Forsmark.
- ❑ Meetings with the Oskarshamn EIA Forum and the Forsmark Consultation and EIA Group 3–4 times a year.
- ❑ Government agencies receive background material and invitations to the public consultation meetings. A reconciliation meeting may be held in 2009.
- ❑ Organizations that obtain funding from the Nuclear Waste Fund receive background material and invitations to the public consultation meetings.
- ❑ A reconciliation meeting may be held with national conservation and environmental organizations in 2009.
- ❑ Two consultation meetings with the countries around the Baltic Sea.
- ❑ A meeting with individuals affected by the water operations during 2009.

Local information

In addition to the formal consultations under the provisions of the Environmental Code, extensive information activities are taking place in both Oskarshamn and Forsmark. Interest in the region around Oskarshamn Municipality has increased during the past year, which is why we have broadened our information activities to extend beyond the municipal boundaries. In Östhammar Municipality we have stepped up our activities within the municipality.

The site investigation for the final repository requires a close dialogue with everyone who is in any way affected by our activities. We have regular contact with the landowners where the investigations are conducted. In addition, we arrange different types of meetings for information and get-together, along with field visits to present and obtain viewpoints on suggested locations of the final repository's above-ground facilities. A news-letter is sent regularly to everyone living in Misterhult parish in Oskarshamn, as well as to nearby and part-time residents in the Forsmark area. The newsletter provides information about the site investigation, our activities in the field and current events.

The contact with nearby residents is particularly important. We therefore regularly invite them to our facilities or arrange get-togethers out in the field. During the spring and summer we arranged four excursions in the districts around Lilla Basthult in Oskarshamn. We invite nearby residents to information meeting in Forsmark as well. There they have an opportunity to ask questions about our work and register any complaints they may have about the site investigations. We are happy that our nearby resident get-togethers are well-attended, since it makes our work easier if our neighbours feel their concerns are being addressed.

Ever since the start of the site investigation we have had contact with pupils and teachers in primary and upper secondary schools in the concerned municipalities and neighbouring municipalities. During the spring, for example, we invited six upper secondary school classes from Oscarsgymnasiet in Oskarshamn to Äspö for the traditional "Kors- och tvärsdagarna" (Here and There Days). The Here and There Days feature an interdisciplinary programme with speakers from Göteborg University and Oskarshamn Municipality's LKO project (Local Competence Building in Oskarshamn Municipality – Nuclear Waste Project). For the first time we arranged a study trip to Forsmark for the pupils in Oscarsgymnasiet's energy programme. Also in 2006, pupils from the primary school in Östhammar Munici-

pality and from Bruksgymnasiet in Gimo visited us in Forsmark. The school visits are organized in cooperation with Forsmarks Kraftgrupp AB. The third year students at the upper secondary school are invited on a study trip to our facilities in Oskarshamn.

Publications and the Web

Four issues of our information magazine Lagerbladet were published during the year. It is distributed to all households in each of the site investigation municipalities. In this magazine we discuss our activities and subjects that have a direct or indirect bearing on us, particularly on the local level.

The websites for Oskarshamn and Forsmark can be accessed via SKB's website. They are updated regularly with information on SKB's activities and on accomplished and planned events in the municipalities. During the autumn, Sweden's 16–20-year-olds had an opportunity to compete on SKB's youth website, Under-

ground. The contestants were supposed to come up with a symbol that warns of the final repository, a symbol that will be understandable 100,000 years from now.

Visitor service

Our visitors come from both near and far. Foreign delegations from e.g. Hungary, Korea, France, Finland and the USA alternate with schoolchildren, local businessmen and university students.

Forsmark celebrated a centenary in the autumn. The 100th study trip went to the facilities in Oskarshamn. This means that a total of more than 3,000 persons from Östhammar Municipality have been given a thorough tour of SKB's activities in Oskarshamn, from the Canister Laboratory and Clab to the field exhibition on Hålö and the Äspö HRL 450 metres down in the rock. In a similar manner, people from Oskarshamn who travel to Forsmark get to visit and learn about SFR and the visitor drilling site.

Documentation of the consultations

The final documentation of completed consultations is the consultation report that will be appended to the EIS for the permit applications. The annual compilations are published to provide an overview of questions and answers from the previous year's consultations.

All consultations, whether in the form of meetings or correspondence, are documented. All minutes, notes and received viewpoints are available on SKB's website.

Documentation of meetings

Minutes are kept of meetings with the Oskarshamn EIA Forum and the Forsmark Consultation and EIA Group, which the participants check and sign. Minutes are also kept of public consultation meetings. The minutes are checked and signed by persons appointed at the meeting. After the public consultation meetings it is possible to submit questions and viewpoints within the framework of the meeting for another two weeks. They are then included in the documentation from the meeting.

The questions and viewpoints discussed during a consultation meeting and received within the appointed period after the meeting are included in the notes of the meeting. There SKB also answers those questions that can be answered immediately. Some questions may lead to supplementary studies and further discussion. Some questions are judged to lie beyond the scope of the EIA work and are dismissed from the consultations. Reasons are given for this.

Written viewpoints

The viewpoints that are received between consultation meetings and in the written consultations are made available on SKB's website and in the annual compilations. Whenever possible, SKB responds to questions and viewpoints.

Annual compilation

The consultations for the encapsulation plant and the final repository have been coordinated. The annual compilations contain excerpts from the past year's minutes grouped in the following categories:

- Encapsulation plant
- Final repository for spent nuclear fuel
- Common issues

The excerpts contain the questions and viewpoints that have come up during the consultation meetings, along with SKB's replies and comments.

The consultation report should explain how SKB has taken submitted viewpoints into account. The consultation report appended to the EIS for the encapsulation plant in 2006 contained comments on the replies given by SKB that are no longer valid, as well as the questions and viewpoints that have led to action. The questions and viewpoints that emerged in the consultations and that concerned the encapsulation plant or the final repository system as well, along with SKB's replies and comments on them, were presented in their entirety, sorted according to topic. All questions and viewpoints received will be presented in the consultation report for the final repository system in 2009.

Completed consultations

The consultation process has been going on for five years. The early consultations were conducted in separate meetings for the encapsulation plant and the final repository. In the continued consultations, joint meetings have been held for both facilities.

Early consultation	Date	Place
Final repository	10 January 2002	Oskarshamn
Encapsulation plant	8 March 2003	Oskarshamn
Final repository	15 June 2002	Forsmark
Encapsulation plant	29 October 2003	Forsmark

Early consultations

Early consultations regarding the final repository and the encapsulation plant were held in Oskarshamn and Forsmark during the period 2002–2003. Invitations were sent out to more households than just those who belonged to the category "likely to be affected". The invitation included specially produced background material describing the project and the purpose of the meeting.

The background material compiled for the early consultations, the consultation reports and the County Administrative Board's decision are available via *www.skb.se*.

Continued consultations

The extended consultations began in 2003. The consultations for the encapsulation plant and the final repository are being coordinated in both Oskarshamn and Forsmark. An important feature of the consultations is the meetings held with the Oskarshamn EIA Forum and the Forsmark Consultation and EIA Group. These groups include representatives from SKB, SKI, SSI and the relevant county administrative board and municipality.

Changes were made in the Environmental Code in 2005. The terms "early" and "extended" consultations were removed. Now only the concept "consultations" remains.

Completed consultations 2006

Ten consultation meetings were held in accordance with the provisions of the Environmental Code in 2006.

Consultations during 2006

Date	Meeting
10 March	Forsmark Consultation and EIA Group
22 March	Oskarshamn EIA Forum
31 May	Public meeting in Oskarshamn Municipality
1 June	Public meeting in Östhammar Municipality
2 June	Forsmark Consultation and EIA Group
12 August	Open house in Östhammar Municipality
13 August	Open house in Oskarshamn Municipality
20 September	Forsmark Consultation and EIA Group
28 September	Oskarshamn EIA Forum
6 December	Joint meeting with Oskarshamn EIA Forum and Forsmark Consultation and EIA Group

All meetings with the Oskarshamn EIA Forum and the Forsmark Consultation and EIA Group were public.

In conjunction with the public meetings of 31 May and 1 June, written consultations were held with concerned government agencies.

Previously held consultations

2003	Meeting
26 May	Oskarshamn EIA Forum
17 September	Forsmark Consultation and EIA Group
30 September	Oskarshamn EIA Forum
12 November	Public meeting in Oskarshamn Municipality
11 December	Oskarshamn EIA Forum, public meeting
17 December	Government agencies

2004	Meeting
19 January	Forsmark Consultation and EIA Group
5 February	Public meeting in Östhammar Municipality
24 March	Oskarshamn EIA Forum
22 April	Local conservation and environmental organizations in Oskarshamn Municipality
4 May	National conservation and environmental organizations
13 May	Local conservation and environmental organizations in Östhammar Municipality
14 May	Forsmark Consultation and EIA Group
26 May	Oskarshamn EIA Forum
1 October	Forsmark Consultation and EIA Group
6 October	Oskarshamn EIA Forum, public meeting
25 November	Public meeting in Östhammar Municipality
8 December	Oskarshamn EIA Forum
10 December	Forsmark Consultation and EIA Group

Written consultations were held during the first quarter of 2004 with regional actors in Kalmar and Uppsala counties.

2005	Meeting
10 March	Forsmark Consultation and EIA Group
11 March	Oskarshamn EIA Forum
5 April	Public meeting in Oskarshamn Municipality
1 June	Oskarshamn EIA Forum
4 June	Public meeting in Östhammar Municipality
3 July	Public meeting in Oskarshamn Municipality
24 August	Common meeting with Oskarshamn EIA Forum and Forsmark Consultation and EIA Group
14 November	Public meeting in Östhammar Municipality
17 November	Public meeting with Oskarshamn EIA Forum
17 November	Public meeting in Oskarshamn Municipality
18 November	Forsmark Consultation and EIA Group, public meeting

At the end of 2005, written consultations were held with concerned government agencies.

Excerpts from minutes

This section contains excerpts from the records of the consultations held in 2006. In each excerpt, questions, viewpoints and topics have been grouped in the following categories:

- Encapsulation plant
- Final repository for spent nuclear fuel
- Common issues

Questions and viewpoints have been expressed both orally at the consultation meeting and in the form of written submissions within the framework of the meeting. The excerpts do not show who asked a question or expressed a viewpoint at the meeting. In the case of written questions and viewpoints, however, there is a notation as to who expressed the question or viewpoint.

The excerpts also show the target group for the meeting, who was present and the theme of the background material, as well as how the invitation took place.

A number of conservation and environmental organizations participated in the consultations, mainly those groups who receive money from the Nuclear Waste Fund to participate:

MKG (the Swedish NGO Office for Nuclear Waste Review) is a joint body between the Swedish Society for Nature Conservation, the Uppsala County Society for Nature Conservation, the Kalmar County Society for Nature Conservation, the Swedish Association of Field Biologists and Oss (Public Opinion Group for Safe Final Storage of Radioactive Waste).

MILKAS (the Swedish Environmental Movement's Nuclear Waste Secretariat), which in turn represents the Swedish Anti Nuclear Movement and Friends of the Earth.

SERO (Swedish Renewable Energies Association).

Furthermore, KASAM (Swedish National Council for Nuclear Waste) and the relevant regional councils have taken an active part in the consultations, particularly in the meetings held with the Oskarshamn EIA Forum and the Forsmark Consultation and EIA Group.

Public meeting with Forsmark Consultation and EIA Group

Date	10 March 2006, 09:00 – 12:45 hrs
Place	Municipal building, Östhammar Municipality
Target group	Östhammar Municipality, County Administrative Board in Uppsala County, SKI and SSI. The meeting was open to the public.
Invitation	The date of the meetings is decided on jointly. SKB sends out e-mail invitations to each meeting. The invitation to private citizens was published in Upsala Nya Tidning (24 February and 9 March), Östhammars Nyheter (23 February and 9 March) and Annonsbladet (22 February and 8 March).
Purpose	The group consults on matters related to SKB's plans to site an encapsulation plant and a final repository for spent nuclear fuel in Forsmark. Furthermore, each participating party gives a status report on the work they are taking part in that has a bearing on the disposal of spent nuclear fuel.
Background material	—
Present	County Administrative Board in Uppsala County – *Leif Byman (chairman), Mats Lindman* Östhammar Municipality – *Bertil Alm, Sten Huhta, Hans Jivander, Bengt Johansson, Gunnar Lindberg, Virpi Lindfors, Margareta Widén Berggren* SKI – *Josefin Päiviö Jonsson* SSI – *Tomas Löfgren* SKB – *Kaj Ahlbom, Saida Laârouchi Engström, Lars Lundqvist (National Heritage Board), Gerd Nirvin, Olle Olsson, Erik Setzman, Claes Thegerström, Henrik Wahlman (Calluna AB), Sofie Tunbrant (secretary)* Invited organizations: *MKG (Johan Swahn), MILKAS (Maria Kuylenstierna), SERO (Olof Karlsson)*
Audience	Representatives of the public, Energy for Östhammar (EFÖ), KASAM, MILKAS, SKB, Stockholm University and Östhammar Municipality. Total about 15 persons.

1 Encapsulation plant

1.1 Calluna AB gave an account of the study of the natural environment in Forsmark.

Discussion

The question of if and how a standalone encapsulation plant in Forsmark will be included in the EIS and the consultation report was discussed. This will be an alter-

native to a siting adjacent to Clab. The design of an encapsulation plant in Forsmark has not begun, but the process in Forsmark is the same as for a plant at Clab. The impact of a plant at Clab can therefore be used as a reference for an assessment of the consequences of locating it in Forsmark.

1.2 No consultation was held on the boundaries of the encapsulation plant in the EIS.

(SKB) The work and consultations concerning "the scoping report" also included the encapsulation plant. All material must be ready when it is time for a decision to be made. We want to start in good time since there is a lot of material for the regulatory authorities to go through!

(County Administrative Board) The consultations called for by Chapter 6 of the Environmental Code for the encapsulation plant continue prior to the submission of an application under the Environmental Code.

2 Final repository

2.1 Does the air from the ventilation shafts contain radioactivity?

(SKB) Yes, there will be radon from rock surfaces and seeping groundwater. This gas must be ventilated away so that it doesn't constitute an occupational health problem. The ventilation air will pass via ventilation buildings on the ground out into the ambient air. Thanks to dilution in the air, the radon from the hard rock facility will not constitute a problem for the surrounding area. Since the spent nuclear fuel is encapsulated there is no free radioactivity, so the ventilation air will not contain radioactivity from the waste. The handling of canisters in the repository does not give rise to any radioactive releases.

2.2 Have you looked at the groundwater's content of radioactive substances in the well inventory that has been carried out?

(SKB) The well inventory that was done relied on SGU's well archive, which contains no information on the radionuclide content of the water. A number of radioactive substances, such as uranium and radium, are measured in connection with the water sampling that is done during the site investigation.

2.3 The long-term safety of a KBS-type final repository during an ice age can be divided into three parts:

- **The risk of inflow of saline water into the final repository that could affect the clay buffer.**
- **The risk of inflow of oxygen-containing meltwater into the final repository that could affect the copper canister.**
- **The risk of earthquakes that could affect the physical integrity of the final repository and water throughflow in the final repository.**

How do the regulatory authorities and SKB handle these issues so that the safety assessment will enable an acceptable account to be included in the environmental impact statement?

They in turn also consult with international experts. Right now they are waiting for SKB's next safety assessment, SR-Can, which is due in the autumn of 2006 and will be an initial evaluation of how the repository sites perform with the copper canisters in which the spent nuclear fuel will be encapsulated.

2.4 Is the ventilation system passive or active, in other words does it need a power supply to work?

(SKB) The ventilation system requires a power supply, but it only needs to operate during construction and operation of the final repository in order to ensure a good working environment.

3 Common issues

3.1 The organizations that have obtained funding from the Nuclear Waste Fund for 2006 (MKG, MILKAS and SERO) introduced themselves.

Discussion

Claes Thegerström wondered specifically what SERO intends to do in the issue of a final repository for spent nuclear fuel. Olof Karlsson replied that SERO's members have broad experience of EIA work, and that they generally have a sense of civic responsibility and want to contribute their expertise. The main purpose is to encourage the use of new energy sources.

MKG was asked what foreign contacts they have. MKG replied that they are members of a strong international network around nuclear power, where nuclear waste is also discussed. Otherwise the nuclear waste issue is more a local issue than an international one.

3.2 SKB informed the meeting of what issues were taken up at SKB's public consultation meetings in 2005 in Oskarshamn and in Alunda in Östhammar Municipality. The theme was "Environmental consequences of the encapsulation plant".

Discussion

The question of what impact a natural lowering of the groundwater table (drawdown) could have on different ecosystems was discussed. There are small delimited areas in the Forsmark area that are sensitive to a groundwater lowering of two to three decimetres. Such an impact would be difficult to compensate for.

3.3 What is the legitimacy/status of this meeting in the consultation process?

(County Administrative Board) About ten years ago the County Administrative Board formed a consultation group in Uppsala County for the feasibility study in Östhammar Municipality. The group was reconstituted when the site investigations commenced, taking into account the responsibilities of the County Administrative Board, the regulatory authorities and the municipality according to the provisions in Chapter 6 of the Environmental Code. The group's work has full legitimacy and its purpose is to bring about efficient and coordinated consultations and exchange of information between the participating parties.

3.4 How would a serious radioactive leak affect the natural environment?

(SKB) An account of this will be given in the assessment of long-term safety.

3.5 MILKAS is constantly asking what will happen if the KBS-3 method doesn't work. A better question is what will happen if it works but is delayed!

(SKI) A delay will cost time and money. The method appears promising but has not been tried. A development of interim storage is possible in the meantime.

(SKB) According to plans the repository will be closed in the middle of this century. Even this is a long time and entails uncertainties. The longer the planning horizon, the greater the uncertainties.

3.6 There ought to be a single environmental impact statement for the entire final repository system, rather than separate ones as now.

(County Administrative Board) The County Administrative Board assumes that the final licensing reviews of an encapsulation plant and a final repository under both the Environmental Code and the Nuclear Activities Act will be coordinated and that a single EIS will be prepared. The contents and scope of the environmental impact statement are determined by the requirements in the Environmental Code. The reviewing authority decides whether the supporting material, including the EIS, is adequate.

(SKI) SKB can submit an application at any time. The authority will examine the application and determine at that time whether it can be considered complete.

3.7 Regarding the municipality's presentation of current issues – the point about long-term responsibility. What time frame are we talking about?

(Municipality) The municipality has no desire to require monitoring or the like. They just want to raise the question. Will there be a need for monitoring, and if so for how long?

(SKI) The premises for KBS-3 include that the repository should not require any monitoring.

3.8 SKB could set up solar cells and wind turbines to generate revenues to cover the costs of monitoring. The EU wants to move towards a common energy policy. Isn't it better to wait a little and see what possibilities this may open up for the management of spent nuclear fuel as well?

No comment.

3.9 How much copper will be used?

(SKB) About 7 tonnes of copper is used for each canister. A production of 200 canisters per year would increase Sweden's copper consumption by just under 1.5 percent.

3.10 There will be a shortage of uranium. Wouldn't it be better to use the resource that is available and reprocess the spent nuclear fuel?

(SKB) A Swedish final repository will nevertheless be needed. France reprocesses approximately one-third of its spent nuclear fuel.

(County Administrative Board) Technology that includes reprocessing and possibly new nuclear facilities is not in line with Swedish policy today or with current legislation. However, the County Administrative Board believes that the alternatives report should include an analysis of the possibilities of reducing the volume and radiotoxicity of the waste, for example by partitioning and transmutation, since this would reduce the risk of environmental impact from a final repository.

Public meeting with Oskarshamn EIA Forum

Date	22 March 2006, 9:30 – 15:30 hrs
Place	Oskarshamn Folk High School, Axel Munthes stig 1, Oskarshamn
Target group	Oskarshamn Municipality, County Administrative Board in Kalmar County, SKI and SSI. The meeting was open to the public.
Invitation	The date of the meetings is decided on jointly. SKB sends out e-mail invitations to each meeting. The invitation to private citizens was published in Oskarshamns-Tidningen (4 and 18 March) and Nyheterna (4 and 18 March).
Purpose	The group consults on matters related to SKB's plans to site an encapsulation plant and a final repository for spent nuclear fuel in Oskarshamn. Furthermore, each participating party gives a status report on the work they are taking part in that has a bearing on the disposal of spent nuclear fuel.
Background material	—
Present	County Administrative Board in Kalmar County – *Ulf Färnhök (chairman), Sven Andersson, Eva Hammarström* Oskarshamn Municipality – *Kjell Andersson, Elisabeth Englund, Rigmor Eklind, Lars Tyrberg, Peter Wretlund, Harald Åhagen* SKI – *Josefin Päiviö Jonsson* SSI – *Mikael Jensen, Tomas Löfgren* SKB – *Claes Thegerström (part of meeting), Saida Laârouchi Engström, Per Hallström (Mannheimer Swartling), Lars Lundqvist (National Heritage Board), Anders Nyström, Katarina Odéhn, Olle Olsson, Pia Ottosson, Erik Setzman, Henrik Wahlman (Calluna), Peter Wikberg, Lars Birgersson (secretary)*
Audience	Representatives of the public, MILKAS, MKG and SERO. Total about 20 persons.

1 Encapsulation plant

No questions or viewpoints were expressed pertaining solely to the encapsulation plant.

2 Final repository

2.1 Who will monitor radiation, leachate and other environmental impact associated with the rock spoil?

SKB replied that any environmental impact caused by e.g. rock spoil will be described in the EIS. The rock spoil will be managed in an acceptable manner from an environmental point of view. The rock spoil extracted during construction of the final repository will not give rise to more radiation than is emitted from "ordinary" rock.

2.2 SSI has urged SKB to conduct a study of an inland siting. Perhaps that would be better than a coastal siting?

SKB replied that the study is finished and the results were presented to the regulatory authorities yesterday (21 March). The results of the study will be presented at the consultation meeting in Oskarshamn on 31 May.

2.3 Have the results of the study been reported?

(SKB) The report is not finished. The results were presented yesterday (21 March). Some work remains to incorporate the viewpoints that emerged from these results.

2.4 It is difficult for us to interpret what it says on rune stones today. So how can we communicate knowledge of the location of the final repository to people who will be alive in thousands of years?

SSI replied that the authorities will look at questions of this type as a part of their remit.

2.5 Does the remit also include looking at long-term responsibility for the final repository?

SSI replied that long-term responsibility for the final repository will be taken up as part of the ongoing work.

3 Common issues

3.1 Swedish legislation assigns responsibility for EIA matters to the activity operator. Does this conflict the EC directive?

(Mannheimer Swartling) The EIA work will be conducted in different countries. In some countries the EIS comprises the permit itself, in others it precedes issuance of the permit. In Sweden it is the activity operator who prepares an EIS that is submitted to an independent authority or directly to the Environmental Court for review. There is nothing to say that this procedure conflicts with the EC directive.

3.2 Should the reported alternative be so well described that the reviewing authority could choose it?

(Mannheimer Swartling) The question relates to the fact that according to Chapter 6 Section 7 of the Environmental Code, the County Administrative Board may require that a report describing similar ways of achieving the same purpose be submitted. In this case the County Administrative Board has not required this, so it is not applicable.

3.3 Where in the Environmental Code is the County Administrative Board's decision mentioned? Previously the County Administrative Board was supposed to make a decision after the early consultations.

(Mannheimer Swartling) The Environmental Code states that the County Administrative Board may require that "similar ways of achieving the same purpose" be discussed in the consultations

3.4 When in the decision process will the municipality be consulted?

(Mannheimer Swartling) The municipality will be heard, but when and how this will be done is determined by the chairman of the Environmental Court.

3.5 Will the municipality then get to see a complete body of material?

(Mannheimer Swartling) Not the Environmental Court's statement of comment, since the Environmental Court will solicit the municipality's opinion before issuing its statement. It is the Government who decides how they want the matter to be handled. It is fully possible that the Government will choose, after the Environmental Court's statement, to send the matter out for circulation and comment to, among others, the municipality.

3.6 Documentation of alternative designs and sites

Discussion

The documentation in coming applications describing alternative designs and sites was discussed. SSI concluded that they will probably need to perform an extensive review in order to be able to judge different alternative designs and sites. SKB said that the application with appurtenant documents should be of manageable scope and that the application should be able to be read and understood by all reviewing bodies. A non-technical summary will also be included.

3.7 There are several different actors around the table at EIA Forum. We from the environmental organizations, who are also actors with funding from the Nuclear Waste Fund to participate in and review the process, are not allowed to ask questions on the same terms, but only during the question period. Why? What is the reason for this?

MKG asked a similar question later during the meeting.

(County Administrative Board in Kalmar County) The chairman replied that all meetings with the EIA Forum will be open to the public from now on and that the public will have an opportunity to ask questions at every meeting. The parties included in the EIA Forum are official actors in the final repository issue, and there are no plans to broaden this circle.

3.8 The Simpevarp area is one of the areas in Sweden with the most archaeological remains. Why isn't it of national interest for cultural heritage preservation?

Lars Lundqvist of the National Heritage Board said that there are areas in Sweden with archaeological remains that are of national interest for cultural heritage preservation, but not within the area in question at Simpevarp/Laxemar.

3.9 MKG said that the question of the long-term safety of a final repository of the KBS type during an ice age can be divided into at least 3 parts:

- **The risk of inflow of saline water into the final repository that could affect the clay buffer.**
- **The risk of inflow of oxygen-containing meltwater into the final repository that could affect the copper canister.**
- **The risk of earthquakes that could affect the physical integrity of the final repository and water throughflow in the final repository.**

How are these questions handled by the authorities and the nuclear power company so that the safety assessment makes it possible for an acceptable account to be included in the environmental impact assessment?

SKB replied that in the ongoing work with the safety assessment SR-Can they are looking at a number of different questions, including the ones brought up by MKG.

SKI said that MKG's questions are among those also raised by the regulatory authorities. SKB's account will be provided in SR-Can. If SKI is not satisfied with the account, SKI will request that a supplementary account be provided in SR-Site.

SSI said that it is important to shed light on this issue, but also others. Many questions are being taken up in the SSA (system analysis and safety assessment) consultations. SSI noted that it is also SKB's responsibility to pursue these matters.

3.10 MILKAS brought up the question of alternative sites. SKB is conducting site investigations at two sites, both of which are situated close to the Baltic Sea. There are researchers who maintain that a final repository near the coast is an inferior alternative, since the groundwater flows increase the risk that radioactive substances will leak out into the sea from near-coastal repositories. What do you have to say about this?

SKB said that the question of inland versus coastal siting has been discussed for a long time and that the authorities have requested that SKB conduct further studies. SKB is currently working intensively to simulate the groundwater's regional flow pattern in eastern Småland. Yesterday, on 21 March, the main results of the study were presented to the regulatory authorities. The study will also be presented at the consultation meeting SKB will hold in Oskarshamn on 31 May. The results of the study show that the factor of greatest importance for the groundwater's regional flow pattern is local conditions, such as the topography of the area in question and the permeability of the bedrock. The study indicates that a repository situated far from the shoreline would generally have longer breakthrough times and flow paths than repository areas nearer the shoreline.

3.11 Will the SR-Can safety assessment be taken up at the consultations?

SKB replied that safety issues, both during operation and post-closure, will be dealt with at consultations in the spring of 2007.

3.12 The Environmental Code states that the best possible alternative for method and site shall be used. If the KBS-3 method is not the best possible alternative, we will have to back up several steps in the process. What does SKB AB's plan of action look like if the entire process has to be changed in 2008?

SKB has worked for a long time to develop the KBS-3 method. SKB is now working to compile supporting material, including an EIS, to apply for a permit to build a KBS-3 repository on one of the two sites where site investigations are being conducted.

3.13 MILKAS said that they do not have, but would like to have, access to the SSA meetings. (Note: In the Government decision from the review of the supplement to RD&D 2001, the Government expressed the need for consultations between SKB, SKI and SSI on matters pertaining to SKB's work with system analysis and safety assessment. SKB, SKI and SSI participate in these SSA meetings. Participants from each municipality are observers. These consultations are not included in the consultations under the Environmental Code.)

SKI and SSI said that SKB is responsible for how the SSA consultations are conducted.

SKB said that they are anxious that all parties have good insight in the ongoing process. SKB has decided that SKB, SKI and SSI should participate in the SSA consultations and that the concerned municipality should participate as an observer. This is a compromise between openness and what is practically feasible. The minutes from the SSA consultations are available to everyone.

3.14 MKG wondered why the environmental movement, as well as the municipalities, cannot be allowed to attend the SSA consultations as observers.

SKB replied that it is important that everyone have good insight into the work, but the municipalities have a special position in the process.

3.15 The representative from Hultsfred Municipality said that Hultsfred was one of the feasibility study municipalities, but that they are not allowed to participate in the ongoing work now because they are not a site investigation municipality. They would like to have better contacts and cooperation with both Oskarshamn Municipality and the County Administrative Board.

Oskarshamn Municipality said that they strive for good contact with other municipalities and that they are under the impression that they have good contact with Hultsfred Municipality. The LKO project emphasizes openness and communication with the inhabitants of Oskarshamn Municipality and the neighbouring municipalities. Oskarshamn Municipality said that Hultsfred Municipality has not brought up the issue of greater cooperation between the municipalities in the final repository matter.

The County Administrative Board in Kalmar County stated that their equivalent of the EIA Forum, EIA-Dacke, was disbanded when Hultsfred Municipality was no longer being considered for SKB's site investigations.

3.16 National and regional environmental quality objectives

Discussion

The opinion was expressed that it should be discussed at some meeting how the national and regional environmental quality objectives should be described in the environmental impact statement. SKB said that this will be elucidated in the permit application for the encapsulation plant, so it would be appropriate to discuss the matter at the meeting in December, which is moreover a joint meeting with the Forsmark Consultation and EIA Group.

3.17 How has SKB secured a supply of clay, metals etc?

SKB replied that they see no problem with this since the final repository system requires relatively little material. There are plenty of copper producers and plentiful access to cast iron and the clays that are needed.

3.18 Is it possible to send in written questions after the meeting but still within the framework of the meeting?

(County Administrative Board in Kalmar County) The chairman replied that this is possible. SKB said that if written questions are sent in after the meeting, they should be clarifications of the questions asked during the meeting, not new questions.

3.19 It is conceivable that the facilities could be targets of international terrorists looking for attention. What do the municipality, the County Administrative Board, the regulatory authorities and SKB say about this?

SKI replied that questions of this type are dealt with in the regulations for physical protection. The new regulations contain stricter requirements than before.

The municipality said that questions of this type are included in the work of the Safety Group.

SKB said that the tougher regulations have led to new investments aimed at strengthening the physical protection. SKB also said that the envisioned method, KBS-3, entails that the spent nuclear fuel is transferred from Clab to the encapsulation plant and further to the final repository at a depth of 500 metres in the bedrock. This disposal leads to increased protection against terrorist attacks.

The County Administrative Board said that they conduct exercises that include terrorist attacks on nuclear power plants.

Public meeting in Oskarshamn Municipality

Date

31 May, 2006

Time

Presentations, 16:00 – 18:00 hrs
Consultation meeting, 19:00 – 21:00 hrs

Place

Figeholms Fritid och Konferens (Figeholm Leisure and Conference), Hägnad, Figeholm

Target group

Private citizens, organizations, government agencies.

Invitation

Written invitation to about 1,300 households in the Misterhult area, plus advertisement in Oskarshamns-Tidningen (13 and 27 May) and in Nyheterna (13 and 27 May). The meeting was also advertised (22 May) for national coverage in Dagens Nyheter, Svenska Dagbladet, Sydsvenska Dagbladet, Göteborgs-Posten, Västerbottenkuriren and Post- och Inrikes tidningar (the Swedish Official Gazette).

A written invitation went to the organizations that obtain funding from the Nuclear Waste Fund to follow the consultations, Östhammar Municipality, the County Administrative Board in Uppsala County and to all government agencies. A list of all those who have obtained a written invitation plus viewpoints received in writing entitled "Summary of written viewpoints and questions plus SKB's replies" is found on page 89.

Theme presentations

- SKB's siting work.
- SKB's work within the framework of the RD&D process with other methods for disposal of spent nuclear fuel.
- the future capability of society to dispose of the spent nuclear fuel.

Background material

Specially produced background material: *Background material for consultations under Chapter 6 of the Environmental Code. Encapsulation and final disposal of spent nuclear fuel. Method – are there any alternatives to the KBS-3 method? Siting – A trip that ended in Oskarshamn and Forsmark. Future – Does society have the capability to dispose of the spent nuclear fuel? SKB, May 2006.* (In Swedish only.)

The material contains a summary of SKB's latest compilations and studies concerning final disposal of spent nuclear fuel in deep boreholes and continued utilization of the fuel by partitioning and transmutation.

Furthermore there is a short summary of the work of the past 30 years to find a safe and otherwise suitable place for final disposal of the spent nuclear fuel.

Concise conclusions are reported from a study of possible developments in the world and our society over the next 75–100 years. How can they affect our ability to protect and dispose of the spent nuclear fuel?

The material was available on SKB's website on 10 May 2006.

Presentations The meeting in the evening was preceded by presentations, where *Roland Johansson*, (Energy and Environmental Consultant) told about SKB's siting work and *Anders Ström* (SKB) talked about the principal results of a recently completed study on supraregional groundwater modelling. *Bertil Grundfelt* and *Marie Wiborgh* (Kemakta Konsult AB) gave an account of the ongoing work with alternative methods for disposal of spent nuclear fuel. Their account dealt with disposal in deep boreholes, extended storage in Clab, supervised dry storage and continued utilization of the fuel by partitioning and transmutation. Finally, *Göran Hallin* (EuroFutures AB) presented the conclusion of a recently completed study concerning society's future capability to dispose of the spent nuclear fuel.

Consultation meeting

Present About 60 persons in all.
Private citizens and organizations: about 35 persons.

SSI – *Tomas Löfgren* and *Mikael Jensen*
SKI – *Josefin Päiviö Jonsson*
SKB – *Saida Laârouchi Engström, Olle Olsson, Erik Setzman, Claes Thegerström, Peter Wikberg* and others.

Representatives from: *MKG, MILKAS, SERO, Döderhult Nature Conservation Society, County Administrative Board in Kalmar County and Oskarshamn Municipality.*

Moderator *Björn Nyblom*, Diplomat PR

Minutes signed by *Ing-Marie Brunnsgård* and *Ola Jönsson*

Questions and answers from the consultation meeting are given below. Written viewpoints received within the framework of this meeting and an equivalent meeting in Forsmark on 1 June are presented in a separate compilation entitled "Summary of written viewpoints and questions plus SKB's replies," page 89.

1 Encapsulation plant

No questions or viewpoints were expressed pertaining solely to the encapsulation plant.

2 Final repository

2.1 Has SKB abandoned the Simpevarp area and instead focused on the Laxemar area for the final repository?

(SKB) SKB has conducted initial investigations in both areas. After evaluation of the results, SKB has decided to continue with the investigations in the Laxemar area. These investigations are expected to be finished by the end of the summer of 2007.

2.2 How does SKB intend to develop and build the final repository, which is a new project? How will SKB plan and execute this project so that it goes as envisioned?

(SKB) SKB has been conducting research and development for about 30 years and will continue this work. In the research and development, SKB systematically examines the processes and events which may affect the final repository, conducts experiments etc. The results of this work are evaluated in safety assessments. If SKB sees that requirements and laws are complied with, SKB will submit permit applications for the final repository to the appropriate regulatory authorities, who will then make the final judgement. Even after the applications have been submitted, SKB will continue to develop technology and methods.

2.3 Does this mean that SKB will conduct research while the facilities are being built?

(SKB) Yes, there may be questions that require research. But we would like to stress the fact that all parts of the final repository are not new. Technology for building in rock exists, SKB has previously evaluated long-term safety, and so on. What is new is that a review of the whole system has not been done before.

2.4 How will you describe for future generations where the repository is located and what the canisters in the repository contain?

(SKB) The contents of each individual canister will be traceable via records. There are requirements from Swedish government agencies and international organizations, such as the IAEA, on records in a suitable format for the future.

2.5 What is "suitable format"? Does it take the form of electronic data, paper or stone tablets?

(SKB) SKB will keep records in a suitable format. It may be on paper in archives, but other media are also possible. International research is looking at how the information should be preserved for posterity.

2.6 What will the consequences be in terms of the road to Simpevarp, considering the fact that truck traffic will increase if the final repository is built in the area?

(SKB) SKB has carried out a conceptual study of the coast road. The purpose of the study has been to solicit ideas for improvements from residents along the road. Representatives of the Misterhult Group have participated in the meetings that have been held. But it is the National Road Administration and not SKB who is responsible for roads and possible improvements. SKB has presented the conceptual study to the National Road Administration. The board of the regional council has decided to provide advance funding for a feasibility study. In the event of an establishment of a final repository in Oskarshamn Municipality, SKB is prepared to participate actively in the process of improving the existing road.

2.7 What is the situation regarding the different siting alternatives? Are there more positive landowners in Oskarshamn than in Forsmark?

(SKB) There are more landowners in Oskarshamn, but it is difficult to say whether there is any difference between the landowners in Oskarshamn and in Forsmark. SKB feels that they have good contacts with the landowners at both sites.

2.8 Is it true that there are more rich and influential people in the Forsmark area and that this means it is simpler to build a final repository in the Oskarshamn area?

(SKB) Opinion surveys show that there is widespread support for a final repository in both municipalities.

2.9 As far as I have understood from your reports regarding recharge and discharge areas, there are discharge areas here and there and the final repository could end up in a discharge area. What about the Laxemar and Forsmark areas? Are they located in recharge or discharge areas?

(SKB) The modelling that has been done shows that the most important thing is not whether the repository ends up in a recharge or a discharge area. Local conditions in the bedrock and the local topography are of more importance for the groundwater's flow pattern. The flow pattern and the composition of the groundwater (salinity) do not constitute a general advantage for either an inland or a coastal siting of the final repository. The groundwater's flow pattern is just one of many siting factors, and a recharge area does not in itself constitute a significant advantage.

Most of the Laxemar area consists of recharge areas. The situation is more complicated in Forsmark, since conditions there are different at different depths in the bedrock. The flow conditions there are also changing over time due to land uplift.

2.10 Isn't it important that the final repository be located so that the flow paths from the repository are as long as possible?

(SKB) Viewed over the modelled area in eastern Småland, only a very small fraction of the flow paths, about 1 percent, are long. What is of interest for long-term safety is above all low groundwater flow.

2.11 Isn't it true that people here in Oskarshamn are more positive to hosting the final repository than people in Forsmark? Could this be due to socio-economic factors, in other words that people in the Forsmark region are more educated and have higher incomes than people in the Oskarshamn area, which means they take a more short-sighted view of the advantages the final repository can bring in the form of work, infrastructure etc., and are less concerned about the environment and safety?

(SKB) SKB's attitude is that safety comes first. Furthermore, the requirements in the Environmental Code must be met. Only when the safety and environmental criteria are fulfilled can other factors be considered.

2.12 A great deal of radioactivity is released into the Baltic Sea already today. Why is the final repository nevertheless being sited near the coast?

(SKB) SSI replied that emissions to air and water are well within the legal limits. The regulatory authorities will not issue permits for facilities that would lead to the limits being exceeded.

3 Common issues

3.1 In the background material that has been compiled for today's meeting, i.e. the report Method-Siting-Future, reference is made to a number of background reports, which are not available. I find it regrettable that the necessary background material is not available at the consultation meeting. When can we get a hold of these reports?

I would also like to express MKG's viewpoint that SKB is not conducting serious research on alternative methods. We have expressed this viewpoint previously and find that SKB's work needs to be supplemented by additional serious research on alternative methods.

As is made clear in the consultation material, SKB said that all reference reports are expected to become available in September 2006. However, SKB pointed out that it is the conclusions of the reports that are important, and that they have been compiled in the consultation material.

It has never been SKB's ambition to make all background material available now for this consultation meeting. However, SKB will have all necessary material ready by 2008 when the applications will be submitted. This leaves plenty of time for MKG and other actors to offer viewpoints and opinions on alternative methods.

3.2 SKB has previously said that all shipments of nuclear waste will go by sea. Now I have heard that all hospital waste is currently being shipped to Clab by truck, is that right?

(SKB) No.

3.3 Who will be the formal applicant in the coming applications? Is it SKB? Or is it the nuclear power companies that own SKB? If it is Vattenfall, will future procurements fall under the Public Procurement Act? If so, what about safety considerations?

(SKB) SKB is the party that formally applies for permits for the final repository. SKB is not subject to the Public Procurement Act. Safety will be prioritized in all procurements. The regulatory authorities will examine and review the matter and will not issue permits for activities that are not safe.

3.4 What about financial guarantees if something goes wrong? A new law is coming that makes tougher requirements on such guarantees.

(SKB) The system in force today entails that the power utilities make payments to the Nuclear Waste Fund which include a safety allowance and a contingency allowance. These "extra" amounts are being set aside so that it will be possible to implement final disposal even if the nuclear power plants are closed earlier than planned, so that no new money is allocated, or to cover the costs that would arise if, for example, the site for the final repository is changed. In other words, secure financing is provided to dispose of the waste regardless of any unexpected events. SKB will naturally comply with any new laws that are passed and reconsider what is required. The new law mentioned will tighten the requirements. SKB wants to make use of the funds and resources that are now available and sees this as an argument to proceed with the current timetable.

3.5 The minutes from the meetings between SKB and the regulatory authorities and the report SKB is preparing about deep boreholes make it clear that a final repository based on the principle of deep boreholes could protect man and the environment against harmful radiation due to the isolating and retarding effect obtained from the slow groundwater flux expected at great depths. With this in mind, why doesn't SKB conduct more research on deep boreholes?

(SKB) The modelling that has been done does indeed show that if the waste is emplaced at great depths and the rock behaves as envisioned, it would take a long time for the waste to come to the surface. The big problem, however, is how to get the canisters down to these great depths.

3.6 It is clear from page 17 of the consultation material that the uncertainties that exist concerning deep boreholes are due to the fact that an effort has not been made to develop the method. Is this true?

(SKB) A number of countries have considered final disposal in deep boreholes and arrived at the conclusion that they do not think the method is reliable and therefore do not want to develop it further. Unlike KBS-3, safety cannot be controlled at all steps of disposal in deep boreholes.

3.7 SKB has not done enough work on deep boreholes. It would probably not require 30 years of work and cost SEK 4 billion, as SKB claims in the consultation material. Does SKB intend to proceed with deep boreholes?

(SKB) Deep boreholes down to a depth of 4 kilometres may sound good, but safety will be based on only one barrier, the rock, which does not comply with the requirements of the Nuclear Activities Act. There is no technology for drilling deep boreholes. There is no technology for getting the canisters down to this depth.

It should also be pointed out that no other country believes in the deep boreholes alternative. The UK, for example, will choose a method similar to the one SKB intends to apply for.

3.8 We in the environmental movement are interested in the long term and are therefore firmly backing the search for alternative methods. We want to find the best way to dispose of the nuclear waste, not just for now but for all time to come.

As far as barriers are concerned, SSI has in meetings with SKB noted that the thermal, chemical and possibly also hydrological conditions that are expected to prevail at the depths in question appear to meet the requirements SKB has stipulated on a site acceptable for a KBS-3 repository, where the life of the canisters is expected to be much longer. Further, SSI has stated that it is therefore not clear why the deep boreholes method could not be regarded as a multiple barrier system.

SKB replied that SSI has stated that they want to have a safety-related evaluation, barrier for barrier.

As far as conditions at great depths in the bedrock are concerned, the temperature increases with increasing depth, as does the salinity. How well the rock acts as a barrier in a repository with deep boreholes depends on the local properties of the rock. In contrast to KBS-3, it is difficult to conduct site investigations for a repository according to the deep boreholes method.

3.9 It sounds incredibly difficult to get a canister down to a depth of 5 km. What happens if the "string" on the canister breaks?

(SKB) SKB also sees these weaknesses, but has no good answer since we have decided not to proceed with the deep boreholes alternative.

3.10 According to the Environmental Code, an account of alternative designs is required. What alternative designs does SKB intend to give an account of?

(SKB) SKB will give an account of alternative designs of KBS-3V. At the present time we are studying KBS-3H, which involves horizontal deposition of canisters. Whether an account will be given of this design of the KBS-3 method or some other design in accordance with the provisions of the Environmental Code is something SKB needs to give further thought to. An account of alternative methods is given and will continue to be given in SKB's research programmes, which are prepared within the RD&D process.

3.11 What happens if SKB does not meet the requirements of the Nuclear Activities Act?

(SKB) SKB will apply for permits under two laws: the Nuclear Activities Act and the Environmental Code. The regulatory authorities will determine whether SKB meets the requirements of these laws. If we fail to meet the requirements we will not receive permits for the planned activities. It is the regulatory authorities, and ultimately the Government, who make this judgement.

3.12 If you fail to meet the requirements will the law then be changed?

(SKB) SKB does not change laws

3.13 What are the areas of responsibility of SKB, SKI, SSI, KASAM etc.? Isn't there a lot of duplicated work?

SKB replied that the division of responsibilities is such that SKB conducts research, develops a technical solution, conducts safety assessments etc. and is responsible for building and operating the final repository. Important parts of this work are presented within SKB's research programmes, RD&D programmes, which are reviewed by the regulatory authorities. Besides reviewing SKB's work, the regulatory authorities conduct certain research themselves. In other words there is a clear borderline between what SKB does and what the regulatory authorities do. In order that the research should be examined from different angles, it is important that various regulatory authorities review it from their different perspectives. This can sometimes entail necessary "duplicated work".

3.14 Does SKB have contacts with the IAEA (the UN International Atomic Energy Agency)?

(SKB) Yes, SKB has contacts with the IAEA. But SKI is the authority that handles Sweden's contacts with the IAEA.

3.15 I would first like to note that MILKAS agrees with Johan Swahn and MKG in their opinions regarding the need to investigate additional alternatives.

Our opinion is that there is a credibility problem in the fact that it is SKB that compares alternative methods with the KBS-3 method. This comparison should be made by someone else.

Furthermore we find it disconcerting when SKB says they are not prepared to devote another 30 years of research to other alternatives, a period we consider to be short in the time scale of the final repository.

Why is no serious research being done on monitored storage pending a better method for final disposal? The regulatory authorities should demand this, since we are talking about the most poisonous substance in existence.

SKB pointed out that the general requirements and principles for the management and disposal of spent nuclear fuel are found in Swedish legislation and international agreements. In brief they can be summarized as follows:

- the owners of the nuclear power plants are responsible for managing and disposing of the nuclear waste in a safe manner,
- the waste must be dealt with inside the country, if this can be done in a safe manner,
- the sea and the seafloor outside the country's boundaries may not be used,
- the system shall be designed to prevent illicit tampering with nuclear materials or nuclear waste,
- safety shall rest on multiple barriers,
- final disposal shall not require monitoring and maintenance,
- appropriate steps shall be taken to avoid imposing undue burdens on future generations.

SKB's goal is to create a final repository in accordance with the above requirements and principles.

3.16 Certainly there are laws, but we in MILKAS want a change in attitude.

We also want to say that we think it is wrong to distinguish between safety and environmental issues. These two areas must be addressed together.

It is also remarkable that we have discussed the waste quantity here tonight but not the core of the whole issue, namely the toxic waste and how to ensure it does not get out into the environment.

(SKB) SKB will give an account of the properties of the waste in conjunction with the applications. SKB does not distinguish between matters relating to safety and the environment. SKB's view is that these two aspects are interrelated.

3.17 I would like to reiterate that the LKO project distinguishes between environmental and safety issues, which was evident on an overhead transparency that was shown earlier today. These two areas must be addressed together.

A representative from Oskarshamn Municipality said that even though they have divided the work into two groups, this doesn't mean that either of the issues is ignored in either of the groups. An important aspect of LKO's work is that issues should be illuminated from several perspectives.

3.18 SKB is planning to build an encapsulation plant and a final repository. If SKB applies for a permit for the encapsulation plant on one site, will it choose the same site for the final repository?

(SKB) No. SKB will apply for a permit to build the encapsulation plant adjacent to Clab. The application for the final repository will stipulate either Oskarshamn or Forsmark.

3.19 The theme of today's consultations is alternative methods and sites. MILKAS once again calls for a study of monitored storage pending a better method for final disposal. The most important thing is that we find the best method and site from an environmental point of view. We once again call for

more extensive studies/accounts of alternative methods than SKB has produced so far. Will there be any more consultations about alternative methods?

SKB replied that this is the consultation that is planned to deal with alternative methods for disposal of spent nuclear fuel. The consultations will continue for several more years, so we are receptive to viewpoints on a theme for coming consultations.

3.20 I would like to see more research on the deep boreholes alternative instead of the marketing of the KBS-3 method which SKB is now engaged in. Will SKB invest more resources in research?

(SKB) SKB has been conducting research on alternative methods for disposal of spent nuclear fuel for around 30 years. Our proposal is that the nuclear fuel be disposed of by means of the KBS-3 method. Since the mid-1980s, we have produced research programmes called RD&D programmes every third year. Our RD&D programmes are reviewed by the regulatory authorities and the Government. The Government has said that the KBS-3 method can serve as a planning premise for the ongoing site investigations.

3.21 I have some questions concerning short-term environmental impact. The KBS-3 method will produce large volumes of rock spoil, which is a re-usable resource. The deep boreholes alternative, on the other hand, will entail that the rock is ground up and cannot be re-used. If the deep boreholes are drilled in the same manner as oil wells, the hole will be stabilized with "mud" that must be collected and pumped away. Drilling deep boreholes is also very energy-consuming. Has any comparison been made between KBS-3 and deep boreholes in terms of energy consumption, for example?

(SKB) SKB has not made any systematic comparisons of the environmental aspects of KBS-3 and deep boreholes. Nor does SKB intend to do so. So far, the environmental aspects of the KBS-3 method such as noise, transportation, ventilation, rock spoil handling and crushed rock have been identified and taken into account.

SKB concurs that one of the difficulties of the deep boreholes alternative is disposal of the drill cuttings that are formed during drilling.

3.22 I would like to see a general comparison of energy consumption for different methods.

SKB notes the request and the viewpoint. But it is difficult to compare methods that have been developed to different levels of detail.

3.23 For us in MKG it is important that the environment come first, and we think SKB is moving too rapidly. Since we are talking about a time perspective of 100,000 years, it is important that the right alternative be chosen for disposal of the waste. We do not feel that the industry has bothered to investigate the alternatives sufficiently. Do you really have enough data to make a proper assessment from an environmental viewpoint?

(SKB) SKB prioritizes safety and we believe we have research results that support the alternative we have chosen.

3.24 SKB and the regulatory authorities hold consultations on safety issues which we (MILKAS) are not allowed to attend. We have protested against this, since we do not have any opportunity to get the whole picture when we are excluded from these meetings.

As far as the alternatives report is concerned, we do not consider KBS-3V and KBS-3H to be different alternatives, but rather variants of the same method.

We also question the wisdom of locating both of these siting alternatives near the coast.

(SKB The meetings which SKB and the regulatory authorities are holding on safety issues are not consultations according to the Environmental Code. The minutes of these meetings are open to everyone. SKB plans to hold consultations on the theme "Safety" during 2007.

3.25 I would like to reiterate that:

- **alternatives must be studied further by outside parties, i.e. independent researchers,**
- **alternatives should not simply be a variant of the main alternative,**
- **they should be serious alternatives.**

What does SKB think about this?

(SKB) SKB is proceeding in accordance with society's requirements and wishes. The waste must be disposed of in the best possible way.

3.26 What happens if the Government gives the go-ahead to proceed with the KBS-3 method, considering the fact that the method has many shortcomings and that SKB has previously changed its mind along the way? What does SKB think about having to modify the entire final repository in 100 years?

(SKB) If SKB doesn't believe in the KBS-3 method we won't submit an application. If SKB applies for a permit for a method which the regulatory authorities and the Government don't believe in, we won't receive a permit.

3.27 It is noteworthy that SKB shows an overhead projection with a time axis of 200 years when we are talking about 100,000 years.

(SKB) Yes.

Public meeting in Östhammar Municipality

Date	1 June, 2006
Time	Presentations, 16:00 – 18:00 hrs Consultation meeting, 19:00 – 21:00 hrs
Place	The Forsmark Nuclear Power Plant's information building, Forsmark
Target group	Private citizens, organizations, government agencies.
Invitation	The meeting was advertised in Upsala Nya Tidning (12 and 30 May), Östhammars Nyheter(14 and 24 May), Annonsbladet (17 and 31 May) and Upplands Nyheter (12 and 26 May). The meeting was also advertised (22 May) for national coverage in Dagens Nyheter, Svenska Dagbladet, Sydsvenska Dagbladet, Göteborgs-Posten, Västerbottenkuriren and Post- och Inrikes tidningar (the Swedish Official Gazette). A written invitation went to the organizations that obtain funding from the Nuclear Waste Fund to follow the consultations, Östhammar Municipality, the County Administrative Board in Uppsala County and to all government agencies. A list of all those who have obtained a written invitation plus viewpoints received in writing entitled "Summary of written viewpoints and questions plus SKB's replies" is found on page 89.
Theme background material	– SKB's siting work. – SKB's work within the framework of the RD&D process with other methods for disposal of spent nuclear fuel. – the future capability of society to dispose of the spent nuclear fuel.
Background material	Specially produced background material: *Background material for consultations under Chapter 6 of the Environmental Code. Encapsulation and final disposal of spent nuclear fuel. Method – are there any alternatives to the KBS-3 method? Siting – A trip that ended in Oskarshamn and Forsmark. Future – Does society have the capability to dispose of the spent nuclear fuel? SKB, May 2006*. (In Swedish only.) The material contains a summary of SKB's latest compilations and studies concerning final disposal of spent nuclear fuel in deep boreholes and continued utilization of the fuel by partitioning and transmutation. Furthermore there is a short summary of the work of the past 30 years to find a safe and otherwise suitable place for final disposal of the spent nuclear fuel. Concise conclusions are reported from a study of possible developments in the world and our society over the next 75–100 years. How can they affect our ability to protect and dispose of the spent nuclear fuel? The material was available on SKB's website on 10 May 2006.

Presentations	The meeting in the evening was preceded by presentations, where *Roland Johansson* (Energy and Environmental Consultant) told about SKB's siting work and *Anders Ström* (SKB) talked about the principal results of a recently completed study on supraregional groundwater modelling. *Bertil Grundfelt* and *Marie Wiborgh* (Kemakta Konsult AB) gave an account of the ongoing work with alternative methods for disposal of spent nuclear fuel. Their account dealt with disposal in deep boreholes, extended storage in Clab, monitored dry storage and continued utilization of the fuel by partitioning and transmutation. Finally, *Göran Hallin* (EuroFutures AB) presented the conclusion of a recently completed study concerning society's future capability to dispose of the spent nuclear fuel.
Consultation meeting	
Present	About 50 persons in all. Private citizens and organizations: 30 persons. SSI –*Tomas Löfgren* and *Mikael Jensen* SKI – *Josefin Päiviö Jonsson* SKB – *Erik Setzman, Saida Laârouchi Engström, Kaj Ahlbom, Olle Olsson* and others. Representatives from: *MKG, MILKAS, Energy for Östhammar (EFÖ), County Administrative Board in Uppsala County* and *Östhammar Municipality.*
Moderator	*Björn Nyblom*, Diplomat PR
Minutes signed by	*Leif Hägg*

Questions and answers from the consultation meeting are given below. Written viewpoints within the framework of this meeting and the equivalent meeting in Oskarshamn on 31 May are presented in a separate compilation entitled "Summary of written viewpoints and questions plus SKB's replies".

1 Encapsulation plant

No questions or viewpoints were expressed pertaining solely to the encapsulation plant.

2 Final repository

2.1 Horizontal or upright canisters, do they take more or less space, will there be more or less rock spoil?

(SKB) Horizontal deposition generates a smaller volume of rock spoil. From this viewpoint it is positive for the environment. But as yet there has been no safety assessment for horizontal deposition. It is being developed in cooperation with Finland. The actual space required for the repository is, however, the same for vertical and horizontal deposition.

2.2 There will be oxygen at the repository level after closure! How long will it remain, considering sulphides and corrosion? How much is needed to dissolve a canister?

SKB) The oxygen will disappear rapidly. Iron minerals and bacterial will consume the oxygen in roughly one year. The remaining oxygen's impact on the canisters is judged to be negligible. The bentonite protects the canister against sulphide attack. These aspects are covered in the safety assessment.

2.3 You must always account for the human factor. Is there any scenario in the environmental impact assessment where a machine crushes a canister?

(SKB) The safety assessment includes scenarios for various conceivable near-accidents and incidents. The work includes designing machines and processes to prevent such risks.

2.4 The sea level will rise 10 metres in 100 years – could this pose any risk? Could land uplift pose any risk?

(SKB) Both sea level rise as a consequence of climate change and the ongoing process of land uplift are included in the scenarios for the safety assessment. A sea level rise is above all of interest for planning during the construction and operating periods. After closure the repository should withstand such changes.

Questions 2.5–2.20 were submitted in writing by Leif Hägg at the meeting.

2.5 The fuel and its content of radionuclides – What kind of chemical environment is required for dissolution of the fuel?

(SKB) All solids have some solubility in water, but it can be very low. If there is no oxygen in the water, uranium dioxide (the material the nuclear fuel is made of) has a solubility of less than 0.2 micrograms per litre of water. If oxygen is present, its solubility can be 10 milligrams per litre, maybe even more depending on the water composition (high concentrations of carbonate, for example).

2.6 The fuel and its content of radionuclides – How can water with dissolved oxygen get into the fuel and in what quantities?

(SKB) Under normal circumstances we regard it as out of the question that water with dissolved oxygen gets into the fuel. On the other hand, oxygen (hydrogen peroxide) can be formed close to the fuel surface due when water is split by radiation from the fuel.

The final repository will be subjected to the greatest stresses during and after an ice age. For example, parts of the buffer material may be lost when the buffer is exposed to glacial meltwater. In order for the meltwater to reach the fuel, the canister must also be damaged. It is not possible to know if oxygen could get into the fuel under these conditions, and if so in what quantities.

2.7 The fuel and its content of radionuclides – What quantities are needed for fuel dissolution to occur?

(SKB) There is really no "limit" below which no fuel is dissolved.

2.8 The fuel and its content of radionuclides – What nuclides are directly accessible between the fuel pellets?

(SKB) A certain fraction (one or two percent) of the gaseous fission products are there (Xe and Kr). In addition, similar quantities of I-129, Cs-137 and Cs-135 may be present there. It is also usually pessimistically assumed that some other nuclides are present in small fractions. The most important are C-14, Cl-38, Se-79, Tc-99, Pd-107 and Sn-126.

2.9 The fuel and its content of radionuclides – Is it possible to calculate the quantity of, for example, I-129, C-14 and C-137 in a canister?

(SKB) It's quite possible to calculate the quantity of I-129 and Cs-137 accurately in a canister. It's not so easy for C-14. C-14 is formed by nuclear reactions where N-14, O-17 or C-13 capture an electron. Nitrogen (N-14 comprises 99.6 percent of all natural nitrogen) can be present in the fuel as an impurity, and usually we only know that the concentration is less than a certain value stated by the manufacturer. O-17 comprises 0.038 percent of all natural oxygen and is thus present in the uranium dioxide. This amount should be easier to calculate.

2.10 The fuel and its content of radionuclides – The buffer's particle surface is negatively charged, will the positively charged radionuclides saturate the space for diffusion by ion exchange?

Which nuclides are negatively charged, and can they be transported by diffusing out into the biosphere, or are they stopped by the positively charged radionuclides?

(SKB) Radioactive iodine, chlorine and selenium occur as negatively charged ions – their diffusion is not affected by positively charged radionuclides. However, the negatively charged bentonite surface is of some importance for diffusion. Roughly speaking you could say that the negatively charged radionuclides diffuse at one-tenth the rate of the positively charged ones. However, this does not mean that it takes a longer time for them to get through the buffer – negative nuclides do not sorb on the surfaces, which the positive and neutral ones can do.

2.11 The fuel and its content of radionuclides – Which nuclides are affected by surface complexation and are thereby retarded?

SKB) Nearly all – with the exception of the negatively charged ones, which do not sorb, and alkali and alkaline earth metals (cesium, strontium and radium), which sorb for the most part with ion exchange.

2.12 The fuel and its content of radionuclides – How long time would a canister failure (earthquake) with inflowing oxygen-rich water in contact with the fuel need to reach the limit value for releases?

(SKB) If we assume that an earthquake damages a canister, the calculations in the recently published SR-Can safety assessment show, somewhat simplified, that the dose reaches a maximum near the limit value after around three hundred thousand years and then remains at around this value.

2.13 Canister and corrosion – Is there water with dissolved oxygen left in the repository after closure?

(SKB) Air remains in the repository after it is closed. We estimate that there will be around 18 kg of oxygen per canister (if the total quantity of oxygen is divided by the number of canisters). Most of this oxygen will be consumed by microbial activity and by oxidizing minerals containing Fe(II).

2.14 Canister and corrosion – How long does it take before the oxygen has been consumed?

(SKB) About a month after water saturation.

2.15 Canister and corrosion – Is there iron pyrite at the repository level? How large quantities of sulphide can reach the buffer?

(SKB) Yes, there is iron pyrite at the repository level. There may also be iron pyrite in the bentonite. We estimate the concentration of sulphide dissolved in water to be less than 1.6 milligrams per litre.

2.16 Canister and corrosion – How much sulphide is needed to corrode the copper canister and the insert with its cladding tubes?

(SKB) No sulphide from the outside is needed to corrode the insert. It corrodes by contact with water: $3\ Fe + 4\ H_2O \rightarrow Fe_3O_4 + 4\ H_2$.

We do not assume credit for any corrosion resistance in the cladding tubes, but assume pessimistically that they have holes where water can get in.

About 1.5 tonnes of sulphide would be consumed by the corrosion of all copper in a canister. SR-Can says that a few millimetres of the copper will corrode away during a million years.

2.17 Canister and corrosion – What will be the effect of the pinhole? How long will it take before fuel dissolution can begin and what quantities can be transported to the biosphere?

(SKB) This depends on a number of factors – it can take thousands to tens of thousands of years for water to enter the canister through a pinhole. The pinhole also restricts the flow of water out of the canister once it is water-filled. How great its importance is depends on how much water is flowing in the rock.

2.18 Canister and corrosion – Is diffusion affected by the fact that the canister temperature is higher than the ambient temperature? In houses, moisture migrates towards the cold surface. Can the same phenomenon occur in the bentonite?

(SKB) Yes, in principle diffusion increases with temperature. But the temperature in the canister will have fallen to approximately the same level as the ambient temperature before radionuclide transport begins.

2.19 Canister and corrosion – How long does it take for the buffer to become saturated with water?

(SKB) That depends on how much water there is in the rock. In a wet deposition hole it may take 10–15 years; if the rock is extremely dry it may take several thousand years. In Forsmark it is estimated to take around 50 years.

2.20 Influence on biosphere and human intake.

- **What effect does I-129 have on the biosphere?**
- **How are human foodstuffs and drinking water affected by the occurrence of iodine?**
- **What other radioactive substances can we expect will get out?**

(SKB) We expect no releases of radioactive substances from the final repository. If, due to an incident, iodine should escape, it will be in such low concentrations that it will not affect human foodstuffs or drinking water.

Questions 2.21–2.33 were submitted in writing by Leif Hägg at the meeting. They are addressed to both SKB and KASAM.

2.21 The safety assessment is mainly concerned with the groundwater's ability to penetrate the barriers and then transport radionuclides to the biosphere. The first question should be: How does water come into contact with the fuel? What is required for fuel dissolution to occur? Does it require water with free oxygen?

(SKB) Under normal circumstances we regard it as out of the question that water with dissolved oxygen gets into the fuel.

The final repository will be subjected to the greatest stresses during and after an ice age. For example, parts of the buffer material may be lost when the buffer is exposed to glacial meltwater. In order for the meltwater to reach the fuel, the canister must also be damaged.

2.22 What quantities of oxygen are present at repository depth: If there are oxygen molecules in the water, how much can get through the bentonite per year by diffusion?

(SKB) Under normal circumstances we regard it as out of the question that water with dissolved oxygen will get into the fuel. Air remains in the repository after it is closed. We estimate that there will be around 18 kg of oxygen per canister (if the total quantity of oxygen is divided by the number of canisters). Most of this oxygen will be consumed by microbial activity and by the oxidation of minerals containing Fe(II).

2.23 How much oxygen/sulphide is consumed by corrosion of the copper, the iron insert and the zirconium tube surrounding the fuel? Only after these barriers have been passed can fuel dissolution begin.

(SKB) We do not assume credit for any corrosion resistance in the cladding tubes, but assume pessimistically that they have holes where water can get in. About 1.5 tonnes of sulphide would be consumed in the corrosion of all copper. SR-Can says that a few millimetres of the copper will corrode away during a million years.

2.24 Zirconium has a very high capacity to resist corrosion. Is there any calculation of its ability as a barrier to retard releases?

(SKB) No, we do not assume credit for the cladding tubes as a barrier.

2.25 Is it true that if the water flux around the canister is 1 litre per year and the quantity of sulphide is 1 mg per litre, it takes 1 million years for 1 kg of sulphide to corrode 4 kg of copper?

(SKB) That is correct, but we also have to take into account the sulphide that may be present in the bentonite buffer, so it's a little worse than that (see reply 2.16).

2.26 Is it true that, with the same calculation for uranium solubility, it takes 1 million years to dissolve 1 gram of UO2 per litre in water with dissolved oxygen?

((SKB) According to our calculation, 1–10 kg dissolves with a solubility of 1–10 mg per litre. The quantity of oxidized UO2 will then be 135 kg.

2.27 Is it true that saline groundwater acts as a "floor" and does not readily mix with fresh groundwater?

(SKB) Yes, it's true that saline groundwater at depth tends to lie more stagnant than the fresher groundwater above, and that it can therefore act as a "floor".

2.28 Will clay sediments beneath peatlands and seafloors act as an extra barrier to radioactive releases?

(SKB) Yes, for certain radionuclides.

2.29 Can hydrogen gas form at a faster rate than the supply of oxygen in the process permits? Won't the need for an exchange of oxygen with hydrogen control how high the pressure can rise in the canister?

(SKB) No oxygen is needed in order for hydrogen to form in connection with iron corrosion (see reply 2.16).

2.30 Is it true that a dissolved hydrogen molecule travels up to 0.5 metre per year? That means it takes about 1,000 years for it to reach the biosphere. Can it be assumed that it takes equally long for radionuclides that come outside the buffer?

(SKB) The question is difficult to answer exactly. We model the advective transport of dissolved substances, including radionuclides, through the rock, but this calculated advective travel time is not the time it takes for a real water molecule to reach the biosphere. In reality a variety of diffusion processes, including diffusion into the rock matrix, enter into the picture. We analyze this with our models for radionuclide transport.

The advective travel times in the rock, including deformation zones, are typically from several years to thousands of years, depending on the model assumptions and the natural variability in the system.

The actual travel time is longer. For sorbing substances in particular, the travel time can be much, much longer.

2.31 Is it possible to calculate how much fuel needs to be dissolved in order for the limit value to be reached?

(SKB) There is no simple answer to this question. The consequences depend on a lot of factors, which besides the fuel have to do with the properties of the canister, the bentonite and the bedrock.

2.32 Forsmark has 0.5 mSv of background radiation and Oskarshamn 1.0. If the goal is that people should be exposed to as little radiation as possible, then Forsmark has an advantage as a final repository site.

(SKB) No, you can't say that. Acceptable radiation doses from a final repository are given by criteria from regulatory authorities and have nothing to do with the background radiation at a given site.

2.33 Is it true that a canister failure (earthquake) with a large influx of saline water does not significantly affect fuel dissolution?

(SKB) The salinity of the water is not of any appreciable importance for the solubility of UO_2 and thereby for fuel dissolution. A large influx of water is naturally of importance. The quantity of dissolved fuel is the solubility times the quantity of water.

3 Common issues

3.1 At a seminar arranged by KASAM last spring, the definition of "alternative methods" was discussed. SKB talks about "alternative designs". How do the regulatory authorities view alternative methods/designs versus the BAT requirement?

(SSI) The EIA process is conducted by SKB, not the regulatory authorities. We expect some type of account regarding BAT, but it isn't only connected to the EIA process. SSI welcomes special meetings with the environmental organizations about this and we don't need to take up SKB's meeting time here.

(SKI) SKI would like to see a simplified safety evaluation for the deep boreholes alternative. We consider it to be the most suitable alternative to KBS-3. Are there any other feasible alternatives? Possibly KBS-3 with horizontal deposition instead of vertical, but this is not an alternative method.

(SKB) The Environmental Code talks about alternative designs, in which case horizontal deposition, KBS-3-H, could be an alternative. The work on method development has been reported in conjunction with the RD&D process, which is regulated by the Nuclear Activities Act.

When a permit application under the Environmental Code is submitted, we will present a compilation of all the alternative methods that have been considered. But SKB has not decided what will be included in the actual application.

(County Administrative Board) The introductory section of the Environmental Code talks about the best site and the best possible technology. It is the Government who finally decides. SKB should give an account of all the alternatives they have considered.

3.2 I think things are unnecessarily complicated. Talk of the best possible technology becomes the enemy of the good. What kind of relationship do we have with our brother country to the east, which is a big brother in this case. Finland has already started to build its final repository. I would like to have an account from SKB, SKI and SSI of how far they have come and how it's going, and when the repository will start operating.

SKB replied that Finland has a different decision process than Sweden. The Finnish parliament has approved an underground laboratory on the site intended for a final repository. An application for a final repository according to the KBS-3 method will be submitted in 2012, and start of operation is scheduled for 2020. SKB is working together with Finland to develop the method and solve remaining questions.

3.3 Isn't it a little strange that the site of the repository is being determined before the method is chosen? Don't you have to know what the site looks like to choose the method?

KBS-3 and WP-Cave – why are there greater risks with long tunnels? Alternative methods – why isn't the fuel vitrified before deposition according to the KBS-3 method or in deep boreholes? Why has the dry storage alternative been dismissed? *[Clarification: WP-Cave is not based on "long tunnels" but is a kind of "hydraulic cage". Long tunnels is another variant of geological deposition where the canisters are placed horizontally in long tunnels.]*

(SKB) The site investigations are being done with final disposal according to the KBS-3 method as a planning premise.

The risks of long tunnels mainly have to do with the working environment. Vitrification is used for reprocessed fuel, whereas direct disposal will be used in Sweden. Dry storage is not a method for final disposal and SKB sees no advantages with it.

3.4 Will SKB write a structured account of alternative methods that will be comprehensible to us laymen? Will there also be an account of the site selection process? The choice of a coastal over an inland siting would then be of particular interest. Will the report also include an explanation of why you rule out certain methods and sites?

SKB will give an account of the site selection process. The account also includes the advantages of a coastal versus an inland siting. We will also present all methods that have been studied with reasons why SKB does not feel they meet the stipulated requirements.

3.5 (To SSI) The purpose of the radiation protection is to keep the background radiation as low as possible, isn't it? The background radiation around the Forsmark plant is 0.5 millisievert and in Oskarshamn 1.0 millisievert. This must give Forsmark an advantage in the siting of the final repository?

(SSI) All new activities are assigned a limit for release of radioactivity, regardless of background radiation.

3.6 People also have radiation sources in their body amounting to 100 becquerels per kilo, which gives a dose of 0.2 millisievert per year. This is equivalent to the cancer risk of smoking 10 cigarettes per year. Is it really economically defensible to invest resources in developing an alternative method to reduce the radiation dose an additional 0.1 millisievert?

SKB has not made this calculation. The Environmental Code contains requirements on, for example, a minimum of damage or detriment, best available technology and conservation of natural resources. All these factors must be weighed together.

3.7 Why haven't the background reports come in time for the meeting? It happens all too often that reports aren't ready in time. Why aren't the reports translated to English? There aren't very many independent experts who know Swedish.

(SKB) We note the viewpoint. All important conclusions are included in the consultation material. The actual reports will come out during the autumn, and there is plenty of time to examine them and pose questions before 2009.

All knowledge concerning deep boreholes is already available in reports from Nirex, which are in English. Their conclusions agree with ours. Of the reports on deep boreholes that we will print in the autumn, one is in English. The report on the groundwater's regional flow pattern will have a detailed English summary.

3.8 In spite of 33 years of work you haven't come further than the AKA committee. You have arrived at the same sites, namely Oskarshamn and Forsmark. Isn't it strange that you end up with two facilities on the Baltic Sea, which is already so polluted. Especially now when there are requirements for alternative sites.

(SKB) The facilities must be safe. SKB must be convinced that they are safe before we submit our applications. The regulatory authorities and the Environmental Court must be convinced by their review that they do not lead to unacceptable consequences, otherwise no permits will be issued.

The siting work has been extensive and thorough with investigations of study areas, general siting studies, eight feasibility studies and now the ongoing site investigations. This is all described in the background material for this meeting. Forsmark and Oskarshamn have excellent prospects of satisfying the geological requirements. They also have special advantages due to their nearness to existing nuclear installations.

3.9 What is the status of the site investigations in Oskarshamn and Forsmark? Have you begun to see any difference between the two sites? Is either one starting to look better than the other?

(SKB) The site investigations were begun in 2002 and are expected to be finished next year. We are looking at two sites in Oskarshamn: Simpevarp and Laxemar. The preliminary safety assessments show that both sites meet the requirements. But space is limited at Simpevarp. In Forsmark the permeability of the rock is low and rock stresses are high.

There will be two possible candidates with roughly comparable bodies of data for the final choice.

3.10 They say that we should stick to the facts and not talk politics. But how can we? If we are to include the environmental aspects the discussion has to be political.

There is nothing about long-term safety in the consultation material. It only talks about difficulties with the other methods.

Will there be material in the EIS so that we can compare the methods environmentally, or will there only be technical descriptions?

(SKB) The content of the EIS must comply with the requirements in the Environmental Code, which means that it will include material for determining whether the method in the application entails the best possible technology, a minimum of damage and detriment and a good use of natural resources.

3.11 Why aren't the environmental aspects of the alternative methods included in the background material for this meeting?

SKB will prepare an environmental impact statement for the method for which we are applying for a permit, i.e. the KBS-3 method. All aspects will be included there. For other methods we will only state why we believe they do not meet the requirements made on final disposal of the spent nuclear fuel.

3.12 Does the deep boreholes method meet the regulatory requirements? I would like replies from MKG, SKI and SSI.

(MKG) MKG does not take a position in the method question or the site selection question. We simply want all alternatives to be investigated.

3.13 MKG replied "don't know" to my question earlier as to whether the deep boreholes method meets the regulatory requirements. In an article in Dagens Nyheter dated 1 June 2006, MKG writes that deep boreholes is a safe method. Should we believe what MKG says or what they write?

(MKG) It is the editors of the newspaper who write the introduction, we were not allowed to see it in advance. MKG does not take a position in the method question, we simply want all alternatives to be investigated.

3.14 The purpose of this meeting was supposed to be to discuss alternative methods.

Why are we meeting here today? There is no background material. It will not be available until September.

Why must the questions be short and concise? Surely the purpose of consultations is to discuss and provide input to the EIS? It is vital that the EIS contain descriptions of the environmental impact of the different alternatives. There must be proof that the best method has been chosen. It is important that we as elected officials get good answers to what the different alternatives entail so that we can give a full account of them.

(SKB) We note these viewpoints. All results of the latest studies of alternative methods are included in the background material for this meeting. If another meeting is required after the reports are finished we can arrange it.

3.15 Is transmutation an alternative method?

(SKB) No, the technology does not exist today and would require a final repository anyway.

3.16 The heavy shipments of bentonite between Forsmark and Hargshamn will pass through two communities with houses near the road. How and where will an account be given of the environmental and safety aspects of these shipments?

SKB has carried out a general environmental risk analysis. Traffic risks are included there. The analysis will be detailed for the site where the final repository will be located.

3.17 In view of what happened at the Hallandsåsen Ridge, how great is the risk of a lowering of the groundwater table? Are there differences between the different alternatives?

(SKB) A temporary lowering of the groundwater table is expected to occur locally around ramps and shafts. No lowering is expected to occur above the actual repository. The concept for deep boreholes includes 45 shafts, which means there is a greater risk of lowering of the groundwater table.

It is difficult to say at this time what will happen in the long term. All data and complete calculations will be reported in the safety assessment.

3.18 The rock stresses are high at the canister down in a "deep borehole". Are there liners that can withstand these pressures? Is it possible to find a canister that can withstand it without imploding? Won't there be a water flow along the canisters up to the surface, and won't there be a heat implosion around the canister?

(SKB) The questions indicate the problems that exist.

3.19 MKG has had access to the draft of a final report for deep boreholes and would like the record to show that we do not think the background material for the consultation and the presentation made by Kemakta agree with this draft. There are boreholes that meet many of the requirements, if not all, and more than KBS-3. Can't we wait the 10 years needed to study what is needed to be able to compare the methods, particularly with regard to environmental impact?

(SKB) As far as comparisons between deep boreholes and the KBS-3 method are concerned, it is possible to make a table based on a safety evaluation that shows which requirements each method meets.

If you have a method that does not meet the initial requirements, why take it any farther? Ten years of studies will not provide solutions to, for example, what to do if a canister gets stuck during deposition. Safety must always come first. The KBS-3 method provides control over all steps in the deposition process and ensures long-term safety. Deep boreholes cannot do this.

3.20 Can questions within the framework of the meeting be submitted as usual after the meeting?

(SKB) Yes, questions and viewpoints that have been received by SKB no later than 16 June will be included in the minutes.

Public meeting with Forsmark Consultation and EIA Group

Date	2 June, 09:00 – 15:00 hrs
Place	ATRIUM, Dragarbrunnsgatan 46, Uppsala
Target group	Östhammar Municipality, County Administrative Board in Uppsala County, SKI and SSI. The meeting was open to the public.
Invitation	The date of the meetings is decided on jointly. SKB sends out e-mail invitations to each meeting. The invitation to private citizens was published in Upsala Nya Tidning (12 and 30 May), Östhammars Nyheter(11 and 24 May), Annonsbladet (17 and 31 May) and Upplands Nyheter (12 and 26 May).
Purpose	The group consults on matters related to SKB's plans to site an encapsulation plant and a final repository for spent nuclear fuel in Forsmark. Furthermore, each participating party gives a status report on the work they are taking part in that has a bearing on the disposal of spent nuclear fuel.
Background material	—
Present	County Administrative Board in Uppsala County – *Leif Byman (chairman), Mats Lindman* Östhammar Municipality – *Bertil Alm, Ronald Arvidsson, Sören Carlsson, Hans Jivander, Bengt Johansson, Gunnar Lindberg, Virpi Lindfors, Margareta Widén Berggren* SKI – *Josefin Päiviö Jonsson, Öivind Toverud* SSI – *Mikael Jensen, Tomas Löfgren* SKB – *Kaj Ahlbom, Saida Laârouchi Engström, Bertil Grundfelt (Kemakta Konsult AB), Göran Hallin (EuroFutures AB), Per Hallström (Mannheimer Swartling), Olle Olsson, Erik Setzman, Marie Wiborgh (Kemakta Konsult AB), Sofie Tunbrant (secretary)*
Audience	Representatives of the public, MILKAS, MKG, Energy for Östhammar (EFÖ), Oss, Nature Conservation Society (ÖNF) and the reference group and the screening group in Östhammar Municipality. Total about 20 persons.

1 Encapsulation plant

No questions or viewpoints were expressed pertaining solely to the encapsulation plant.

2 Final repository

2.1 SKB gave an account of the questions asked by the municipal council and SKB's preliminary answers.

Discussion

SKB's main alternative for the backfill has been crushed rock containing roughly ten per cent bentonite. SKB's studies show that a backfill material consisting of 100 percent clay is better able to meet the requirements.

The County Administrative Board wondered what type of clay this is and where it comes from. SKB replied that there are sufficient quantities of Friedland clay in Germany. It is a mixed clay consisting of roughly 30 percent montmorillonite.

2.2 The rock spoil will be taken to Gräsö, where it is needed for construction of the harbour.

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3 Common issues

3.1 If we continue to store the spent nuclear fuel in Clab, when will it be necessary to begin planning to expand Clab again to make room?

(SKB) The planning for an expansion must begin by about 2015.

3.2 How great is the probability that the holes [deep boreholes] will not intersect a fracture zone? Will holes be rejected because of this?

(Kemakta) There is a great probability at these depths that networks of fracture zones exist. We cannot "afford" to reject holes for this reason.

3.3 The high rock stresses in Forsmark may require the use of a steel liner. Experience from Manitoba in Canada, where the rock stresses are of the same order of magnitude as in Forsmark, shows that breakout occurs in the boreholes after drilling. There isn't even time to get down a liner. Are there criteria on the rock where waste could be disposed of in deep boreholes?

(Kemakta) I'm not aware of that.

3.4 The question of alternatives is of central importance. Great uncertainties exist as to whether alternatives will work or not, so claims should not be made with such confidence that, for example, deep boreholes are not feasible. SKB should not dismiss methods, but should consult about them. There must be background material to permit comparison of the methods. Deep boreholes can't just be dismissed out of hand. Transmutation, however, is not the way to solve today's problems.

Just claiming a method is superior without being able to compare it on a fair basis with another is not enough.

It was also a strange discussion on design versus method for the account in the EIS.

(Mannheimer Swartling) We are within the consultation intended to clarify and solicit viewpoints on what should be included in the EIS, for example with respect to the alternatives report. It is, however, important to note that the consultation process, which is regulated in the Environmental Code, is not a forum for promoting the development of technologies and methods for the disposal of spent nuclear fuel.

The Nuclear Activities Act charges SKB with the task of conducting allround research and development activities. The results of these activities are presented in the RD&D programmes, which the Government approves or makes additional requirements on.

3.5 Is the entire final repository system fully developed? Decommissioning of the nuclear power plants remains.

(SKB) SKB will submit an application. We are convinced that the method works and is safe. All that remains is to prove this, which is done through the application and review procedure.

3.6 How can this information [the future evolution of society] be evaluated? Are there any "figures"?

(EuroFutures) There are no figures. The forecasts we make cannot predict sudden events, climate changes or economic crises. But there is good reason to include these factors.

(SKB) The purpose of the study is to clarify what could happen in the future. We can then draw conclusions for our own activities, for example Clab. Operating personnel and knowledge exist today, but what will it be like in 50 years?

3.7 Is there really any group that supports continued storage in Clab?

(SKB) KASAM has stated that continued storage in Clab is not an implementation alternative, nor is there any political party that supports it. But it has been said in the consultations that we should wait.

(Mannheimer Swartling) SKB is obliged to give an account of the "the consequences if the activity or measure is not implemented".

3.8 To what extent is SKB obliged to give an account of alternative methods?

(Mannheimer Swartling) This is something which the consultations are intended to determine. The premise is that the alternatives report should be sufficient to permit the effects of the applied-for activity on man, the environment and the conservation of natural resources to be assessed.

3.9 How can alternatives be compared if the research isn't equivalent?

(SKB) There are fundamental requirements and premises in Swedish legislation and international agreements which a final repository for spent nuclear fuel must comply with. SKB has been tasked to design a repository that complies with them. We have studied several different alternative methods. If it soon becomes apparent that one method does not meet a requirement, SKB sees no reason to study the alternative further. For example, we believe that disposal in deep boreholes fails to satisfy the requirement that safety should rest on multiple barriers.

3.10 If all nuclear power plants are shut down under a future government, what will happen then?

(EuroFutures) One consequence will be a loss of competence in nuclear technology.

3.11 Due to threats in the future, continued storage in Clab is not a solution. How do the threats affect disposal according to the KBS-3 method? Interrupting the process in the middle of a deposition phase is surely worse than leaving the waste in Clab?

(EuroFutures) We conducted the survey, but others will evaluate the results.

3.12 According to the consultation material, SKB has changed its strategy for where the waste will be placed, but the KBS-3 method is still alive despite 30 years of development. Does SKB feel they have examined the advantages of other methods? The consultations are supposed to consider the best method.

(Mannheimer Swartling) The consultations are supposed to contribute to the form and content of the EIS, not determine which method or activity SKB should apply for a permit for.

(SKB) An account of the alternatives SKB has studied is given in RD&D-K ("Integrated account of method, site selection and programme prior to the site investigation phase," SKB, December 2000). The consultation material contains a summary of what has happened since SKB's account in RD&D-K, for example an update of experience of deep boreholes.

3.13 It is serious that SKB's legal counsel takes the stand that the consultations are not supposed to deal with alternative methods. Our stand is that the consultations should be open-ended.

We would also like to say that we do not agree that continued storage in Clab means that we don't want to solve the issue. On the contrary! The Environmental Code is everyone's instrument for together finding a solution to one of our biggest environmental problems. Don't say that we advocate continued storage in Clab because we don't want to solve the problem. Say that we want to buy more time to find another solution.

(SKB) I think we all want to find a solution. But EuroFutures' study and presentation shows that it is best to resolve the question now.

3.14 How can we take an open-ended approach when those involved are so prestige-minded?

As far as alternative methods go, we must be able to choose between the alternatives on equal grounds. But the choice of method was made long ago. It was wrong to just research and develop one method. The problems with deep boreholes would have been solved by now if the same resources had been devoted to that method as to KBS-3, which also had problems – isn't that right?

(SKB) The evaluations in RD&D-K were based on the same criteria for all methods. You can't disregard the steps and criteria that are not fulfilled. The safety assessment goes through all the uncertainties.

3.15 The background material [distributed prior to the consultation] is unsatisfactory. It says nothing about the advantages of deep boreholes.

(Kemakta) The presentation and the background material explain the advantages. For example, the last overhead transparency about deep boreholes in the presentation says: "model calculations show that if conditions are stable the exchange of water between the deep system and the near-surface system is limited".

3.16 One conclusion of the future study should surely be that the phase-out of nuclear power and development of the deep boreholes method should be hastened?

(SKB) If the threats materialize this could have great consequences for the whole society.

3.17 Regarding the overhead transparency with the list of design premises and requirements: Can't a point-by-point comparison be made between KBS-3 and deep boreholes?

(SKB) Yes, that's possible.

3.18 What is the experience from the deep boreholes drilled to explore for natural gas in "Dala djupgas"?

(Kemakta) It is included as background material to the study performed by Kemakta. As far as technology is concerned, however, it involved other, much smaller diameters.

3.19 If SKB would like to realize deep boreholes in Forsmark, is the municipality likely to issue a permit for this?

(SKB) We may have to present another method that would involve less detriment.

3.20 There is an article in UNT today (2 June) about the consultation meeting yesterday in Forsmark. It says that the environmental organizations are of the opinion that disposal in deep boreholes is a much safer method than KBS-3. Does MKG stand behind this?

(MKG) We do not take a position on which method is best. We just want to have all alternatives explored.

3.21 The municipality's desire for a special forum to discuss its questions is reasonable, but it's too bad the environmental organizations are being kept out when we are also a party in the process. We must have access to the same information. Is there any law or authority whose purpose is to check that the activity operator does not exceed the limit for implementation?

(SKI) It isn't quite that simple. The RD&D process under the terms of the Nuclear Activities Act has led to the KBS-3 method, for which SKB will apply for a permit. But that doesn't mean that the method has been approved. The Canister Laboratory and the research on Äspö, where the activities are focused on development of the KBS-3 method, do not require permits under the Nuclear Activities Act.

(SKB) The research and the investigations being conducted by SKB do not entail an implementation of the method. A possible implementation, i.e. start of construction of the facilities, will not take place until the method has been approved and the requisite permits have been obtained.

3.22 Has SKI received the report on groundwater flow? Do you know to whom it will be sent for review? It would be simpler to find international reviewers if the report were written in English.

(SKI) SKI will submit the report to Insite, our international review team. It includes American experts who know Swedish.

3.23 SKB said something earlier in the meeting about SKB's goal being to show that the KBS-3 method is best. Surely that can't be the purpose. The advantages of other methods are not even mentioned. There are experts who recommend other methods.

(SKB) SKB's goal is to apply for a permit for a method which we believe can be used for safe disposal of the spent nuclear fuel. Then the regulatory authorities will review the application with supporting material and decide whether they can agree with the choice of method.

3.24 The concept for deep boreholes described in the consultation material is not optimized. It's the worst possible solution.

(SKB) The presented concept is based on currently available engineering know-how and experience on drilling to such great depths.

(SKI) Experience from the deep drilling at Siljan shows that it is very difficult to drill to such great depths.

(Municipality) There are boreholes that have diverged 90 degrees.

3.25 A lot of reports are produced. Can we find out what reports are written and to whom they are sent?

(SKB) There are technical reports in English. Then there are P-reports and R-reports, which are usually in Swedish with a summary in English. All reports are sent to the regulatory authorities and can be ordered via SKB's website. One copy of all reports is also sent to the so-called "legal deposit libraries".

Public meeting in Östhammar Municipality – Open house

Date	12 August 2006
Time	10:00–12:00 hrs
Place	Strandhotellet, Öregrund
Target group	Private citizens, particularly part-time residents.
Invitation	The meeting was advertised in Upsala Nya Tidning (22 July and 9 august), Östhammars Nyheter (27 July and 9 August), Annonsbladet (26 July and 9 August) and Upplands Nyheter (28 July and 11 August). Notices were put up on 15 bulletin boards on Gräsö.
Theme background material	– SKB's siting work, – SKB's work within the framework of the RD&D process with other methods for disposal of spent nuclear fuel, – the future capability of society to dispose of the spent nuclear fuel.
Background material	Same background material as for the public meeting in Forsmark on 1 June. *Background material for consultations as required by Chapter 6 of the Environmental Code. Encapsulation and final disposal of spent nuclear fuel. Method – are there any alternatives to the KBS-3 method? Siting – A trip that ended in Oskarshamn and Forsmark. Future – Does society have the capability to dispose of the spent nuclear fuel? SKB, May 2006. (In Swedish only.)* The material contains a summary of SKB's latest compilations and studies concerning final disposal of spent nuclear fuel in deep boreholes and continued utilization of the fuel by partitioning and transmutation. Furthermore there is a short summary of the work of the past 30 years to find a safe and otherwise suitable place for final disposal of the spent nuclear fuel. Concise conclusions are reported from a study of possible developments in the world and our society over the next 75–100 years. How can they affect our ability to protect and dispose of the spent nuclear fuel? The material was available on SKB's website on 10 May 2006.
Present	About 10 persons in all. Private citizens and organizations: Two persons. SKB: *Erik Setzman, Kaj Ahlbom, Marie Wiborgh (Kemakta Konsult AB)* and others. Representatives from: *County Administrative Board in Uppsala County, Östhammar Municipality and Oss.*
Moderator	—
Minutes signed by	—

Viewpoints received and questions and replies from the consultation meeting are given below.

MKG sent in written viewpoints after the meeting. The same viewpoints apply for the open house in Oskarshamn on 13 August. MKG's viewpoints and SKB's comments are presented in a separate compilation entitled "Summary of written viewpoints and questions plus SKB's replies", page 124.

1 Encapsulation plant

No questions or viewpoints were expressed pertaining solely to the encapsulation plant.

2 Final repository

2.1 The following viewpoints were submitted in writing by a private person.

- **The rock spoil should be used for improvement of the harbour in Öregrund.**
- **The repository should be designed so it is possible to retrieve the spent fuel to use it again, if desired.**
- **I view positively the increase in employment that could follow from an establishment of the final repository in Forsmark.**

SKB notes these viewpoints.

2.2 The following viewpoints were submitted in writing by EFÖ.

As far as EFÖ is concerned, the question of deep boreholes for the final disposal of the Swedish spent nuclear fuel is not a realistic alternative in a 30 to 50-year perspective.

SKB is a commercial enterprise tasked by its owners to build, with currently known technology, a final repository that is acceptable to the and local politicians, regulatory authorities and the environmental courts. The SKB method must be implemented with BAT (best available technology) and with an EIS that can be approved under the Environmental Code.

If deep boreholes were to be presented as an alternative under the Environmental Code, with currently unknown technology and geology, SKB could not carry out the intentions of its owners to build a final repository for future needs, but would instead have to wait for an international technical breakthrough and basic research in geology and related sciences such as chemistry.

It appears meaningless to EFÖ that the nuclear power industry should be prevented from trying to meet a need for final disposal of the spent nuclear fuel with currently known technology when it is time for the fuel to be transferred from the Clab interim storage facility after the requisite cooling-off period for further management.

Who will finance the investments for the development of an alternative in the form of deep boreholes? The basic research would most likely be tax-funded, while both tax money and Nuclear Waste Fund money would be used for development of the technology. The Nuclear Waste Fund is not intended for this.

EFÖ assumes that SKB will be allowed to realize its plans for a final repository according to the KBS-3 method at the same time as it should be possible to develop a method for deep boreholes. If the KBS-3 method

is found to be the best alternative after the repository has been filled and is about to be closed in 30–50 years, then consent for closure should be given by the Government. If it is found in the meantime that another method for deep disposal of the spent nuclear fuel is better than the realized KBS-3 repository, closure consent should not be given by the Government, which can instead mandate the better method. the KBS-3 method would then have proved to be a good method for continued interim storage of the spent nuclear fuel.

SKB notes these viewpoints.

3 Common issues

3.1 A private person submitted a viewpoint in writing.

I believe that the encapsulation plant should be located in Oskarshamn. The final repository should be located in Forsmark where the rock has been found to be special with the virtually fracture-free lens and where the final repository has plenty of room with the shock-absorbing Singö Fault and Forsmark Fault. This will be of decisive importance in enabling the repository to survive the next ice age.

SKB notes the viewpoint.

Public meeting in Oskarshamn Municipality – Open house

Date	13 August, 2006
Time	10:00–13:00 hrs
Place	SKB's site investigation office, Simpevarp Peninsula.
Target group	Private citizens, particularly part-time residents.
Invitation	Written invitation to about 1,300 households in the Misterhult area and advertisement in Oskarshamns-Tidningen (29 July and 9 august) and Nyheterna (29 July and 9 August).
Theme background material	– SKB's siting work. – SKB's work within the framework of the RD&D process with other methods for disposal of spent nuclear fuel. – the future capability of society to dispose of the spent nuclear fuel.
Background material	Same background material as for the public meeting in Hägnad on 31 May. *Background material for consultations as required by Chapter 6 of the Environmental Code. Encapsulation and final disposal of spent nuclear fuel. Method – are there any alternatives to the KBS-3 method? Siting – A trip that ended in Oskarshamn and Forsmark. Future – Does society have the capability to dispose of the spent nuclear fuel? SKB, May 2006. (In Swedish only.)* The material contains a summary of SKB's latest compilations and studies concerning final disposal of spent nuclear fuel in deep boreholes and continued utilization of the fuel by partitioning and transmutation. Furthermore there is a short summary of the work of the past 30 years to find a safe and otherwise suitable place for final disposal of the spent nuclear fuel. Concise conclusions are reported from a study of possible developments in the world and our society over the next 75–100 years. How can they affect our ability to protect and dispose of the spent nuclear fuel? The material was available on SKB's website on 10 May 2006.
Present	About 15 persons in all. Private citizens and organizations: about 10 persons. SKB: *Erik Setzman, Peter Wikberg, Olle Zellman, Bertil Grundfelt (Kemakta Konsult AB), Katarina Odéhn, Erika Löfqvist, Lars Birgersson.* Representatives from: *MKG, County Administrative Board in Kalmar County, Oskarshamn Municipality and KASAM.*
Moderator	—
Minutes signed by	—

Viewpoints received and questions and replies from the consultation meeting are given below.

MKG sent in written viewpoints after the meeting. The same viewpoints apply for the open house in Öregrund in Östhammar Municipality on 12 August. MKG's viewpoints and SKB's comments are presented in a separate compilation entitled "Summary of written viewpoints and questions plus SKB's replies", page 124.

1 Encapsulation plant

No questions or viewpoints were expressed pertaining solely to the encapsulation plant.

2 Final repository

2.1 How many jobs will the final repository create?

(SKB) The number of jobs will differ during different phases. During the construction phase there will be about 800 jobs, and during the operating phase about 200 jobs.

2.2 Is it possible to retrieve spent nuclear fuel that has been deposited in a final repository?

(SKB) Yes, it's possible. However, retrieval will be more difficult the farther the deposition process has proceeded.

2.3 Could the copper in the canisters be worth mining in the future? How will information be conveyed to future generations that the canisters contain nuclear waste?

(SKB) This issue has been studied previously. At present the regulatory authorities are looking at this.

2.4 Sometimes SKB uses the term "deep repository" and sometimes "final repository". Which of these terms is correct?

(SKB) The terms "final repository" and "deep repository" are both used for the facility for final disposal of spent nuclear fuel. The designation "final repository" is the only one used in legal and regulatory texts.

2.5 What will the bentonite clay be used for and where can bentonite be bought?

(SKB) Bentonite will be used in the deposition holes, around the canisters. Bentonite can be found at different places in the world, but of different qualities. The bentonite that is used today in the experiments in the Äspö HRL comes from Wyoming, USA. Bentonite can also be found around the Mediterranean Sea and in Africa. The tunnels may be backfilled with Friedland clay, which is found in Germany.

2.6 The encapsulation plant is planned to be built adjacent to Clab. If the final repository is built in Forsmark, will Sigyn be used for the shipments of the encapsulated waste? If so, will one ship be enough?

(SKB) If encapsulated waste has to be transported from Clab to Forsmark, then Sigyn, or her successor, will be used for these shipments. One ship is plenty.

2.7 Why will the final repository be built at a depth of 500 metres?

(SKB) SKB plans to build the final repository at a depth of 400–700 metres. The exact depth depends on conditions on the site. The uppermost part of the bedrock, about 100–200 metres, is rather heavily fractured due to former ice ages. Below this depth the water flow rate is limited. With corrosion in mind it is important that there is not too much dissolved oxygen in the water, which there definitely isn't at depths greater than 100–200 metres. At great depths in the bedrock the rock stresses are high, which can create problems. By building the repository at a depth of 400 – 700 metres, we can thereby avoid the disadvantages that exist in both the more superficial bedrock as well as the bedrock at great depth.

2.8 Is it true that the compressive stresses are zero at great depth in the bedrock?

(The question did not get a reply during the meeting but was put in the notes to be answered there.)

(SKB) The stresses increase with the depth, since the weight of the overlying rock increases. On the other hand, any anisotropy (different loads in different directions) in the stresses decreases with increasing depth. This is because if the differences in load in the rock are too great, they are inevitably equalized. The final result is equally large stresses in all directions (isotropic state). Many signs indicate that this occurs at a depth of 3 – 5 kilometres.

2.9 Use of rock spoil

Discussion

The use of rock spoil was discussed. During construction of the final repository a great deal of rock spoil is produced, which can be used, for example, as fill for expansion of the harbour in Oskarshamn, or in road and railway construction.

2.10 Canister and canister fabrication

Discussion

Canister and canister fabrication were discussed. SKB has built a Canister Laboratory in Oskarshamn to develop a welding method, among other things. The canister shell can be fabricated by different methods, for example pierce and draw processing and extrusion. A method has not yet been chosen. .

2.11 The final repository will be a relatively large industrial project that will have an impact on, for example, the cultural environment. Has SKB devised a scale model that illustrates possible damage and detriment?

(SKB) We have not devised any model, but we have been careful in keeping the landowners informed of our plans. The parts of the facility on the ground surface will cover a total of 8 – 10 hectares. In addition there will be an interim storage area for rock spoil.

2.12 Will the activities at the final repository give rise to noise problems?

(SKB) Noise will probably cause the most noticeable environmental impact, since haulage, blasting, handling of rock spoil etc. will all cause noise. Noise will mainly arise during the construction phase. To alleviate the noise problems, noise barriers can be built and noisy work can be carried out at suitable times of the day.

2.13 SThe final repository will have an impact on the groundwater level. Will the Laxemarån River be affected?

(SKB) The final repository will have an impact on the groundwater level in the bedrock and in nearby wells. The Laxemarån River will probably be affected since it has a clay bottom. When the final repository has been backfilled the groundwater level will be restored.

2.14 The final repository will attract many people to the area to find work. How will the sanitary issues be resolved? Will there be a common system with the nuclear power plant?

(SKB) The plan is that the final repository will have its own plant for sewage treatment.

2.15 The area being investigated by SKB is to some extent of national interest for nature conservation and also of national interest for final disposal of spent nuclear fuel and nuclear waste. Which national interest carries the most weight?

(SKB) Different national interests will be weighed against each other. But there is nothing that says that areas of different national interests cannot coexist.

2.16 Does the Shore Protection Act also apply to the final repository?

(SKB) Yes.

2.17 Are summer cottage owners (part-time residents) more critical to the final repository than permanent residents?

(SKB) It is possible that that is the case, since part-time residents have come to the area looking for peace and quiet. The permanent residents may be more appreciative of the advantages entailed by a final repository in the form of regional development.

2.18 Siting of the final repository.

Discussion

Siting of the final repository was discussed. SKB has been conducting a stepwise siting process for the final repository since 1992. The general siting prospects in different parts of the country were determined by general siting studies. The prospects in a total of eight municipalities were evaluated in the feasibility studies. Based on these studies, SKB prioritized three sites for site investigations: the Forsmark area, the Simpevarp/Laxemar area and an area in the northern part of Tierp Municipality. The municipalities of Östhammar and Oskarshamn have taken a positive stand on allowing SKB to conduct site investigations. The municipality of Tierp has declined to participate. Site investigations are planned to be conducted for another year or so. The permit application for the final repository will be submitted at the end of 2009.

2.19 Inland versus coastal location.

Discussion

An inland versus a coastal location was discussed. One argument offered for an inland siting was that it could result in longer flow paths from a repository compared with a near-coastal siting. SKB has therefore recently conducted an analysis of the groundwater's regional flow conditions in eastern Småland. The overall conclusion is that local conditions in the bedrock and local topography are of great importance for

the groundwater's flow pattern. The flow pattern and the composition of the groundwater (salinity) do not constitute a general advantage for either an inland or a coastal siting of the final repository.

3 Common issues

3.1 How do other countries plan to dispose of spent nuclear fuel?

(SKB) There is an international consensus that some form of geological disposal is suitable for disposal of long-lived radioactive waste. Different geological environments have been studied in different countries, depending on local conditions. SKB has developed the so-called KBS-3 method for final disposal in Swedish bedrock. Finland, which has similar geological conditions, has been cooperating with SKB for a long time and also plans to dispose of its spent nuclear fuel in a KBS-3 repository.

3.2 How much progress has been made in developing transmutation?

(SKB) The technology for transmutation is still in the basic research stage. Even if it were possible to implement transmutation, it will give rise to waste that must be managed and disposed of. So the method is not an alternative that permits final disposal to be dispensed with.

3.3 What is the advantage of disposing of the waste at great depth, for example according to the deep boreholes method?

(SKB) The advantage is that the groundwater is more or less stagnant at great depth in the bedrock. This is difficult to show, however. One problem is how to get the canisters down to these great depths. No technology for this exists today.

3.4 Who will make the decision on which method is to be used for final disposal?

(SKB) SKB will apply for a permit for disposal according to the KBS-3 method. The Government will make the final decision.

3.5 Has SKB decided on a method for final disposal?

(SKB) SKB will apply for a permit for disposal according to the KBS-3V method, i.e. vertically deposited canisters. At present work is under way to prepare the necessary supporting material for the applications, which are planned to be submitted at the end of 2009. Furthermore, experiments are being conducted on Äspö with the KBS-3H method, which entails horizontally deposited canisters.

3.6 How much copper will be consumed?

(SKB) Relatively small quantities of copper will be needed for fabrication of the canisters. The quantity of copper used to produce 200 canisters/year is less than 1.5 percent of the quantity consumed in Sweden, and about one ten-thousandth of the global consumption.

Public meeting with Forsmark Consultation and EIA Group

Date	20 September 09:00 – 12:30
Place	Hotell Rydberg, Östhammar
Target group	Östhammar Municipality, County Administrative Board in Uppsala County, SKI and SSI. The meeting was open to the public.
Invitation	The date of the meetings is decided on jointly. SKB sends out e-mail invitations to each meeting. The invitation to private citizens was published in Upsala Nya Tidning (9 September), Östhammars Nyheter(14 September), Annonsbladet (13 September) and Upplands Nyheter (15 September).
Purpose	The group consults on matters related to SKB's plans to site an encapsulation plant and a final repository for spent nuclear fuel in Forsmark. Furthermore, each participating party gives a status report on the work they are taking part in that has a bearing on the disposal of spent nuclear fuel.
Background material	—
Present	County Administrative Board in Uppsala County – *Leif Byman (chairman), Mats Lindman* Östhammar Municipality – *Bertil Alm, Ronald Arvidsson, Sten Huhta, Hans Jivander, Bengt Johansson, Gunnar Lindberg, Virpi Lindfors, Margareta Widén Berggren* SKI – *Josefin Päiviö Jonsson* SSI – *Tomas Löfgren, Petra Wallberg* SKB – *Kaj Ahlbom, Saida Laârouchi Engström, Gerd Nirvin, Olle Olsson, Erik Setzman, Claes Thegerström, Sofie Tunbrant (secretary)*
Audience	Representatives of the public, Energy for Östhammar (EFÖ), KASAM, MILKAS, MKG, Oss, SERO, the Regional Council in Uppsala County, and the reference group and the screening group in Östhammar Municipality. Total about 15 persons.

1 Encapsulation plant

No questions or viewpoints were expressed pertaining solely to the encapsulation plant.

2 Final repository

No questions or viewpoints were expressed pertaining solely to the final repository for spent nuclear fuel.

3 Common issues

3.1 SKB provided an overview of current activities.

Discussion

The discussion concerned the siting of Clab and the management of the fuel. SKB says that logistically, a location adjacent to Clab is the most natural solution, avoiding further transportation of unencapsulated fuel. Furthermore, there are personnel with the necessary competence at both OKG and Clab.

The encapsulation rate is envisioned to be the same throughout the operating period: about one canister per day. Clab has to be in operation until the last fuel is encapsulated. It will be possible to store several months of production of encapsulated fuel before deposition, if it should prove necessary.

3.2 SKI presented its planning for review of the applications.

Discussion

The discussion concerned what documents may be classified as secret and how common it is that SKI decides to classify documents as secret. Documents pertaining to the safety of the facility may in particular be classified as secret. The actual technical process has already been openly presented.

The municipality wondered when and how SKI will start the dialogue in the work of reviewing SR-Can. Are there plans for a joint kick-off meeting? If there is a meeting, the municipality wants an opportunity to participate with more than three persons.

SKI replied that it has not been decided how kick-off will take place. If someone wants a meeting, for example the municipality, SKI will be agreeable to this and in that case there will be no limits on how many participants the municipality can have.

3.3 SSI provided information on its overall planning for the review of the application under the Nuclear Activities Act for the encapsulation plant and the work with new interim goals for the national environmental quality objective of a safe radiation environment.

Discussion

SKB wondered what the function of the reference group is in the review of the application and where this function is described. SSI replied that the formation of the reference group is intended to facilitate communication between different parties. The group's duties will be discussed at the first meeting.

The implications of the proposed new interim goals for the environmental quality objective of a safe radiation environment were also discussed. One problem may be that SSI proposes two interim goals related to releases of radioactive substances. The Government only wants one. The interpretation of the interim goal of a national solution should be that a decision is taken in the specified year.

Questions that were asked but not answered are whether SSI is planning for requirements for reduced personal doses from the nuclear power plants and whether requirements for further reductions may then come, and whether the same requirements on personal doses from SKB's facilities will be made as from the nuclear power plants.

The question of radon is linked to the environmental objective of a good built environment, for which the National Board of Housing, Building and Planning is responsible. SSI exercises oversight as regards radon concentrations, but there is no activity operator to impose requirements on.

3.4 SKB gave a brief account of the consultations which SKB had before and after the summer and future consultation plans.

Discussion

The municipality expressed its gratitude for the clarifications made in response to their questions and wondered what kind of consultations SKB is holding on the alternatives report. SKB replied that the consultations cannot be about which method

permits should be applied for. SKB will apply for permits for the KBS-3 method. The alternatives report in the EIS will deal with alternative designs of the KBS-3 method, in accordance with the provisions of the Environmental Code.

One alternative design may, for example, be horizontal deposition of the canisters or different layouts of the facilities.

SKB's work to develop a method and find a suitable site for the spent nuclear fuel is not like any other project. The discussions that have been held over the years concerning alternative methods clearly have an impact on the thrust of the studies that are conducted and the research SKB follows within the framework of the RD&D work, as well as the account that will be given when the applications are submitted.

The municipality asked whether SR-Can will be translated to Swedish. An approximately 100 page summary in Swedish will be published in January next year.

3.5 SKB talked a little about what happens on the site when the site investigations are finished.

Discussion

The municipality wondered if the site selection made by SKB in the middle of 2009 is for internal use or whether it will be official, and when the permit applications are planned to be submitted.

The selected site will be announced when the choice has been made, and the applications are planned to be submitted at the end of the year, in November/December 2009.

3.6 How is the work of building a final repository in Finland going?

(SKB) We were there on Monday. Finland has different formal design premises. They have taken a decision in principle stating that final disposal will take place according to the KBS-3 method and stipulating where the repository will be built. They have also decided to build an underground laboratory on the site and commence the work. They have come 1,300 metres along the tunnel, which is equivalent to about 140 metres down in the bedrock. Posiva plans to apply for a permit to build the final repository in 2010. SKB and Posiva have just signed a new five-year cooperation agreement.

3.7 Requirements regarding the best possible site and technology in relation to requirements in the Environmental Code were discussed at KASAM's seminar on alternatives reporting in February. The sites being investigated by SKB are not so different, so how can it be determined which is the best site?

(SKB) BAT is a part of the general rules of consideration in the Environmental Code. SKB will argue that the KBS-3 method and the selected site comply with these rules in a special appendix to the applications.

3.8 What happens if the applications are not approved?

SKB) That depends on why the applications are not approved. Which issues are considered unclear. We have been thorough in our work and have full confidence in the content of our coming applications.

3.9 How do you manage all the information you have? What kind of software do you use?

(SKB) We have modern tools. Each report has search words you can search on. All reports are available via SKB's website.

3.10 What is the name of the database?

(SKB) We have a library database called Bibas.

3.11 Why don't you make the software available to everyone?

(SKB) It is a commercial programme which SKB has purchased and we cannot make it available to everyone.

(Municipality) There a good databases for literature searching available via the universities.

3.12 Have you digitized all reports? It's difficult to check a conclusion if you don't have access to all the background material.

(SKB) All reports published from 1998 onward are available digitally via SKB's website. But we have no campaign for digitizing older material.

3.13 MKG has sent in written questions concerning both consultation meetings, the one on 12 August in Öregrund and the one on 13 August in Simpevarp. Will the replies to the questions be included in the documentation from the two meetings?

(SKB) Yes.

3.14 Is it correct that alternative methods will not be described in the EIS appended to the applications for a final repository, but only alternative designs of the KBS method?

(SKB) Yes, that is correct. SKB no longer intends to give an account of our work with alternative methods and strategies for disposal of spent nuclear fuel in the actual EIS. A full account will be given when the applications under the Environmental Code and the Nuclear Activities Act are submitted in 2009.

3.15 The recent election will result in some restructurings in different political groups. It would therefore be good if newly appointed individuals can be offered training on different subjects, for example what radioactivity is, fuel dissolution and the function of the barriers in the final repository.

(EFÖ) EFÖ has just discussed this. We have provided training on these subjects for ten years and plan to start it again. It might be a good idea to cooperate.

3.16 Regarding the role of the activity operator, is it possible to discuss at these meetings the advantages and disadvantages of having an independent party conduct the EIA process?

(SKB) A discussion about amending the legislation should not be conducted within the framework of consultations, but on the political plane.

(County Administrative Board) The consultations and the discussions we have in this forum are predicated on existing laws. It is not appropriate to discuss changes in these premises here.

3.17 There is a conflict of interest in that such short notice is given of the meetings.

(SKB) We provide information on our plans for the consultation meetings on our website. No later than three weeks before a meeting we post information on the time and place of the upcoming meeting. No later than three weeks before a meeting we also place ads in local newspapers giving the time and place. Compared with other consultations this is definitely not short notice.

3.18 Soon the safety assessment SR-Can and the system analysis Sys-Inka will be ready for review. Will they be circulated for broader consideration and comment?

(SKI) SR-Can and Sys-Inka are not part of the applications and will not be circulated for comment. It is, however, since they are public documents they are available to anyone.

3.19 Can't they be circulated for comment anyway?

(SKI) SKI does not see the purpose of circulation the documents for comment when they are not included in the applications. It is possible to offer viewpoints anyway. The official supporting material will accompany the applications in 2009.

3.20 How will the question of secrecy – for the permit application for the encapsulation plant under the Nuclear Activities Act – be handled?

(SKI) The entire application is sent to SKI, who then decides which parts are confidential.

3.21 What form of secrecy are we talking about? Physical protection for security reasons or commercial secrecy?

(SKB) It is not corporate secrets but security aspects that must be kept confidential. Most information on the KBS-3 method and the encapsulation process has already been made public in our reports.

3.22 What does SKB think about the how the consultation meeting on 12 August was conducted?

(SKB) The consultation meeting on 12 August took the form of an open house lasting two hours. We did not hold any presentations, but were prepared to provide the same information as at the consultation meeting on 1 June. About ten persons attended the meeting and three viewpoints were submitted during the meeting, which will be included in the minutes of the meeting.

It can be concluded that there is not much interest in the formal consultations. One reason may be that people think they get enough opportunity for dialogue and the information they want via SKB's local information activities. These activities include visits to workplaces, study visits to SFR, study trips to Oskarshamn, nearby resident get-togethers and, not least, personal meetings.

(Municipality) We think it's good that everyone, including the municipality, has an opportunity to get information and pose questions to different parties.

3.23 Comment: I would first like to offer my compliments on the informative website.

SERO does not consider transmutation to be an alternative to final disposal. Deep boreholes can be interesting as an alternative to KBS-3. The difficulty of knowing where in the hole the canister ends up can be solved by laser measurement.

I would further like to refer to two ongoing studies that may have a bearing on the final repository for spent nuclear fuel: SOU 2006:39 about extended environmental liability, and SOU 2006:43 about review of nuclear liability.

3.24 If the nuclear power plants are operated for 60 years, will there be room for the spent nuclear fuel in Forsmark?

(SKB) It is possible to build a final repository in two levels in Forsmark, so there should be room.

3.25 The minutes of these meetings with the Forsmark Consultation Group formally come from the County Administrative Board, but are written by SKB. It would be good if it were made clearer that they are written by SKB.

(County Administrative Board) The division of labour between the different parties is stipulated by the work rules. It is also stated in the minutes who the secretary is, both in the final signatures and usually also in the list of participants on the first page.

3.26 Who makes sure that the questions asked during the question and answer period at the meetings and the replies given are correctly rendered in the minutes?

(County Administrative Board) The minutes are checked by all participating parties. Any errors can be taken up at the next meeting.

(Municipality) We have a special interest in making sure that the organizations are handled correctly and usually take a special look at this in the minutes.

3.27 Who pays for the activities of the Forsmark Consultation and EIA Group?

(SKB) Each party pays for its participation. Additional costs when the meetings are public are paid by SKB.

3.28 What guarantees are there that Vattenfall will not dispose of the nuclear waste from its German nuclear power plants in the Swedish final repository? Has the matter come up in SKB Board of Directors?

(SKB) It is governed by Swedish legislation. The matter has not been taken up by the Board of Directors.

3.29 Don't the Swedish laws that regulate the transport of nuclear waste across national boundaries conflict with the EU's acquis communautaire?

(SKB) Per Cramér is in the process of finishing his research report on these matters, which he has studied within the framework of our social science research programme. It can be noted that Sweden is in the same situation as other countries. Every country has the political will to deal with its own waste. Naturally it is possible to change the laws, but nothing points in this direction.

3.30 To guarantee access to uranium, the Euratom Treaty stipulates that the EU has the right of ownership with respect to fissile materials. A change can occur quickly. What Swedish legislation says is one thing. The EU's legislation supersedes Swedish legislation. Sweden has a good reputation for its policy in these matters, and maybe the EU will want to use the Swedish model.

(SKB) This is true, but any changes will not occur quickly. They will be preceded by many long discussions, in which Sweden will participate.

3.31 Is it possible to take photographs at this meeting?

(County Administrative Board) No, we have decided to prohibit photographs at these meetings.

3.32 SKI and SSI have previously pointed out that SKB should continue to keep track of technological developments regarding different alternatives for disposal of nuclear waste within the framework of the RD&D programmes. How will SKB give an account of its work with alternative methods in RD&D-Programme 2007?

(SKB) RD&D-Programme 2007 will include an up-to-date status report on alternative methods such as reprocessing, partitioning and transmutation, and deep boreholes.

Public meeting with Oskarshamn EIA Forum

Date	28 September 2006, 9:30 – 15:30 hrs.
Place	Oskarshamn Folk High School.
Target group	Oskarshamn Municipality, County Administrative Board in Kalmar County, SKI and SSI. The meeting was open to the public.
Invitation	The date of the meetings is decided on jointly. SKB sends out e-mail invitations to each meeting. The invitation to private citizens was published in Oskarshamns-Tidningen (16 and 23 September) and Nyheterna (16 and 23 September).
Purpose	The group consults on matters related to SKB's plans to site an encapsulation plant and a final repository for spent nuclear fuel in Oskarshamn. Furthermore, each participating party gives a status report on the work they are taking part in that has a bearing on the disposal of spent nuclear fuel.
Background material	—
Present	County Administrative Board in Kalmar County – *Ulf Färnhök (chairman), Sven Andersson* Oskarshamn Municipality – *Rigmor Eklind, Charlotte Liliemark, Lars Tyrberg, Peter Wretlund* SKI – *Josefin Päiviö Jonsson* SSI – *Mikael Jensen, Tomas Löfgren* SKB – *Claes Thegerström, Saida Laârouchi Engström, Anders Nyström, Katarina Odéhn (part of meeting), Olle Olsson, Erik Setzman, Olle Zellman, Lars Birgersson (secretary)*
Audience	Representatives of the Regional Council in Kalmar County, Östhammar Municipality, Hultsfred Municipality, KASAM, MKG, the Döderhult Nature Conservation Society, MILKAS and SERO. Total about 20 persons.

1 Encapsulation plant

1.1 Will fabrication of and requirements on canisters be described in the application being submitted this autumn?

(SKB) This information will not be included in the permit application for the encapsulation plant. The requirements that are made on the canister are linked to the canister's function in the final repository and will be described within the framework of the applications planned for 2009. There are, however, reports (the DOKAP reports) available now that deal with these issues.

1.2 Who owns the issue once the application has been submitted? Who will communicate with the municipality and private citizens?

SKB replied that SKB owns the content of the submitted application and that both SKI and SKB will need to communicate with the municipality and private citizens.

SKI agreed that SKB owns the content of the application. Since it is SKI who will review the application, the authority is obliged to solicit viewpoints from municipalities, regulatory authorities and other interested parties.

1.3 Will the EIS that is now being prepared for the encapsulation plant be expanded for the applications in 2009?

(SKB) The EIS that is now being prepared for the encapsulation plant is fairly complete as far as the encapsulation plant is concerned. Prior to the applications in 2009, the EIS will be expanded with parts that have to do with the final repository.

1.4 Oskarshamn Municipality will need about a year to review the application before a statement can be submitted to SKI. According to SKI's timetable, the application will be circulated for comment until the summer of 2007. Is it possible to extend this deadline?

SKI replied that they do not expect any replies before the summer of 2007 and that it is no problem if, for example, the municipality wants to take a year to review the application.

1.5 How widely with the application be circulated for comment? Will it be limited to authorities or be generally circulated?

SKI replied that SKB's application will be sent to the municipalities of Oskarshamn and Östhammar, the county administrative boards in Kalmar and Uppsala counties, the organizations that receive funding from the Nuclear Waste Fund to participate in the consultations and SSI. SKI will also inform other authorities that an application has been received and that additional applications will be coming from SKB in 2009.

1.6 The film that was showed about the encapsulation process is incomplete in many respects. For example, what happens with the left-over copper? How is it disposed of? It would be good if the film included such facts.

SKB agrees that the information provided in the film may seem incomplete in many respects. The film requires an introduction. But the encapsulation process has been discussed a number of times at EIA Forum meetings, so the film needs no introduction in this group.

1.7 Where will canister fabrication take place?

SKB replied that trial fabrication of canisters takes place today at several places. The components for the canisters will be fabricated by various suppliers. However, SKB is responsible for the quality of the canisters and therefore needs to have control over the canister components that enter the encapsulation plant, which may mean that SKB will want to have their own "canister factory" for final machining and assembly of the components. Such a "canister factory" could possibly be located adjacent to an existing industrial plant.

A feasibility study for the "canister factory" is planned to start at the end of this year. The actual design work for the "canister factory" is projected to begin in 2009 or 2010.

1.8 Could the "canister factory" end up abroad?

SKB replied that nothing has been decided yet. However, Sweden is collaborating with Finland in the final repository project, so it is possible that canister fabrication will also be coordinated.

1.9 The film about the encapsulation plant clearly shows that the entire process has to take place without the presence of humans, since the radiation levels are high. Shouldn't this be explained in the film to give a fair picture of the challenge involved in getting it to work?

SKB said that it is true that certain steps must be performed with radiation shielding and that this involves advanced technology. However, experience exists of this type of work and nearly everything is done with proven technology.

SSI said that radiation protection issues will be important in the review of SKB's application.

1.10 Will SKB distribute the permit application for the encapsulation plant under the Nuclear Activities Act on CD or DVD?

(SKB) The application will be distributed on CD.

2 Final repository

2.1 How will records of the repository be kept for posterity?

SSI replied that records of the final repository will be filed in the national archives and probably abroad as well, for example in the IAEA's archives. At present SSI is studying together with SKI how records of the final repository should be kept. A detailed presentation of this work will be made at the next meeting of the Oskarshamn EIA Forum on 6 December.

SKB replied that it is the authorities who decide what records should be kept for posterity. International projects are being conducted concerning transmitting information to posterity. SKB will participate more actively in these projects from now on.

2.2 What kind of time scale do these records have? 50 - 100 years?

SSI replied that the time scale for the records is much longer. Many future generations must have knowledge of the repository's location and contents.

2.3 Supraregional groundwater modelling

Discussion

Rigmor Eklind, Oskarshamn Municipality, said that the report on supraregional groundwater modelling (SKB R-06-64) is not easy to understand, which conflicts with the municipality's condition no. 3. One of the municipality's EIS questions (question no. 7) deals with recharge and discharge areas. The municipality wondered whether SKB's study is the reply to the municipality's EIS question. It was further suggested that the results should also be reported to a larger group, for example Hultsfred Municipality. Olle Olsson, SKB, said that the study that has now been reported is the study of regional groundwater modelling that SKB intended to carry out and that the report, together with the memo sent to SKI and SSI, presents SKB's standpoint on the issue. SKB presented the study in Hultsfred in August.

Josefin Päiviö Jonsson, SKI, said that the report on supraregional groundwater modelling was done in response to a requirements by the regulatory authorities. The regulatory authorities will conclude the review of the report in October according to the current timetable and intend to inform the municipality of their conclusions in November. This can be done at an all-day meeting that deals with both recharge and discharge issues and the preliminary safety evaluation that has been prepared for Laxemar.

3 Common issues

3.1 Background material for consultation meetings and account of alternative methods.

Discussion

Peter Wretlund, Oskarshamn Municipality, said that it is important that both concise background material and supporting reports are on hand at the consultation meetings. Peter Wretlund went on to say that the alternatives issue is important and is also associated with one of the municipality's conditions, condition 12. It would therefore be valuable if other actors could shed light on the issue. Torsten Carlsson, KASAM, said that KASAM is planning to hold a seminar in the spring of 2007 on alternative methods, with a focus on deep boreholes.

Charlotte Liliemark, Oskarshamn Municipality, raised the question of the scope of the consultations as far as alternative methods are concerned. SKB noted earlier during the meeting that the consultations concern the siting, scope, design and environmental impact of the applied-for activity, as well as the form and content of the environmental impact statement. What is meant by "the applied-for activity"? Should "the applied-for activity" be interpreted narrowly as "the KBS-3 method" or broadly as "final disposal of spent nuclear fuel"? Claes Thegerström, SKB, said that SKB intends to apply for a permit for final disposal according to the KBS-3 method, but that SKB is at the same time open to discuss alternative methods. The alternatives SKB sees are to apply for a permit to dispose of spent nuclear fuel according to the KBS-3 method in Oskarshamn or Forsmark, or no to apply for a permit at all.

Rigmor Eklind, Oskarshamn Municipality, stressed that the background reports were not available at the consultation meeting on 31 May, which meant it was not possible to study the issues thoroughly. Saida Laârouchi Engström, SKB, replied that the background material that was compiled for the consultation meeting contained all important conclusions from the studies and that the material is popularly written to make it easily comprehensible.

The scope of the account of the deep boreholes alternative was discussed. Mikael Jensen, SSI, said that the challenge to SKB to make an "evaluation" of long-term safety comes from SSI. What SSI is looking for is not a proper "safety assessment" but an "evaluation" of long-term safety.

3.2 The recent election means that new ministers will be appointed. How will this affect the final repository process?

SKB replied that they do not yet know what the change in Government will mean for the final repository process. We will have to wait and see what happens. However, so far there has been broad political agreement on the waste issue.

3.3 The consultations in the spring were supposed to be about alternatives. The background material said that certain alternatives, for example deep boreholes, were so little researched that comparisons were not possible. This was used as an argument for the claim that the alternatives were not realistic. It was circular reasoning where the fact that an alternative had not been sufficiently investigated previously was used as an argument that it would not be investigated now either. There are different opinions among different environmental attorneys, those who work for SKB and those who participated at KASAM's seminar on alternatives, as to what is meant by the best available or best possible technology. Who finally decides which interpretation should apply?

SKB replied that SKB is responsible for judging how much effort should be devoted to alternative methods. SKB will present the work that has been done on alternative

methods in the applications. The final interpretation will be made by the Government and the Environmental Court.

3.4 At the meeting with the Forsmark Consultation and EIA Group on 20 September, SKB said that the different alternatives will be included in the environmental impact statement but not be discussed at the consultations. Now SKB says that the alternatives will be described in the application, but perhaps not in the environmental impact statement. The alternatives report is constantly being put off with the excuse that it will be taken up later than previously stated, or in another forum. According to SKB, different alternative methods should not be discussed at the consultations, but merely different designs of KBS-3. This is a strange interpretation of the requirements on alternatives reporting. It is no news that SKB wants to use the KBS-3 method, but if the consultations are to be about the applied-for activity, then surely the activity is final disposal and not a certain method for final disposal?

SKB does not intend to consult about which method will be used for final disposal. SKB has stated this and received viewpoints on this policy. The viewpoints are included in the minutes of the meeting. However, it is possible to express viewpoints in the consultations regarding alternative methods.

3.5 Previously the nuclear power industry has been against giving organizations funding from the Nuclear Waste Fund. Even when the new Financing Act was passed in the Riksdag there were indications of political lobbying aimed at preventing the new act from allowing this. The current trial programme will be evaluated in 2007 and 2008 and a proposal will be made regarding if and how the programme should continue. Does the nuclear power industry, SKB and its parent companies think organizations should be eligible for funding from the Nuclear Waste Fund to participate in the consultation process even after 2008?

SKB replied that it is important that everyone is able participate in the consultations. What SKB was against was that the funding for the organizations should be taken from the Nuclear Waste Fund, as is the case now. SKB suggested that the organizations could receive support from the funds allocated to the municipalities from the Nuclear Waste Fund.

SKB has not taken a stand on whether the organizations should receive funding from the Nuclear Waste Fund after 2008. First we have to evaluate the experience from this period and then discuss the matter with the owners.

3.6 MKG's request to participate as a member of the EIA Forum.

Sven Andersson, County Administrative Board in Kalmar County, said that MKG submitted a communication to the County Administrative Board in May 2006 with a request to participate in the Oskarshamn meetings as a member of the EIA Forum. An equivalent request has been sent to the County Administrative Board in Uppsala County to participate as a member in the meetings of the Forsmark Consultation and EIA Group.

MKG's request has been discussed in the EIA Forum's working group, which consists of representatives of all parties. After consultations and deliberations with the regular parties in the Oskarshamn EIA Forum, the County Administrative Board finds that the current forms for consultations between the participants in the group are adequate and functional. The EIA Forum's current work forms will therefore be left unchanged. The decision has been coordinated with the County Administrative Board in Uppsala County, which made a similar decision at a meeting with the Forsmark Consultation and EIA Group on 20 September.

Discussion

Peter Wretlund, Oskarshamn Municipality, said that the municipality considers the environmental organizations to be an important and strong resource for the work with the final repository issue. Furthermore, Peter Wretlund said that the EIA Forum is an important arena for discussions between different parties and that the municipality is satisfied with the current work forms in EIA Forum.

Mikael Jensen, SSI, said that SSI sees the EIA Forum as the municipality's way of gathering information and knowledge and that SSI sees itself as a resource for the municipality.

3.7 The minutes from the Oskarshamn EIA Forum formally come from the County Administrative Board in Kalmar County. The minutes are written by SKB and the participating organizations check them. Who makes sure that questions from organizations and private citizens and the replies made are reported correctly?

SKB explained that the minutes are supposed to reflect questions and replies from the meeting. The parties check the minutes and are responsible for the whole.

The chairman pointed out that the minutes are posted on SKB's website in good time before they are checked and signed. If anyone has been misquoted this can be noted in the subsequent minutes.

3.8 SKB prepares an annual compilation of the questions posed at and after the consultation meetings. The question itself is included in the compilation for 2005, but not the background. Can SKB include discussions, arguments and explanatory introductions in the consultation minutes and compilations in the future and not just sentences that end with a question mark?

SKB said that at the previous meeting with EIA Forum, on 22 March, it was noted that it is possible to send in clarifications of the questions posed during the meeting after the meetings, but no new questions.

3.9 Canister fabrication will be very costly. How will the procurement be handled? Does SKB fall under the Public Procurement Act?

SKB does not fall under the Public Procurement Act. This means that SKB can procure like "an ordinary industrial company"..

3.10 Vattenfall is the principal owner of SKB and also owns German nuclear power plants. How will the waste from these reactors be managed? Is it possible it will be disposed of in Sweden?

SKB is responsible for managing and disposing of the waste arising in the Swedish reactors. The country of origin of the waste is the crucial factor. In some few cases there has been an exchange of waste between countries.

3.11 Given the rising price of copper on the world market, the cost of canister fabrication will increase. How will this affect SKB?

SKB replied that each canister will contain about 7 tonnes of copper, and at most 200 canisters per year will be fabricated. This means that the quantity of copper consumed in canister production will amount to about 1 percent of the quantity of copper consumed in Sweden during the same period.

3.12 The Government's decision concerning RD&D 2004 says: "SKI and SSI point out in their statements that SKB should clarify its account of alternative methods for examination under the Environmental Code. A comparison with the KBS-3 method should be made that utilizes safety assessment methodology. The Government makes the same judgement."

How will SKB report the work with alternative methods in RD&D 2007? Will a description be given of the knowledge that is lacking in order to make a comparative safety evaluation between the KBS method and the deep boreholes method that satisfies the wishes of the Government and the regulatory authorities?

SKB replied that the RD&D programmes always include an account of SKB's work with alternative methods. RD&D 2007 will include an account of SKB's work with reprocessing and transmutation, as well as the work of updating the state of knowledge on deep boreholes. SKB has arrived at the conclusion that a great deal of time and money would be needed to bring the deep boreholes alternative up to the same knowledge level as KBS-3.

3.13 The judgement is made in SKB's report R-00-28 from 2000 that it would take 30 years and cost at least SEK 4 billion to achieve a level of knowledge that makes it possible to perform a safety assessment of the same quality as for the KBS-3 method. A project of this scope is not needed to investigate the prospects for the safety of execution and for the long-term safety of a final repository according to the deep boreholes method. How much time and money does SKB estimate this would take?

SKB makes note of the viewpoint.

Public joint meeting with Oskarshamn EIA Forum and Forsmark Consultation and EIA Group

Date	6 December 2006, 09:00 – 15:30 hrs
Place	Arlanda Conference & Business Center
Targeet group	Oskarshamn Municipality, Östhammar Municipality, County Administrative Board in Kalmar County, County Administrative Board in Uppsala County, SKI and SSI. The meeting was open to the public.
Invitation	The date of the meetings is decided on jointly. SKB sends out e-mail invitations to each meeting. The invitation to private citizens was published in Upsala Nya Tidning (25 November), Östhammars Nyheter (23 November), Annonsbladet (22 November) and Upplands Nyheter (1 December), as well as in Oskarshamns-Tidningen (25 November) and Nyheterna (25 November).
Purpose	The groups consult on matters related to SKB's plans to site an encapsulation plant and a final repository for spent nuclear fuel in Oskarshamn and Forsmark, respectively. Furthermore, each participating party gives a status report on the work they are taking part in that has a bearing on the disposal of spent nuclear fuel.
Background material	—
Present	County Administrative Board in Kalmar County – *Ulf Färnhök, Sven Andersson* County Administrative Board in Uppsala County – *Leif Byman (chairman), Mats Lindman* Oskarshamn Municipality – *Rigmor Eklind, Elisabeth Englund, Krister Hallberg, Charlotte Liliemark, Kaj Nilsson, Rolf Persson, Göte Pettersson, Lars Tyrberg, Peter Wretlund* Östhammar Municipality – *Bertil Alm, Ronald Arvidsson, Sten Huhta, Hans Jivander, Gunnar Lindberg, Virpi Lindfors, Jacob Spangenberg, Anna-Lena Söderblom, Margareta Widén Berggren* SKI – *Holmfridur Bjarnadottir, Stig Isaksson, Josefin Päiviö Jonsson, Elisabeth André Turlind* SSI – *Mikael Jensen, Tomas Löfgren* SKB – *Kaj Ahlbom, Lars Birgersson (secretary), Allan Hedin, Saida Laârouchi Engström, Olle Olsson, Erik Setzman, Claes Thegerström, Sofie Tunbrant (sekretary), Peter Wikberg*
Audience	Representatives of MKG, MILKAS, SERO, KASAM, the Regional Council in Kalmar County, the Regional Council in Uppsala County, Energy for Östhammar (EFÖ), the Opinion Group for Safe Final Disposal (Oss) and the reference group and the screening group in Östhammar Municipality. Total about 15 persons.

1 Encapsulation plant

No questions or viewpoints were expressed pertaining solely to the encapsulation plant.

2 Final repository

No questions or viewpoints were expressed pertaining solely to the final repository for spent nuclear fuel.

3 Common issues

3.1 Judging from the presentation [of SR-Can] is appears as if SR-Can mainly deals with the risks of external factors. What happens if the canister has initial defects? How many canisters will have initial defects?

SKB has studied this. The number of defective welds that can be expected has been estimated on the basis of extensive test series taking into account how good the welding method is, how good the method for detecting defects is, etc. In SKB's judgement, no canisters are expected to have initial through defects, although there will be canisters with minor defects. This has been included in SR-Can.

3.2 A weakness in SR-Can is that the body of data is different for Laxemar and Forsmark, which means the sites cannot be compared. This does not appear to be possible until SR-Site. Is it possible to get an indication of the suitability of Laxemar before this?

SKB replied that currently available data indicate that Laxemar is more favourable that has been assumed in SR-Can. This picture will be confirmed or denied before SR-Site is finished. SR-Site will come at the end of 2009.

3.3 How will SR-Can be circulated for comment? Will it be sent out to the municipalities?

SKI replied that they will inform the municipalities, the environmental organizations, the county administrative boards and other reviewing bodies how the review will be conducted at a meeting on 11 December. The question of the municipalities reviewing work can be brought up at this meeting.

3.4 MKG believes that the connection between the geochemical environment and the microbiological processes in the rock is a very important, and perhaps crucial, issue for the assessment of the long-term safety of a final repository. The microbiological processes may turn out to be crucial for the groundwater chemistry in various scenarios. The discussion of this issue in SR-Can is very limited. Will SKB do more to link the chemical environment to the microbiological processes that occur and may occur in the rock? How do the regulatory authorities intend to handle this issue in the reviewing work?

SKB replied that the presence of bacteria in the rock can be both good and bad.

The bacteria can provide extra protection for the canister by consuming oxygen, which can otherwise damage the copper canisters. Certain bacteria can convert sul-

phate in the groundwater to sulphide. Sulphide can, like oxygen, cause corrosion of the copper canisters. These aspects have been taken into account in SR-Can and will be further studied.

3.5 Oss wonders if SKB has decided which backfill material is to be used?

SKB replied that a final choice of backfill material has not been made. We have looked at a mixture of bentonite clay and crushed rock (30/70) and so-called Friedland clay.

3.6 Have you taken into account the fact that the rise in the sea level could put the repository under water?

SKB replied that future sea level rise has been taken into account in SR-Can. It is no disadvantage from a safety viewpoint if the final repository ends up under water.

3.7 Do you rule out the possibility of sea level rise during the operating period?

SKB noted that the operating period is expected to last 50–60 years. The sea level rise during that time is estimated to be 1–2 metres. Planned access openings are higher than that, so SKB doesn't see any problem with future sea level rise.

3.8 There are no scenarios with intentional intrusion or speculative intrusion in the safety assessment. SKB says that future generations must always take responsibility for their own actions. But today we find many actions to be unacceptable, for example terrorism and nuclear weapons proliferation. Since the issue of intentional intrusion is complex, it is important that it be handled correctly in the safety assessment and the environmental impact assessment. Could SKB reconsider its view in this matter?

SKB replied that only inadvertent intrusion is included in the SR-Can safety assessment, in accordance with international practice. The question of intentional intrusion is related to retrievability. It is possible to retrieve deposited canisters during the operating period of the final repository. After the repository has been closed, retrieval would require enormous resources in time and money. This is only possible if society makes a deliberate effort.

3.9 If someone should want to intrude into the repository to get at the copper, when will it be possible to handle the canisters?

SKB said that the question of when a canister can be handled depends on its temperature and radiation. The heat output declines after a few decades, and the canister can be touched after a couple of hundred years. Radiation will be a problem for a much longer time, however.

3.10 SKB claims that it would be enormously difficult to reach and retrieve materials from the final repository after closure, that this would require enormous resources and that it would incur enormous costs. Could SKB conduct a study to examine these difficulties, this resource need and these costs more closely?

SKB replied that a very rough estimate is that it will not cost more to retrieve the canisters than it has cost to deposit them.

3.11 SKI provided information on the content of regulations on the physical protection of nuclear installations. A discussion followed.

The legal examination of physical protection was discussed. The County Administrative Board in Uppsala County said that when the Oskarshamn nuclear power plant (OKG) was examined under the Environmental Code, the Environmental Court in Växjö paid particular attention to the requirements on physical protection. In the judgement of the Court, an armed defence force must be stationed at the site. The matter was thereby referred to the Government for examination of the permissibility under the Environmental Code of the applied-for activity at OKG. The Government found that the activity is permissible with regard to physical protection and that conditions for the purpose of preventing an accident or sabotage at OKG should be considered in the overall assessment of physical protection that is made under the Nuclear Activities Act and regulations issued pursuant to this act. SKI stated that they do not recommend the presence of armed personnel on the site. If necessary the police can be called in.

3.12 Östhammar Municipality wondered if it is now possible to define how large a land area the state should own?

SSI replied that the state should own the land area immediately above the repository, as well as whatever surrounding land area may be affected by the repository. How large this may be cannot be said today, since it depends on the geology of the area and other factors.

3.13 Oskarshamn Municipality stated that in view of the large number of landowners in the Laxemar area, the question of the long-term ownership of the land area surrounding the final repository is an important local issue. Is it possible that the study [proposal for how the Nuclear Activities Act can be clarified with respect to long-term responsibility for the closed final repository for spent nuclear fuel] will be sent to the municipality for review and comment and that they will have an opportunity to reply before it is sent to the Government?

SSI replied that SKI is responsible for submitting the study to the Government.

SKI said that the work has been conducted jointly by SKI and SSI. The municipality's request to receive the study for comment before it is submitted to the Government will be passed on to SKI's staff lawyer, who is in charge of submitting the study to the Government.

3.14 SKB wondered whether the study [proposal for how the Nuclear Activities Act can be clarified with respect to long-term responsibility for the closed final repository for spent nuclear fuel] will contain proposals for amendments to the Nuclear Activities Act?

SSI replied that first all questions will be addressed, after which any proposed amendments will be considered. Whether the study will yield any proposals for amendments will be decided by SKI's staff lawyer.

3.15 The County Administrative Board in Kalmar County wondered whether the area for the final repository will be marked out physically in the terrain?

SSI replied that it is possible that the area will be marked out, but that such more detailed questions can better be judged later, prior to closure.

3.16 The County Administrative Board in Uppsala County wondered if marking out the area for the final repository could pose a risk in itself?

SSI replied that it could pose a risk to mark out the area, but the advantages probably outweigh the disadvantages.

3.17 Oskarshamn Municipality intends to issue a statement of comment on SKB's application. The deadline when statements of comment are to have been received by SKI has not been set, but it is important for the municipality that this reviewing work be coordinated in a suitable manner with other reviews and that we have an opportunity to coordinate our statement with Östhammar Municipality.

SKI replied that the timetable for the municipality's statement can be discussed at the presentation meeting in January. But it should be noted that this is not a commenting round, but a chance to express viewpoints. A formal commenting round will take place when a complete application has been received from SKB, i.e. at the end of 2009 according to SKB's planning. SKI intends to notify SKB if essential parts of the application need to be supplemented.

3.18 Östhammar Municipality wondered how the submitted EIS for the encapsulation plant relates to the upcoming EIS for the entire final repository system?

SKB said that they have no plans to make changes in the EIS just submitted, unless viewpoints emerge that require changes or supplements. If changes are made in the EIS for the encapsulation plant, they will be clearly marked.

3.19 Oskarshamn Municipality presented the municipality's EIA question no. 11 regarding transparency in site selection. SKB provided information on how they have explained the principles they intend to apply in site selection. Discussion in connection with the presentations.

The principles for site selection were discussed. It was concluded that there are fundamental requirements that must be met by potential sites. The site must be suitable with respect to safety and environmental requirements and it must be available in terms of availability of land and the municipality's policy. If these fundamental requirements are not met, the site will not be selected. Sites that satisfy these fundamental requirements can then be judged with respect to other aspects.

3.20 Östhammar Municipality wondered about the use of data from Forsmark and Laxemar in SR-Can. It has been said that the information from these two sites is not comparable in terms of quantity and depth. What are the differences? There is also talk of "a lens" in Forsmark. Are there similar geological phenomena in Laxemar?

SKB replied that the data used for Laxemar in SR-Can come from measurements outside the area in which we now want to locate the repository. Furthermore, the investigations in Laxemar are about six months behind those in Forsmark, which means that the quantity of data included in SR-Can was greater for Forsmark. At present, however, the data density is roughly the same in the Laxemar area as in Forsmark.

There is no geological formation in Laxemar equivalent to the "lens" in Forsmark. The area in question in Laxemar is located in a relatively large rock volume consisting of quartz monzodiorite.

3.21 Oskarshamn Municipality wondered what has happened in the landowner issue and what it means to have "disposition" over the land. Will new negotiations be necessary?

As far as SKB is concerned, disposition means that you have acquired the land area or are entitled to use it under an easement. SKB is now looking at questions associated with disposition. It is not a question of new negotiations, but of application of existing agreements. The landowner issue must be cleared up on both sites before the applications are submitted in 2009.

3.22 It may be difficult to mark out the site for the final repository so that inadvertent intrusions do not occur in the future. Isn't this a reason to study a monitored repository as a conceivable alternative?

SKB plans to build and operate a final repository in accordance with regulatory requirements. The final repository will consist of passive barriers and will not require post-closure monitoring.

SSI said that the Riksdag has asked for a final repository. Monitored storage is not final disposal.

3.23 According to the regulations concerning physical protection, the repository shall be designed to prevent illicit tampering with nuclear materials or nuclear waste. Are the regulations applicable in a long-term perspective?

SKI replied that the regulations apply to facilities in operation, not a closed repository. Work is being done internationally on requirements on safeguards for facilities in operation. But this work does not include a closed final repository.

3.24 Since there is a possibility that a monitored repository is environmentally advantageous, this alternative should be explored. At KASAM's seminar on 15 November, environmental attorney Peggy Lerman said that it should also be possible for repositories that are not final repositories to be studied and presented as alternatives, even if they are not main alternatives. Is it possible to have a study done of the environmental advantages of monitored repositories?

SKB is working according to the existing requirements. Society requires a final repository.

3.25 Oskarshamn Municipality's EIA question no. 11 was discussed earlier, which has to do with transparency in site selection. The problem is that the project has no overall purpose. This was also brought up at the KASAM seminar in November.

SKB has formulated a purpose that focuses on achieving a safe final repository. The formulated purpose was presented at KASAM's seminar. As far as the site selection process is concerned, safety is the most important aspect, after which comes the municipality's attitude.

3.26 SKB says they have a description of the purpose of the KBS project which they claim is in agreement with the societal purpose. SKB's purpose was formulated to be included in the background material for the consultation meetings in Oskarshamn and Östhammar in May/June 2006. The consultations dealt with alternative methods and sitings. The background material, and thereby SKB's purpose as it is described in the background material, were clearly designed to support SKB's choice of method and site. This illustrates the importance of an independent effort to describe, and at the Government level to adopt, societal purposes for the project that SKB's project goals can be compared with.

The purpose formulated by SKB is based on Swedish legislation, conventions and statements of comment in the RD&D process, i.e. what society has expressed in different contexts.

3.27 When will Clab be empty? How will Clab's power supply be arranged, for example for cooling, during the operating period?

SKB replied that Clab will be emptied some time between 2050 and 2060. Resources have been set aside to operate Clab.

3.28 Discussion of public insight.

MILKAS said that public insight and knowledge in the nuclear waste issue is virtually non-existent, at least outside the two candidate municipalities. According to SKB a milestone has been reached in the Swedish nuclear waste programme with the recently submitted permit application for the encapsulation plant. But this was done without raising the issue to a national level, for example among members of parliament, parties, trade unions, trade unions and a broader public. MILKAS has previously urged the Forsmark Consultation and EIA Group and the Oskarshamn EIA Forum to be more transparent and visible. Making the meetings less closed, holding them at accessible locations, letting us in the environmental organizations express our opinions during the meetings, and not just during the question and answer periods at the end. The way it works now SKB, who represents a special interest, is completely in control not only of research and development, but also of the forms for review and discussion. The environmental organizations run around chasing review reports, applications, SR-Can etc. to try to keep up with what is happening in the nuclear waste issue. Instead, regulatory authorities, environmental organizations and other actors should set an agenda stipulating what questions will be brought up. We cannot always just react, we have to act as well. The project isn't reaching a broader public. Many members of parliament feel they don't have time to familiarize themselves with the issue. The issue is too important to be handled only by experts. KASAM's project for transparency and their seminar on 15 November are the only positive developments for public insight and knowledge in the nuclear waste issue in a long time.

SKB stated that they are open to what themes should be dealt with at coming public consultation meetings. Furthermore, SKB is of the opinion that the politicians discuss the nuclear waste issue, but not in the public arena. The county benches are active and a good link in to the Riksdag. The Government makes decisions on SKB's RD&D-Programme every third year. So our politicians are involved and not ignorant in the nuclear waste issue.

Oskarshamn Municipality said that transparency and openness are important issues. There is no other single issue where discussion is more desirable. The municipality has noted that there is some interest in the issue, but a stronger local environmental movement would be desirable. It is important that the political parties take their responsibility and work to focus greater national attention on the matter.

Östhammar Municipality concurred with what Oskarshamn Municipality said. Representatives of the municipality are often out informing and discussing, but unfortunately interest on the part of the general public is rather low. One reason the media have not shown any great interest in the nuclear waste issue may be that there are not yet any conflicts.

The Regional Council in Kalmar County said that they are working with the issue in the county's municipalities, but that interest is often cool. Meetings were recently held in Borgholm and Högsby. Three private citizens came to the meeting in Borgholm and one to the meeting in Högsby.

MILKAS pointed out that the nuclear waste issue is perceived as difficult, perhaps because not enough aspects of concern to ordinary people are addressed. Östhammar Municipality said that the goal is to reach make an impression at the layman level.

MILKAS noted that there was previously talk of arranging a hearing for members of parliament on the nuclear waste issue. Isn't it possible to do this? KASAM said that the MPs had been asked about this. Östhammar Municipality said that it is a good idea, but it should be done in a better way than before. For example, environmental organizations, municipalities and others should be invited.

3.29 Discussion concerning the legal handling of the application.

MKG has claimed that the legal handling of the application for the encapsulation plant under the Nuclear Activities Act is incorrect. There has been criticism of this, from the municipalities for example. It is possible that there is a lack of clarity at this meeting as to how the regulatory authorities will handle the application. SKI will convene a meeting to clarify the issue at the beginning of next year, but MKG would like to read aloud what it says in the information on the handling of applications which SKI sent out on 17 November 2006.

"SKI will send SKB's application to the reviewing bodies for comments after SKB has submitted the requested supplement. SKI will therefore limit the distribution of received material to those parties that can be considered to be particularly affected as well as those parties that ask for the material. SKI does not expect any viewpoints from the reviewing bodies until they have examined all the material. However, there is nothing to prevent reviewing bodies from offering viewpoints on the need for supplementary supporting material."

This means it is not a question of circulation of the application for comment and confirms the fact that the criticism of the application procedure voiced by MKG was justified.

Summary of written viewpoints and questions and SKB's replies from public meetings in Oskarshamn Municipality (31 May) and Östhammar Municipality (1 June)

Regarding questions and replies brought up at the different meetings, see the particular meeting.

Written invitations to participate at the consultation meetings and/or to submit written viewpoints were sent to the following organizations (which obtain funds from the Nuclear Waste Fund to follow the consultations), government agencies and concerned municipalities. The table also shows who replied.

National Board of Housing, Building and Planning	Viewpoints expressed
Swedish Environmental Protection Agency	Abstains
SKI	Abstains
SSI	Abstains
Swedish Energy Agency	No objections
National Board of Fisheries	Abstains
National Institute of Public Health	No reply
Swedish Armed Forces	No reply
National Rural Development Agency	No objections
Swedish Board of Agriculture	No viewpoints
KASAM	No reply
Legal, Financial and Administrative Services Agency	No reply
National Chemicals Inspectorate	No reply
Swedish Emergency Management Agency (KBM)	No viewpoints
Swedish Agency for Economic and Regional Growth (NUTEK)	No viewpoints
National Heritage Board	No reply
Swedish Rescue Services Agency	Abstains
Geological Survey of Sweden (SGU)	No viewpoints
Swedish Maritime Administration	Viewpoints expressed
National Board of Forestry	No viewpoints
National Board of Health and Welfare	No reply
National Road Administration	No reply
County Administrative Board in Kalmar County	Abstains
County Administrative Board in Uppsala County	Viewpoints expressed

Municipalities and county administrative boards	
Oskarshamn Municipality	Viewpoints expressed
Östhammar Municipality Environmental Health Committee	Viewpoints expressed
Organizations that obtain funding from the Nuclear Waste Fund	
Environmentalists for Nuclear Power	No reply
Swedish NGO Office for Nuclear Waste Review (MKG)	Viewpoints expressed
Swedish Environmental Movement's Nuclear Waste Secretariat (MILKAS)	Viewpoints expressed
Swedish Renewable Energies Association (SERO)	No further viewpoints
Döderhult Nature Conservation Society	Viewpoints expressed
Public Opinion Group for Safe Final Storage of Radioactive Waste (Oss)	Viewpoints expressed

1 Encapsulation plant

No questions or viewpoints were expressed pertaining solely to the encapsulation plant.

2 Final repository for spent nuclear fuel

2.1 How does SKB plan to handle the post-closure transfer of information on the final repository? (Döderhult Nature Conservation Society)

The issue of information transfer has two parts: documentation and communication. As far as documentation (records) is concerned, for example what type of fuel is deposited where, this is governed by SSI's regulations. The communication issue, i.e. whether information on the final repository is to be preserved for posterity, if so how this should be done and under what forms it should be preserved, is being studied both in Sweden and internationally.

The issue of information transfer will undergo final legal examination at the time of closure, i.e. during the latter part of this century.

2.2 Will the repository be monitored after closure? If so, how does SKB view this in the long-term perspective? (Döderhult Nature Conservation Society)

The KBS-3 method is designed on the premise that the repository will not be subject to post-closure monitoring.

3 Common issues

3.1 On 21 December 2005, the National Board of Housing, Building and Planning issued a statement of comment on consultation material from SKB. This statement is still relevant.

The Board found that the choice of method for final disposal of spent nuclear fuel is vital for how the waste system as a whole is to be designed and that a formal choice of method needs to be clarified at the same time or before a decision is made on the design and siting of other parts of the system. The Board also found that a general explanation should be given as to why the two candidate sites have been selected as sites for the final repository. See their statement for further details.

SKB will apply for a permit for final disposal of spent nuclear fuel according to the KBS-3 method.

To provide a sufficient basis for the legal examination of the KBS-3 method, SKB will present a summary and evaluation of the other strategies and methods for management and final disposal of spent nuclear fuel that SKB has studied in its research, development and demonstration work (RD&D). This account will accompany the applications under the Nuclear Activities Act and the Environmental Code in 2009.

The consultation material that was compiled for the consultation meetings on 31 May and 1 June 2006 provides a general account of why the two candidate sites have been selected for the current site investigations. A more detailed account is provided in the report SKB R-06-42 "Lokalisering av slutförvaret för använt kärnbränsle" ("Siting of the final repository for spent nuclear fuel", in Swedish only), which came out in September 2006.

3.2 The Swedish Maritime Administration concludes that both fairways and ports are well adapted for today's ship traffic to and from the facilities in Oskarshamn and Forsmark. Most of the shipments are carried by the special vessel Sigyn. We do not find that a decision on an encapsulation plant or a final repository would appreciably affect these shipments and do therefore not wish to recommend either of the alternatives.

The ship Sigyn has proved so far to be excellent for these shipments with a high safety standard on board. However, the ship is relatively old now and in view of the fact that shipments of high-level waste for encapsulation and final disposal are expected to continue for many years to come a replacement vessel may be necessary. In this case the safety arrangements in the fairways to the ports, the fairways themselves and the port facilities may have to be modified if the replacement vessel differs in size, draught or manoeuvring characteristics from Sigyn.

SKB concurs in the Swedish Maritime Administration's judgements.

3.3 Oskarshamn Municipality noted at the consultation that SKB has adopted a new view of the alternatives issue after interpretation of the legal requirements. As far as we can understand, SKB's new policy that the consultations under the Environmental Code are not concerned with the alternatives issue means that this issue falls under the requirements of the Nuclear Activities Act on a research programme and that the alternatives report under the Environmental Code will only deal with alternative designs of the KBS method.

The current consultations shall, according to the Environmental Code (Chap. 6, Sec. 4), be concerned with the siting, scope, design and environmental impact of the applied-for activity and the content and design of the environmental impact statement. SKB has sorted different issues, reports and documentation to different parts of the supporting material accompanying the applications. SKB will present alternative designs and sitings of the applied-for activity within the framework of the EIS. An account of other

methods and strategies for disposal of spent nuclear fuel which SKB has studied in its research, development and demonstration work (RD&D) will accompany the applications under the Nuclear Activities Act and the Environmental Code in 2009.

Viewpoints that have emerged in the consultations will still be taken into account in an appropriate manner in the consultation report appended to the EIS.

3.4 Oskarshamn Municipality refrains from offering any final standpoint in the alternatives issue at this time. But we reserve the right to return with a more detailed viewpoint on this issue. We limit ourselves today to offering the following general viewpoints, proposals and questions:

- **We propose that the alternatives issue be discussed at the next meeting of the EIA Forum, where SKB should explain the background of the change in policy and what consequences this new policy might have.**
- **We propose that the regulatory authorities present their viewpoints on the further consultations at this meeting.**

SKB would be happy to have a discussion of the presentation of alternatives at upcoming meetings with the EIA Forum.

3.5 Questions from Oskarshamn Municipality, continued:

- **We wonder what consequences a subdivision of issues into different legislative categories (the Nuclear Activities Act, KTL, and the Environmental Code, MB) according to SKB has for applications and for the consultations.**
- **We wonder whether an isolation of the alternatives issue to the Nuclear Activities Act means that two different EISs will be submitted: one under KTL and one under MB?**
- **Is it then SKB's intention that SKI, as the regulatory authority, should rule on the alternatives issue, while it is excluded from the Environmental Court's examination?**
- **Won't the nuclear technology issues and radiation protection nevertheless be included in the Environmental Court's examination? In that case, what will the account of alternatives look like in the material submitted to the Environmental Court? Or will the alternatives issue be omitted entirely?**

SKB will apply for a permit for final disposal of spent nuclear fuel according to the KBS-3 method. Accounts of the studies of other methods for disposal of spent nuclear fuel which SKB has made within the framework of the RD&D work will accompany the applications under the Environmental Code and the Nuclear Activities Act in 2009. The account will thereby be included both in the permit application under the Nuclear Activities Act for a final repository for spent nuclear fuel and in the permit applications under the Environmental Code for a final repository, an encapsulation plant and Clab. The same account will be given in the applications under the Environmental Code and the Nuclear Activities Act. In other words, SKB will not subdivide the alternatives report into different legislative categories.

An EIS will be prepared in 2009. This EIS will be appended to the applications under both the Nuclear Activities Act and the Environmental Code. Alternative designs and sitings that have a significant impact on safety, radiation protection or other environmental aspects will be described in the EIS. SKB will also explain in a special appendix to the applications how SKB complies with the requirements in the Environmental Code's general rules of consideration (e.g. the precautionary principle, BAT, the siting principle and the conservation principle). This appendix will also be the same in the applications under the Nuclear Activities Act and the Environmental Code.

3.6 Questions from Oskarshamn Municipality, continued:

– What does BAT (best available technology) mean in the context of the alternatives issue?

BAT is a part of the general rules of consideration in the Environmental Code. Anyone who pursues a professional activity shall make use of the best possible technology (Chap. 2, Sec. 3 of the Environmental Code). SKB will argue that the KBS-3 method complies with the general rules of consideration in a special appendix to the applications.

3.7 Questions from Oskarshamn Municipality, continued:

– The municipality, SKI, SSI, the Government and others have offered the opinion that the alternatives report should be based on what has emerged in the EIA consultations, which we have understood to be SKB's line as well. We understand that this does not entail an account of implementation alternatives but rather a comparison on a more general level. As regards the deep boreholes alternative, SKB has previously said that they intend to prepare material that enables safety evaluations to be made. Will SKB prepare this material?

Within the framework of the RD&D work, SKB has just completed another study of the deep boreholes concept aimed at performing a safety evaluation. However, this has not yet proved feasible due to a lack of necessary knowledge and data. We will now evaluate the work that has been done and judge whether it is meaningful to proceed.

3.8 Questions from Oskarshamn Municipality, continued:

– How will SKB's new policy affect what has emerged in earlier consultations and how will the continued consultations be affected by the new policy?

– How does SKB view the role of the consultations in influencing the continued consultation process and its content?

As SKB has begun to structure the supporting material for the applications it has become clear to us that methods and strategies for disposal of spent nuclear fuel will be compiled in an account that will be presented as an appendix to the applications under the Environmental Code and the Nuclear Activities Act in 2009.

In the environmental impact statement SKB will give an account of alternative sitings and designs of the chosen method. In this way the EIS will be kept focused and manageable, as is customary with an EIS.

SKB will shortly present a new plan for the consultations based on the change of the main timetable that was made in the spring of 2006. The consultation parties will continue to be welcome to offer both questions and viewpoints on the content, format and execution of the consultations.

3.9 Questions from Oskarshamn Municipality, continued:

– What is the status of the scoping report which SKB published in October 2005 in relation to the new policy?

The scoping report is not applicable in all respects. The scoping report shows SKB's intentions, in October 2005, regarding what will be included in the EIS for the encapsulation plant and for the final repository system at the different application occasions. The main points are still applicable. We have gradually narrowed down our identification of which parts of the supporting material for the application are best presented in the EIS and which should be presented in other documentation. This work, which is still under way, is being pursued in dialogue with SKI and SSI.

The fact that the structure of the account is changed does not mean that there are questions that will not be answered or information that will not be reported. SKB has started a project to structure different issues and different types of supporting material so that the packaging of the application documents will be clear, concise and consistent.

3.10 We also wish to express our dissatisfaction with the fact that in the consultation material that was presented at the meeting, SKB drew conclusions from underlying reports that had not yet been published, for example regarding the study of deep boreholes. If transparency is a guiding principle in the work, this means that it should be possible to see in general documents how SKB draws conclusions from detailed technical studies, which was not possible on this occasion. We hope that SKB will revise its procedures in this respect for coming consultation meetings. (Oskarshamn Municipality)

The purpose of the consultations is not that they should be an occasion for review of SKB's reports. The consultations shall, according to the Environmental Code (Chap. 6, Sec. 4), be concerned with the siting, scope, design and environmental impact of the applied-for activity and the content and design of the environmental impact statement. Prior to the consultation meetings we compile background material concerning relevant studies. SKB's goal is that any background reports should also have been printed prior to the consultations. But this will not always be the case. The reports that served as a basis for the background material for the meetings in May/June will be published in the autumn. If there are questions concerning these reports/studies, other reports/studies or SKB's work in general, they can be taken up at a consultation meeting, for example. The consultations will continue until at least the first quarter of 2009.

3.11 The background material for the consultations presents in an easily comprehensible fashion the time perspectives and decisions that have led to the siting alternatives Oskarshamn and Forsmark for a final repository. However, a similar account of the standpoints and deliberations that led to the proposal to recommend that the encapsulation plant be located in Oskarshamn is lacking. (Environmental Health Committee in Östhammar Municipality)

Siting of the encapsulation plant was specially dealt with at the consultation in Alunda on 14 November 2005. The background material for this consultation meeting gave the reasons why SKB's main alternative is that the encapsulation plant be located adjacent to Clab. In the applications for the encapsulation plant and Clab under the Nuclear Activities Act which SKB submitted in November 2006, SKB further justifies the siting in a special appendix entitled "The activity and the general rules of consideration".

3.12 As far as very long tunnels and WP-cave are concerned, the material contains a description of experience of these alternatives in other countries and a list of references and describes in greater detail why the methods have been rejected. The latter also applies to the deep boreholes method, where the Committee finds it unsatisfactory that the report R-06-58 is not available. (Environmental Health Committee in Östhammar Municipality)

SKB is currently focusing on the methods deep boreholes and partitioning & transmutation in its RD&D work. As far as deposition in very long tunnels or WP-cave are concerned, they have been taken into account in the broad overview of methods and strategies that was published in 2000 (report SKB R-00-32). Both of these methods, like the KBS-3 method, are based on disposal at a depth of several hundred metres

in the bedrock. In an integrated evaluation in the light of both ethical and technical requirements, KBS-3 was judged to be the most advantageous alternative.

Prior to the consultation meetings, SKB compiles background material concerning relevant studies. Those reports that served as a basis for the background material for the meetings in May/June will be published in the autumn. If there are questions concerning these reports/studies, other reports/studies or SKB's work in general, they can be taken up at a consultation meeting, for example. The consultations will continue until at least the first quarter of 2009

3.13 The Environmental Health Committee notes that the KBS-3 method has been thoroughly studied, and different alternative deposition orientations (horizontal and vertical) have been examined as a reference design. This should be supplemented with a short discussion of the reference design in terms of the choice of material for the canister and what decisions have been made. (Östhammar Municipality)

It's true that a great deal of work has been done, for example on design and choice of materials for the canister. A description of this work will be presented in the supporting material for the applications submitted in 2009, probably in a separate appendix entitled "The activity and the general rules of consideration".

3.14 The Environmental Health Committee would also like a description of how to sketch the scenario where groundwater enters Clab in the event of dryout. The committee assumes that there is no contact at all today between the groundwater and Clab. (Östhammar Municipality)

The storage pools in Clab are below groundwater level, which means that groundwater leaks into the facility. The rate of leakage of groundwater into the two rock vaults during the period January 2001 to December 2004 varied between 26 and 80 litres per minute, peaking at 142 litres per minute during a period with very heavy precipitation. It has been assumed in the dryout scenario that groundwater flows into the facility, and 46 litres per minute has been used as a representative mean value for the leakage into a dried-out facility.

3.15 The County Administrative Board wishes to emphasize the need for an exhaustive alternatives report in the EIS, which should be the same for the applications ...

The alternatives report comprises an important basis for the judgements that are to be made during examination under the Environmental Code in accordance with the general rules of consideration regarding best possible technology and suitable siting entailing a minimum of damage and detriment to human health and the environment (see Chap. 2, Sec. 3 and 4 of the Environmental Code).

The alternatives report should therefore be designed so that it is possible to follow and understand the strategic judgements that have been made with respect to human health and the environment, including issues relating to long-term safety and conservation of resources. The EIS should also have an appropriate structure ensuring clarity, completeness and comparability with respect to the different alternatives. (County Administrative Board in Uppsala County)

SKB has begun the work of sorting different issues, reports and documentation so that the packaging of the application documents will be clear, concise and consistent.

SKB will present alternative designs and sitings of the applied-for activity within the framework of the EIS. An account of the methods and strategies for disposal of spent nuclear fuel which SKB has studied in its research, development and demon-

stration work (RD&D) will accompany the applications under the Nuclear Activities Act and the Environmental Code in 2009.

The same environmental impact statement will be submitted for the encapsulation plant, Clab and the final repository. The environmental impact statement will be used for the licensing processes under the Nuclear Activities Act and the Environmental Code.

SKB will also explain in a special appendix to the applications how SKB complies with the requirements in the Environmental Code's general rules of consideration (e.g. the precautionary principle, BAT, the siting principle and the conservation principle). This appendix will be the same in the applications under the Nuclear Activities Act and the Environmental Code.

3.16 In view of the compulsory requirement to describe in the EIS the so-called zero alternative, which can show the urgency of the activity being implemented, and the need for a broad account of alternative sites, designs, methods and technology, the County Administrative Board has emphasized that the alternatives report in the EIS should deal with all possible alternative sites and designs that are or have been considered at SKB's consultations or in its research and development work. Such a general account should, according to the County Administrative Board, be so comprehensive that it permits an integrated, comparative assessment of the advantages and disadvantages of the alternatives, with special consideration given to effects on human health and the environment as well as on the conservation of natural resources, in the light of the fundamental values expressed in Chap. 1, Sec. 1 of the Environmental Code. (County Administrative Board in Uppsala County)

SKB notes these viewpoints and will taken them into consideration in the continued preparatory work

SKB will argue that the KBS-3 method complies with the general rules of consideration in a special appendix to the applications.

3.17 In the judgement of the County Administrative Board, the alternatives report should also contain an analysis of the possibilities of reducing the quantity and radiotoxicity of the waste (for example by partitioning and transmutation), since this would reduce the risk of environmental impact. (County Administrative Board in Uppsala County)

SKB agrees that this type of analysis is warranted in the applications. The account of the work SKB has done on partitioning and transmutation, within the framework of the RD&D work, will include an analysis of the possibilities of utilizing the spent nuclear fuel as a resource and the possibilities of reducing its quantity and radiotoxicity.

3.18 In the consultation material it says in an appendix that the material is based on nine reports that SKB has produced via various consultants. None of the reports were available in final versions in advance of the consultation meetings and could therefore not be reviewed prior to the meetings. How does the nuclear power industry expect the participants in the meetings to prepare questions for the consultations if the background material was not ready in advance? (MKG)

The purpose of the consultations is not that they should be an occasion for review of SKB's reports. The consultations shall, according to the Environmental Code (Chap. 6, Sec. 4), be concerned with the siting, scope, design and environmental impact of the applied-for activity and the content and design of the environmental impact statement. Prior to the consultation meetings we compile background material concerning relevant studies. SKB's goal is that any background reports should also have been printed

prior to the consultations. But this will not always be the case. The reports that served as a basis for the background material for the meetings in May/ June will be published in the autumn. If there are questions concerning these reports/ studies, other reports/studies or SKB's work in general, they can be taken up at a consultation meeting, for example. The consultations will continue until at least the first quarter of 2009.

3.19 Since the background reports were missing, the participants had to trust that the background material and the presentations at the meetings accurately reflected the content of the reports. MKG had access to drafts of two of the reports (SKB R-06-58 Djupa borrhål and SKB R-06-64 Storregional grundvattenmodellering) in advance of the meeting. MKG is of the opinion that the content of these two reports, which contain important knowledge for assessments of alternative methods and sitings, were not accurately reflected in the consultation material or in the presentations at the meetings.

Here is an example: While the nuclear power industry had hung up an illustration from the borehole report on the wall in the meeting room that was supposed to show how problematic the deep boreholes method is environmentally because it would require a much larger area than the method advocated by the nuclear power industry, they did not even show in the presentation about deep boreholes one of the figures from the report showing the new modelling results that are presented and that arrive at the conclusion that if conditions at depth can be shown to be stable, the exchange of water between the deep system and more superficial systems will be very limited. Nor is the figure included in the consultation material.

Does the nuclear power industry intend to present a more accurate picture of the results they themselves have arrived at regarding alternative methods and alternative siting in future consultation material and presentations, and in the Environmental Court? (MKG)

MKG criticizes SKB for not accurately presenting the results that have been arrived at. SKB considers MKG's criticism to be unwarranted.

The presentations that preceded the consultation meeting were made by individuals who had worked with the studies. The same individuals took part in the production of the consultation material to ensure that both the presentations and the material would accurately reflect the conclusions of the studies.

3.20 Will the nuclear power industry supplement the report on deep boreholes that Kemakta Konsult AB is currently producing with a report from more independent and objective experts? If not, will the nuclear power industry translate the report to English so that it can be reviewed by independent and objective international experts? (MKG)

SKB currently finds no reason to supplement the work which Kemakta Konsult AB has done on deep boreholes. The report will not be translated.

3.21 Will the nuclear power industry translate the report SKB R-06-64 Storregional grundvattenmodellering to English so that independent international experts can confirm that the conclusions presented in the report agree with the results of the modellings in the study, and make their own judgements of the importance of locating a final repository in a groundwater recharge area with longer breakthrough times, longer flow lengths and lower specific flows? (MKG)

The report SKB R-06-64 will not be translated to English. However, the report does contain detailed summaries in both Swedish and English. Our working language in

modelling and site investigations is generally English, but in this case priority has been given to the importance of the report in Sweden and for the municipalities. We believe this is the right priority.

3.22 What regional groundwater conditions prevail at the two test drilling sites in Forsmark and Laxemar? MKG did not get an answer to this question at the consultation meetings and would like to have a clarifying answer that clearly relates to the terms recharge area or discharge area for regional groundwater flows. What is the magnitude of breakthrough times, flow lengths and specific flows at different depths and in the surrounding geology for each area? (MKG)

This is a question that cannot easily be answered in a few short phrases. The existing site descriptions contain extensive hydrogeological accounts. See for example SKB R-06-10 for Laxemar and SKB R-06-38 for Forsmark.

Forsmark: : The groundwater flow through the part of the rock mass in Forsmark that is of interest for a possible repository (at a depth of 400–500 m in the north-western part of the candidate area), see R-05-18, is deemed to be very slow based on the approximately 20 deep cored boreholes from which measurements are available. According to these measurements, the flow through the "target area" is not subject to a large regional groundwater flow. The flow through the target area is probably limited on the southwestern side of the candidate area by the regional water divide between the candidate area and the Forsmark Zone. Towards the sea, which is located northeast of the candidate area, the flow is probably limited by the Singö Zone, which is currently the subject of hydrogeological investigations by means of deep drilling and pumping tests. Above the repository level, very close to the ground surface, there are gently-dipping fractures that are clearly water-conducting. They probably serve as a hydraulic cage and short-circuit the topography-controlled flow cells and groundwater recharge from precipitation and snowmelt. The water flow in the fracture zones located closest to the envisioned repository is currently subject to extensive investigations.

ForsmarkLaxemar/Simpevarp: Groundwater movements have been analyzed both regionally and locally and reports have been published. Most of the groundwater flow is local; the water infiltrates on the heights and flows out in the valleys. The greatest groundwater flows can generally be found in the major fracture zones, and the major fracture zones that are located in deep valleys are generally also discharge areas. The groundwater flow declines with increasing depth both in the major fracture zones and in the rock mass between the major fracture zones (SKB R-06-10, section 8.5.4).

The results of the measurements on both sites – geological, rock mechanical, hydrogeological and hydrogeochemical – will be compiled in an extensive site model. Calculations and modellings that answer the more detailed questions (breakthrough times, flow lengths and specific flows) will be performed on the basis of these data. Results from preliminary calculations are reported in the preliminary safety evaluations for the two sites (section 3.7.3 in TR-05-16 and TR-06-06). The results of simulated flow and transport calculations from a hypothetical repository will be presented in the safety assessment (SR-Site) that will be published by SKB from both sites in 2009. A preliminary account was given in the SR-Can safety assessment in the autumn of 2006.

3.23 Does the nuclear power industry still insist that it is of no importance for long-term safety if a final repository is located in an area with long breakthrough times? How can the nuclear power industry continue its siting work in the fact of modellings that show that there may be repository areas that have very long breakthrough times in the interior? (MKG)

The point isn't that there are areas with only long breakthrough times. The study shows that there are short breakthrough times in the interior of the country as well. Modelling of supraregional groundwater movements is associated with great uncertainties and the results should be used with caution. We base the safety of the final repository on more robust factors. It is better, for example, to put the focus on the local permeability of the rock and adapt the repository to this. There are safety margins to gain.

3.24 How will the nuclear power industry report alternative methods and designs in the environmental impact statement accompanying the application under the Nuclear Activities Act for the encapsulation plant and in the environmental impact statement accompanying the final applications for the encapsulation plant and the final repository under the Nuclear Activities Act and the Environmental Code? (MKG)

SKB is in the process of sorting different issues, reports and documentation to different parts of the supporting material accompanying the applications. SKB will present alternative designs and sitings of the applied-for activity within the framework of the EIS. An account of the methods and strategies for disposal of spent nuclear fuel which SKB has studied in its research, development and demonstration work (RD&D) will accompany the applications under the Nuclear Activities Act and the Environmental Code in 2009.

The same environmental impact statement will be submitted for the encapsulation plant, Clab and the final repository. The environmental impact statement will be used for the licensing processes under the Nuclear Activities Act and the Environmental Code.

SKB will also explain in a special appendix to the applications how the KBS-3 method complies with the requirements in the Environmental Code's general rules of consideration (e.g. the precautionary principle, BAT, the siting principle and the conservation principle). This appendix will be the same in the applications under the Nuclear Activities Act and the Environmental Code.

The fact that the structure of the account is changed does not mean that there are questions that will not be answered or information that will not be reported. SKB has started a project to structure different issues and different types of supporting material so that the packaging of the application documents will be clear, concise and consistent.

3.25 In the background material the nuclear power industry presents a very suboptimized example of what a borehole solution for the Swedish waste could look like. The example appears to be deliberately chosen to maximize the surface area usage in order to prove that the short-term environmental impact would be very great. If the deep boreholes method were optimized, more holes could presumably be drilled from the same location on the surface, and it may even be possible to for each borehole on the surface to be subdivided into several deposition holes beneath the surface. Can the nuclear power industry present a modern, optimized example of deep boreholes that makes use of the most recent knowledge in drilling technology? (MKG)

Depositing the spent nuclear fuel in deep boreholes would require a large number of holes, which must be well separated from each other due to the heat output from the fuel. It is impossible to say today whether it is possible to drill several holes from the same drilling site, or if it is even possible for each hole on the surface to be subdivided beneath the surface into several deposition holes, since knowledge of the type of drilling that is required is lacking.

3.26 The nuclear power industry writes in the consultation material that they estimate that it would take 30 years and cost at least SEK 4 billion to achieve a level of knowledge that makes it possible to perform a safety assessment of the same quality as for the KBS-3 method. The origin of this statement is a report which the nuclear power company SKB AB produced in 2000 entitled R-00-28, "Förvarsalternativet djupa borrhål: Innehåll och omfattning av FUD-program som krävs för jämförelse med KBS-3-metoden" by Wikberg et al. A review of this report leads to the conclusion that what is described is an estimation of the time and cost required to achieve a level of knowledge entailing that the project has arrived at an application for a permit to start building a final repository. It isn't this project that is needed to investigate the conditions for the safety of execution and for the long-term safety of a final repository according to the deep boreholes method.

Parts of the report R-00-28 can be used as a basis for a more relevant study. How much time and money does the nuclear power industry estimate it would cost to investigate the conditions for the safety of execution and for the long-term safety of the deep boreholes method? (MKG)

SKB believes that the work described in R-00-28 is what is needed to make a relevant assessment of the long-term safety of the deep boreholes method and its technical and geoscientific premises.

3.27 In the consultation material the nuclear power industry says that the following requirements and criteria should apply to a final repository for spent nuclear fuel:

- **the owners of the nuclear power plants are responsible for managing and disposing of the nuclear waste in a safe manner,**
- **the waste must be dealt with inside the country, if this can be done in a safe manner,**
- **the sea and the seafloor outside the country's boundaries may not be used,**
- **the system shall be designed to prevent illicit tampering with nuclear materials or nuclear waste,**
- **safety shall rest on multiple barriers,**
- **final disposal shall not require monitoring and maintenance,**
- **appropriate steps shall be taken to avoid imposing undue burdens on future generations.**

How does the nuclear power industry judge the likelihood that its method (KBS) and the deep boreholes method can satisfy the above requirements and criteria? MKG assumes that the nuclear power industry will take into account aspects such as long-term physical protection of the final repository to prevent illicit tampering with nuclear materials or nuclear waste. (MKG)

It is evident from the consultation material that the above requirements and criteria are a summary of international agreements and Swedish legislation, and that SKB's goal is to create a final repository that meets these requirements and criteria.

It is SKB's conviction that the KBS-3 method has been designed with a view towards these overall requirements and criteria. It is evident from the consultation material that SKB does not believe that any of the other described strategies or methods meet them in all respects. This is made clear in the consultation material.

3.28 When the zero alternative is presented in the environmental impact statement, an alternative design of interim storage that may be environmentally superior to continued interim storage in CLAB can be described. Monitored interim storage of dry fuel containers in rock caverns may be safer since the need for active cooling can be eliminated.

Will the nuclear power industry present monitored dry storage as an alternative design to the zero alternative of continued storage in CLAB? Does the industry intend to study this alternative further to be able to make a comparative environmental analysis with interim storage in CLAB? (MKG)

Monitored dry storage is dealt with in the consultation material. A more detailed description of methods and use in other countries and an assessment of the prospects in Sweden is provided in the report SKB P-06-94, which will be published in 2006. SKB does not intend to present monitored dry storage as an alternative to continued storage in Clab.

3.29 MKG has in various contexts, including in a letter to the regulatory authorities, raised the question of the safety of a final repository during an ice age. The questions concern the risks that changed groundwater conditions may break down the manmade barriers on which the long-term safety of the final repository is based and risks of earthquake damage. There is a risk that water of high salinity may come into contact with the final repository during certain periods and break down the bentonite clay that is supposed to protect the copper canisters (which is supposed to protect the nuclear waste) against contact with a corrosive groundwater environment. There is a risk that water with a high salinity may during other periods come into contact with the copper canisters, which may then corrode apart. There is also a risk that unprotected copper canisters may be affected by microbiological processes. Added to this is a risk that earthquakes during an ice age could cause fracturing of the rock and damage the physical integrity of the final repository and the surrounding rock. How will the nuclear power industry deal with these issues in the coming safety assessment SR-Can? (MKG)

The issues brought up by MKG are dealt with in SR-Can, which came out in November 2006. SKB recommends that MKG and other interested parties study SR-Can and the detailed analysis of these issues that are presented there.

3.30 The nuclear power industry had ordered a dystopic future scenario from a consulting company for the consultation. The gist of the scenario presented at the consultation meetings was that there is a risk that Sweden will be exposed to a military invasion within a 75-year period.

If the nuclear power industry can agree that there is an invasion risk, then shouldn't societal resources be devoted to phasing out nuclear power, moving the interim storage of spent nuclear fuel to a dry store and implementing the deep boreholes method of final disposal as quickly as possible in order to minimize the nuclear risks and the risk of proliferation of nuclear weapons in the event of an invasion? (MKG)

MKG claims that SKB had ordered a dystopic scenario. This is not correct. SKB had ordered a study that was supposed to cover a timespan of 75–100 years and focus on two questions:

– Does society have the capacity and capability to guarantee protection against unwanted access and use on this timescale?

– Will society have the capacity and capability to achieve a final repository in 75–100 years?

The study was conducted by means of literature surveys and interviews with 15 persons who are experts in different fields, for example from the Swedish Defence Research Agency (FOI), the Institute for Future Studies, the Swedish Institute of International Affairs and the Riksbank. The results of the study are based on the opinions of these individuals. It is then up to everyone to draw their own conclusions based on the results of the study.

3.31 Vattenfall, which is a part-owner of the nuclear power company SKB AB, currently owns all or part of two German nuclear power plants. What guarantees exist that Vattenfall will not dispose of nuclear waste from these nuclear power plants in a Swedish final repository? (MKG)

The Nuclear Activities Act prohibits disposal of foreign spent nuclear fuel in Sweden without a special permit. The fact that Vattenfall owns all or part of German nuclear power plants is of no significance in this context.

3.32 The nuclear power industry has said that only clay will be used as backfill in the deposition tunnels and other tunnels in the final repository instead of a mixture of clay and crushed rock. What safety evaluations lie behind this change?(MKG)

SKB's main alternative for the backfill has been a 30/70 mixture of bentonite/crushed rock. In conjunction with SR-Can, analyses were made of the performance and safety-related importance of several different backfill materials. SKB has found that both a 30/70 mixture of bentonite/crushed rock and swelling clay (for example Friedland clay) meet the requirements on performance identified in the safety assessment. Friedland clay has been judged to be more robust and have several advantages from the viewpoint of long-term safety compared with the 30/70 mixture. Examples of the advantages of Friedland clay are that it has high resistance to piping in conjunction with installation, its hydraulic conductivity is less sensitive to high salinities, and the clay is less sensitive to chemical erosion. In light of these factors (which are described in detail in SR-Can), SKB has prioritized the use of Friedland clay, or another swelling clay with similar properties, as backfill material in deposition tunnels.

3.33 Can the nuclear power industry specify the approximate quantity of copper that would be needed if all countries implement the KBS method and nuclear power continues at roughly the same level as today for another fifty years? How is this need related to the quantity of copper that exists in the technosphere today, to the annual new production of copper and to present-day estimates of how much copper can be mined at different price levels? (MKG)

Disposal of the Swedish spent nuclear fuel by means of the KBS-3 method entails the use of about 35,000 tonnes of copper for the canisters. This is assuming that the waste is placed in 4,500 canisters with a wall thickness of 5 centimetres. Approximately 200 canisters will be produced per year. As a result, annual Swedish consumption of copper will increase by just under 1.5 percent and global consumption by about 0.013 percent.

Which final disposal method and which canister material is best suited in other countries depends on, among other things, local geological conditions. SKB cannot speculate on this.

3.34 The nuclear power industry prepares an annual compilation of the questions posed at and after the consultation meetings. The question itself is included in the compilation for 2005, but not the background. This does not give the reader an opportunity to properly understand the question and the nuclear power industry's reply. Will the nuclear power industry include in its future consultation compilations oral arguments and explanatory introductions that come directly before questions are posed – questions that end with a question mark? Will the 2005 compilation be revised in this respect? (MKG)

SKB has previously included, and will continue to include, in its annual compilations the concrete questions that are posed, as well as in some cases some or all of the background that has been given for each question. These compilations do not comprise consultation reports, which will be included in the EIS and the applications, but are a part of SKB's follow-up and reporting on our activities.

The consultation report that will be appended to the EIS and the applications will include complete briefs from all consultation parties. During the time the consultations are in progress, complete written briefs are available on SKB's website, since they constitute appendices to the minutes from the same consultation meetings.

3.35 A final repository will contain plutonium, which is used to make nuclear weapons. After about 1,000 years this plutonium can be retrieved and processed with just a simple radiation shield compared with what would be needed today.

The problem of nuclear weapons proliferation associated with a final repository will exist for tens of thousands of years and the final repository will need to be kept under surveillance. In a future when nuclear power has been phased out globally, the final repository for nuclear waste according to the method the nuclear power industry wants to use is the simplest source of nuclear weapons materials. Is SKB prepared to broaden its scenario work to include intentional intrusion in future safety assessments? (MKG)

Retrieving deposited canisters after a repository has been closed is possible, but requires a considerable effort which is only feasible if undertaken by society.

SKB does not intend to broaden the scenario work in the safety assessments to include intentional intrusions. SKB's handling of this in the safety assessment conforms to both international practice and Swedish legislation. Furthermore, the analysis that would be needed to handle intentional intrusions is of an entirely different kind that those dealt with in the safety assessment.

3.36 In the first place, different alternatives must be investigated without preconceptions as far as different actors and historical prestige and tradition are concerned. Ever since SKB AB's research began several decades ago, no independent researchers have been involved in the process in a reasonable manner in terms of resource allocation. Nor has the company in all these years relaxed its fixation on the KBS-3 method, i.e. disposal in groundwater-bearing crystalline bedrock. (MILKAS)

SKB has been assigned the task of managing and disposing of Sweden's spent nuclear fuel in a safe manner. A large project was commenced in the late 1970s for the purpose of developing a method and find a suitable site for a final repository. Overviews of different disposal strategies and methods have been presented on a number of occasions. Their potential to meet the requirements defined in Swedish legislation and international agreements and conventions has been evaluated, which is how the KBS-3 method was arrived at.

SKB cooperates with various universities. The research that is conducted must be credible and well-supported regardless of who funds it. SKB encourages the researchers to publish in scientific journals. This enables the results to undergo independent peer review before they are published, ensuring that the research is objective and of good quality.

3.37 In the second place, the alternative sites and methods cannot only be used for the purpose of demonstrating the excellence of the main alternative, which MILKAS contends has been the case in the process. For example, the advantages of the alternatives must be highlighted, not just the disadvantages. (MILKAS)

When the KBS-3 method has been compared with other methods and strategies during the ongoing RD&D work, any advantages of these methods have naturally been taken into account.

3.38 In the third place, the research on alternative sites and methods must be given reasonable resources in relation to the main alternative. The resources that have been allocated to looking at methods which MILKAS finds interesting to investigate, such as monitored storage and dry storage, have been tiny compared with the KBS-3 method. (MILKAS)

Internationally, monitored storage is being done in both wet and dry facilities. This means that many countries have a great deal of experience of monitored interim storage during a limited time, up to a few decades. Monitored storage is not final disposal, but merely permits a postponement of finding a solution that meets the requirements on a final repository. SKB has examined this in its RD&D work.

3.39 During the consultations the nuclear waste company and its environmental attorney claimed that the consultations are not intended to question the choice of method! MILKAS finds such a statement to be very disconcerting. In the first place, the contents of the consultations cannot be dictated in advance, and in the second place this means that requirements on alternative methods and sites cannot be made, which was in fact the theme during this phase of the consultation process. The logical conclusion is that KBS is the only alternative the consultations can be concerned with. (MILKAS)

The consultations shall, according to the Environmental Code (Chap. 6, Sec. 4), be concerned with the siting, scope, design and environmental impact of the applied-for activity and the content and design of the environmental impact statement. SKB intends to apply for a permit for final disposal according to the KBS-3 method.

3.40 An argument frequently cited by SKB AB during the consultations was that not enough knowledge exists about the alternative methods. Then why, MILKAS wonders, doesn't the company try to acquire more knowledge about these methods? Otherwise SKB is engaged in circular reasoning: if alternative methods and technologies are not investigated and demonstrated, they cannot be compared, considered and evaluated. (MILKAS)

SKB has been assigned the task of managing and disposing of Sweden's spent nuclear fuel in a safe manner. A large project was commenced in the late 1970s for the purpose of developing a method and find a suitable site for a final repository. Overviews of different disposal strategies and methods have been presented on a number of occasions. Their ability to meet the requirements defined in Swedish legislation and international agreements and conventions has been evaluated, which is how the KBS-3 method was arrived at.

3.41 On repeated occasions during the consultations, representatives of SKB AB expressed opinions that show that the company has already decided in advance, no matter what criticism of the KBS-3 3 method emerges during the consultation process, to implement this method, even though knowledge of whether environmentally superior alternatives exist is lacking. For example, it was asserted that "SKB's goal is ultimately to show that KBS-3 is the reasonable method", "there is no idea preparing an EIS for the alternative methods, such as deep boreholes, which SKB does not think has any solution" and "we cannot devote 30 more years of research to bringing another method up to a comparable level with the KBS method". MILKAS believes that this attitude damages confidence in the consultation process, since such a process requires an unbiased attitude to different ways of managing the nuclear waste issue. (MILKAS)

The consultations shall, according to the Environmental Code (Chap. 6, Sec. 4), be concerned with the siting, scope, design and environmental impact of the applied-for activity and the content and design of the environmental impact statement. SKB intends to apply for a permit for final disposal according to the KBS-3 method.

SKB has been assigned the task of managing and disposing of Sweden's spent nuclear fuel in a safe manner. A large project was commenced in the late 1970s for the purpose of developing a method and find a suitable site for a final repository. Overviews of different disposal strategies and methods have been presented on a number of occasions. Their ability to meet the requirements defined in Swedish legislation and international agreements and conventions has been evaluated, which is how the KBS-3 method was arrived at.

3.42 A serious deficiency that has already been noted by several parties at the consultation meetings is that SKB AB has not yet been able to present the appendices with studies that belong to the consultation material. These appendices are not due until September. In order to be able to evaluate the background material, all parts must naturally be available. (MILKAS)

The purpose of the consultations is not that they should be an occasion for review of SKB's reports. Prior to the consultation meetings we compile background material concerning relevant studies. SKB's goal is that any background reports should also have been printed prior to the consultations. But this will not always be the case. The reports that served as a basis for the background material for the meetings in May/June will be published in the autumn of 2006. If there are questions concerning these reports/studies, other reports/studies or SKB's work in general, they can be taken up at a consultation meeting, for example. The consultations will continue until at least the first quarter of 2009.

3.43 Which alternative methods to the KBS method will SKB choose to give an account of in the EIS in the application under the Nuclear Activities Act for the encapsulation plant and in the final application for the final repository under the Nuclear Activities Act and the Environmental Code? (Döderhult Nature Conservation Society)

SKB has begun the work of sorting different issues, reports and documentation so that the packaging of the application documents will be clear, concise and consistent.

SKB will present alternative designs and sitings of the applied-for activity within the framework of the EIS. An account of the methods and strategies for disposal of spent nuclear fuel which SKB has studied in its research, development and demonstration work (RD&D) will accompany the applications under the Nuclear Activities Act and the Environmental Code in 2009.

The same environmental impact statement will be prepared for the encapsulation plant, Clab and the final repository. The environmental impact statement will be used for the licensing processes under the Nuclear Activities Act and the Environmental Code.

SKB will also explain in a special appendix to the applications how the KBS-3 method complies with the requirements in the Environmental Code's general rules of consideration (e.g. the precautionary principle, BAT, the siting principle and the conservation principle). This appendix will also be the same in the applications under the Nuclear Activities Act and the Environmental Code.

3.44 It says in the Nuclear Activities Act that the nuclear waste shall be disposed of safely and should not require monitoring and maintenance. At the same time we talk about retrievability. What does SKB have to say about this and how does it go together? (Döderhult Nature Conservation Society)

By "retrievability" SKB means that it is possible to retrieve individual canisters during deposition or a number of deposited canisters during the operating period of the final repository. Retrieving deposited canisters after the repository has been closed is possible, but requires a considerable effort. In other words, SKB sees no conflict between relative simple retrievability during the operating period and the fact that the final repository should not require monitoring and maintenance after closure.

3.45 The Radiation Protection Act says that radiation doses should be limited as far as possible with a view to economic and societal factors, and the most effective measure that does not entail unreasonable costs shall be adopted to limit releases. What is unreasonable? Who determines this? (Döderhult Nature Conservation Society)

In SSI's regulation 1998:1 entitled "The Swedish Radiation Protection Institute's Regulations on the Protection of Human Health and the Environment in connection with the Final Management of Spent Nuclear Fuel and Nuclear Waste" it says in the definitions (Section 2) that best available technology means "the most effective measure available to limit releases of radioactive substances and the harmful effects of the releases on human health and the environment, which does not entail unreasonable costs."

What is reasonable is determined by the supervisory authority. Within the framework of the licensing procedure under the Nuclear Activities Act, SSI will be entitled to prescribe conditions for the benefit of radiation protection. SSI will also be able to prescribe new radiation protection conditions when the activity is in operation.

3.46 Why is SKB against acquiring more knowledge about alternative final disposal methods? Time and money are available! Now the Government has consented to extended operation of the nuclear power plants for 60 years. The time difference for research between, for example, the KBS method and the deep boreholes method is marginal in a long-term perspective. Why is SKB in such a hurry? (Döderhult Nature Conservation Society)

SKB has been assigned the task of managing and disposing of Sweden's spent nuclear fuel in a safe manner. A large project was commenced in the late 1970s for the purpose of developing a method and find a suitable site for a final repository. Overviews of different disposal strategies and methods have been presented on a number of occasions. Their ability to meet the requirements defined in Swedish legislation and international agreements and conventions has been evaluated, which is how the KBS-3 method was arrived at.

3.47 Why does SKB repeatedly talk about 40 years of nuclear power operation in the consultation material when the nuclear power industry is now talking about 60 years of operation in their application for a permit to modernize and raise the capacity of the Swedish nuclear power reactors? (Döderhult Nature Conservation Society)

It doesn't say in the consultation material that the nuclear power plants will be operated for 40 years. However, the quantity of waste that would result from 40 years of operation is used as a premise in the discussion of deep boreholes and transmutation, as well as for heat output in Clab.

It is true that 60 years of operation of the nuclear power plants is now under discussion. This would result in larger waste volumes and thereby entail that greater capacity would be required in the final repository and that the number of boreholes and the area required for the deep boreholes method would increase. As far as transmutation is concerned, if the nuclear power plants were operated for 60 years it would take longer to transmute all the resultant waste.

3.48 Why was it underscored several times by SKB at the consultation meeting on 31 May that they did not wish to consult about alternative methods? What grounds does SKB have for saying this? (Döderhult Nature Conservation Society)

The consultations shall, according to the Environmental Code (Chap. 6, Sec. 4), be concerned with the siting, scope, design and environmental impact of the applied-for activity and the content and design of the environmental impact statement. SKB will apply for a permit for final disposal according to the KBS-3 method.

3.49 If SKB obtains gets an operating licence according to the proposed solution (KBS method), it is likely that the "world" will emulate them, i.e. that other nuclear power countries will decide to use the same or a similar final disposal method. This means there will be a great demand for copper and bentonite clay, which are non-renewable resources. With increasing demand there is also a risk of rising prices. How has SKB taken this into account? Will there be enough raw materials if many countries emulate Sweden's model, and how expensive can it get? (Döderhult Nature Conservation Society)

Final disposal according to the KBS-3 method involves the use of copper and bentonite clay, among other raw materials. Which final disposal method and which canister material is best suited in other countries depends on, among other things, local geological conditions. SKB cannot speculate on this.

3.50 The basic problem with the final repository project is that a given method has already been decided on before the environmental consequences have been studied. This defeats the whole purpose of the EIA process. (Oss)

SKB has been assigned the task of managing and disposing of Sweden's spent nuclear fuel in a safe manner. A large project was commenced in the late 1970s for the purpose of developing a method and find a suitable site for a final repository. Overviews of different disposal strategies and methods have been presented on a number of occasions. Their ability to meet the requirements defined in Swedish legislation and international agreements and conventions has been evaluated, which is how the KBS-3 method was arrived at.

The consultations shall, according to the Environmental Code (Chap. 6, Sec. 4), be concerned with the siting, scope, design and environmental impact of the applied-for activity and the content and design of the environmental impact statement. SKB's applications will be for final disposal of spent nuclear fuel according to the KBS-3 method.

3.51 Oss is of the opinion that alternative methods must be presented so that it is possible to judge whether the KBS-3 method is the environmentally best method for achieving the goals and purposes of the Environmental Code. It isn't enough to merely report the state of knowledge for other alternatives and explain why the company has rejected them. (Oss)

SKB will argue that the KBS-3 method complies with the general rules of consideration in the Environmental Code in a special appendix to the applications.

3.52 On what grounds has SKB AB changed its attitude towards what requirements are made on the alternatives report according to the Environmental Code and the EC directives? SKB AB must cite legal support for this new interpretation so that it is clear that the coming EIA does not risk being inadequate for an environmental assessment of the choice of method. (Oss)

According to Chap. 6, Sec. 7 of the Environmental Code, the EIS shall always contain an account of alternative sites, if such are possible, and alternative designs of the applied-for activity, together with the reasons why a certain alternative was chosen, as well as a description of the consequences if the activity or measure is not implemented. SKB intends to fulfil these requirements.

SKB has started a project to structure different issues and different types of supporting material so that the packaging of the application documents will be clear, concise and consistent. SKB intends to apply for a permit for the KBS-3 method. SKB further intends to give an account of the methods that have been studied within the RD&D process in connection with the applications under the Environmental Code and the Nuclear Activities Act in 2009.

3.53 The concept of BAT is directly linked to the goal of sustainable development and is therefore defined as the best environmental technology. SKB AB now defines the BAT concept simply as the "best available technology". The company now claims that the KBS-3 method is ready to be used, and that it is therefore available. Other alternative methods are defined as unrealistic and undeveloped and can therefore, according to SKB AB, not be considered to be available and can then not be included in the choice of BAT either.

Oss is of the opinion that SKB AB's definition of BAT is erroneous and unfounded. The KBS-3 method is still under development, is still associated with great uncertainties, has not yet been subjected to environmental review and does not have the necessary permits. The KBS-3 method can therefore not reasonably be considered available. The company is actively contributing to undermining confidence in the EIA process by asserting this standpoint, while at the same time making alternative methods unavailable by deliberately refraining from gathering comparable data. (Oss)

BAT – best available technology – is one of the general rules of consideration in the Environmental Code (Chap. 2 Sec. 3). SKB will argue that the KBS-3 method complies with these rules in a special appendix to the applications.

3.54 Section 5 of the Nuclear Activities Act requires that Section 2 of the Environmental Code [SKB's note: In the question from Oss it says "Section 2"; SKB has assumed that they mean "Chapter 2"] be applied, where it is required that the best possible technology be used. Sweden has also undertaken to use BAT in several environmental conventions, and then in the sense of the environmentally best technology.

SKB AB has to report in the EIS how alternative designs can serve as a basis for a judgement of whether these requirements and commitments are fulfilled. (Oss)

SKB will give an account of alternative designs of the applied-for activity in the EIS. In a special appendix to the applications, SKB will also argue that the KBS-3 method meets the law's BAT requirement.

3.55 Oss believes that SKB is creating great uncertainties around long-term protective capability of the chosen method by not presenting comparable data for other possible alternative solutions. It is therefore our opinion that the precautionary principle must be applied and that the company should therefore postpone further development of the KBS-3 concept until comparable data for other alternatives is presented. (Oss)

SKB intends to continue developing and applying for permits for the KBS-3 method and notes the viewpoint.

3.56 The consultation material has focused on why SKB AB has rejected the alternatives. The EIA legislation requires data to be presented so that it is also possible to make a theoretical judgement of which method is best able to meet the requirements of the environmental legislation. (Oss)

According to Chap. 6, Sec. 7 of the Environmental Code, the EIS shall always contain an account of alternative sites, if such are possible, and alternative designs of the applied-for activity, together with the reasons why a certain alternative was chosen, as well as a description of the consequences if the activity or measure is not implemented. SKB intends to fulfil these requirements.

SKB has started a project to structure different issues and different types of supporting material so that the packaging of the application documents will be clear, concise and consistent. SKB intends to apply for a permit for the KBS-3 method. SKB further intends to give an account of the methods that have been studied within the RD&D process in connection with the applications under the Environmental Code and the Nuclear Activities Act in 2009.

3.57 The Government said in its statement of comment on RD&D-98 that SKB AB shall shed light on the deep boreholes alternative in the manner "that is needed in order for this method to be compared with the KBS-3 method on equivalent grounds" (Government decision M1999/3040/Mk). The Government therefore required a supplementary analysis in order to clarify whether a significantly better method than the KBS-3 method is available for Swedish purposes (RD&D-K). (Oss)

This is not entirely correct. The Government decision states further that "Furthermore, the deep boreholes alternative (disposal in boreholes at a depth of several kilometres) should be explored with a focus on the scope and content of the research and development programme that is needed in order for this method to be compared with the KBS-3 method on equivalent grounds". What the Government wants is thus a focus on the scope and content of a research and development programme. This work was reported by SKB in August 2000 in the report SKB R-00-28 (Förvarsalternativet djupa borrhål. Innehåll och omfattning av FUD-program som krävs för jämförelse med KBS-3-metoden). Important conclusions from the study were:

- The technology for drilling and deposition does not exist today.
- It would take more than 30 years and cost more than SEK 4 billion to bring knowledge of deep boreholes to a level where the method can be compared with the KBS-3 method.

SKB concludes that deep boreholes does not fulfil the purpose of final disposal.

3.58 The Government refers in its RD&D-04 decision to SKI and SSI and makes the same judgement that a comparison should be made between the alternatives and the KBS-3 method utilizing safety assessment methodology (Government decision M2005/3965/Mk).

In the opinion of Oss, SKB AB has not yet presented data that permit comparison of the alternative methods based on the requirements of long-term safety, and we believe that such data must be included in the EIS since the requirement on an account of alternatives in the Environmental Code is not less important than the similar requirement in the Nuclear Activities Act. (Oss)

According to Chap. 6, Sec. 7 of the Environmental Code, the EIS shall always contain an account of alternative sites, if such are possible, and alternative designs of the applied-for activity, together with the reasons why a certain alternative was chosen, as well as a description of the consequences if the activity or measure is not implemented. SKB intends to fulfil these requirements.

SKB has started a project to structure different issues and different types of supporting material so that the packaging of the application documents will be clear, concise and consistent. SKB intends to apply for a permit for the KBS-3 method. SKB further intends to give an account of the methods that have been studied within the RD&D process in connection with the applications under the Environmental Code and the Nuclear Activities Act in 2009.

3.59 It is the opinion of Oss that SKB AB must present in a serious and credible fashion an unbiased and objective body of material, free of values, based on the principles of the deep boreholes method for the purpose of permitting comparison with the KBS-3 concept. (Oss)

SKB has been assigned the task of managing and disposing of Sweden's spent nuclear fuel in a safe manner. A large project was commenced in the late 1970s for the purpose of developing a method and find a suitable site for a final repository. Overviews of different disposal strategies and methods have been presented on a number of occasions. Their ability to meet the requirements defined in Swedish legislation and international agreements and conventions has been evaluated, which is how the KBS-3 method was arrived at.

3.60 The unique problem and goal of the nuclear waste project is to eliminate or minimize the long-term consequences of radioactive releases. The point of departure must therefore be that engineered solutions cannot be expected to last for the long spans of time in question here. It must be possible to judge the methods based on scenarios where leakage actually occurs and make comparative analyses of the basic principles of the alternative methods with a focus on the long-term consequences. (Oss)

The KBS-3 method has been developed to satisfy the requirements on long-term safety and radiation protection. The regulatory authorities' regulations provide guidance regarding which scenarios are to be analyzed and the criteria for judging whether the safety and radiation protection requirements have been met. The focus is on assessing how well man and the environment are protected from radioactivity from the repository. Scenarios including the escape of radioactive substances from a KBS-3 repository will be analyzed in the safety assessments.

3.61 SKB AB refers to the RD&D programmes and notes that the regulatory authorities and the Government have approved the focus on a geological repository in accordance with the KBS-3 method. SKB AB takes the viewpoints that have emerged in this connection as proof that the company has satisfied the requirements and expectations on an account of alternative solutions and sitings.

We would like to point out that the RD&D programmes are based on the requirements stipulated by the Nuclear Activities Act, the regulatory authorities and the Government, and not on the requirements and expectations in the environmental legislation and environmental objectives. (Oss)

The facilities and activities that are required for final disposal according to the KBS-3 method will be scrutinized under the Environmental Code and the Nuclear Activities Act, and SKB intends to comply with the legal requirements.

3.62 SKB AB must in the EIS clarify its views on the Environmental Code's resource conservation rule in relation to the retrievability of the waste, and further how this aspect should be ranked in relation to other requirements in the Environmental Code. (Oss)

The Environmental Code's conservation rule is a part of the general rules of consideration. SKB will argue that the KBS-3 method complies with the general rules of consideration in a special appendix to the applications.

By "retrievability" SKB means that it is possible to retrieve individual canisters during deposition or a number of deposited canisters during the operating period of the final repository. Retrieving deposited canisters after the repository has been closed is possible, but requires a considerable effort.

3.63 The KBS-3 method is not fully developed and has not been environmentally examined and approved. The safety analysis report is not finished, and safety assessments and scenarios around leakage of radioactivity are lacking. Since the method is based on the assumption that any leakage will be diluted by the groundwater and the Baltic Sea, the design principle must be regarded in relation to the selected site. In the opinion of Oss, the KBS-3 method is not a proven design and SKB AB must explain in the EIS on what environmental grounds it has been selected, since comparable data for other alternatives are lacking. (Oss)

The KBS-3 method will be examined by the Government on the basis of SKB's applications for Clab, the encapsulation plant and the final repository for spent nuclear fuel. The applications are planned to be submitted at the end of 2009. In conjunction with the applications, SKB will also submit the safety assessment SR-Site, in which scenarios for the escape of radionuclides will also be examined. The most important environmental ground for choosing the KBS-3 method is that it satisfies stringent requirements on both pre- and post-closure safety and radiation protection. The method has been progressively developed over the past 30 years, and important parts of the system and aspects of the method have been tested in SKB's laboratories (Äspö HRL and Canister Laboratory) as well as other laboratories.

The KBS-3 method is not based on the principle of dilution of radionuclides by the groundwater, but on isolation as the primary safety function and retardation and dispersion as secondary safety functions. Dilution is not credited as a safety function, but in order to calculate the consequences quantitatively, for example of releases to a well or a stream, dilution effects must be taken into account.

3.64 In SKB AB's account of the radiation protection requirements it is said that the impact of radiation on man and the environment shall be acceptable. When can it be considered acceptable when the goal of sustainable development and the legislation say that releases shall be minimized and, if possible, eliminated? (Oss)

The question will be considered by the regulatory authorities and the Environmental Court when SKB has submitted its applications.

3.65 SKB AB also writes that radiation doses shall be limited with respect to economic and societal factors. Does this mean that SKB believes that we should impose requirements on environmental protection for the next 100,000 years based on the situation that exists today, and does this wording mean that the requirements should be adjusted so that they are tougher in Sweden than, for example, in Belarus due to the different conditions in the countries? (Oss)

It is SKB's opinion that the KBS-3 method is ripe for formal examination by the regulatory authorities, the Environmental Court and the Government according to the requirements in the Nuclear Activities Act and the Environmental Code. The applications, which are planned to be submitted in 2009, will include a safety assessment that covers a period much longer than 100,000 years.

SKB cannot say anything about the requirements and conditions that apply in, for example, Belarus.

3.66 It is further written that the most effective measure that does not entail unreasonable costs shall be used to limit releases. The KBS project is estimated to cost SEK 65 billion, which is already an unreasonable cost for such an inefficient and dangerous form of energy production as nuclear power. This was confirmed by the Environmental Court's statement of comment on the Ringhals plant's licence application in 2005. How much higher does SKB AB think the costs must be for a measure in order for it to be considered unreasonable from a long-range environmental and societal perspective? (Oss)

It is SKB's opinion that the KBS-3 method is ripe for formal examination by the regulatory authorities, the Environmental Court and the Government according to the requirements in the Nuclear Activities Act and the Environmental Code. In an appendix to the applications planned to be submitted in 2009, SKB will argue that the facilities and activities required to implement final disposal according to the KBS-3 method comply with the general rules of consideration in the Environmental Code. In conjunction with the licensing procedures, the benefit of protective measures and other precautions will be assessed in comparison with the costs of such measures.

3.67 It is said in the background material that international agreements and conventions which Sweden has undertaken to comply with shall apply. Which conventions are meant here and how has this affected the choice and design of method and site? (Oss)

The following agreements are addressed on page 8 of the consultation material:

- The UN agency IAEA's (International Atomic Energy Agency) nuclear waste convention.
- The Non-Proliferation Treaty from 1968.
- The 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, known as the London Convention.

These agreements have influenced the choice of method and site.

3.68 The background material refers to the 1968 Non-Proliferation Treaty and the requirement in the Nuclear Activities Act that the waste shall be rendered inaccessible for proliferation. How does SKB prove that the KBS-3 method is the method that best satisfies this requirement, and how can the requirement of inaccessibility be combined with the desirability of retrievability as expressed by SKB? (Oss)

By "retrievability" SKB means that it is possible to retrieve individual canisters during deposition or a number of deposited canisters during the operating period of the final repository. Retrieving deposited canisters after a repository has been closed is possible, but requires a considerable effort which is only feasible if undertaken by society.

3.69 How does SKB prove that the KBS-3 method and siting at Forsmark or Simpevarp protect the Baltic Sea from further non-point releases in a better way than the deep boreholes alternative could do? (Oss)

Deposition according to the KBS-3 method takes place in bedrock with favourable conditions with regard to such factors as temperature, salinity and rock stresses. Deposition can be done in a controlled manner, providing excellent prospects for a long-term containment of the waste.

Deposition according to the deep boreholes method takes place in bedrock with less favourable conditions and cannot be done in the same controlled manner. Nor is it reasonable to assume that the knowledge that exists of the surrounding bedrock is as good as for KBS-3.

Taken together, SKB therefore concludes that the KBS-3 method can be shown to offer better protection against releases than deep boreholes.

3.70 SKB AB refers to the requirement that safety should rest on multiple barriers. Where and by what authority is the requirement made that unresearched and undeveloped methods must also satisfy this requirement? Are these requirements unconditional or do they only apply to the KBS-3 concept? (Oss)

SKI's regulation SKIFS 2002:1 entitled "The Swedish Nuclear Power Inspectorate's Regulations concerning Safety in connection with the Disposal of Nuclear Material and Nuclear Waste" states the following:

Barriers and their Functions

Section 2 Safety after the closure of a repository shall be maintained through a system of passive barriers.

Section 3 The function of each barrier shall be to, in one or several ways, contribute to the containment, prevention or retention of dispersion of radioactive substances, either directly, or indirectly by protecting other barriers in the barrier system.

A regulation specifies what requirements must be met in order for a law to be complied with, in this case the Nuclear Activities Act. The requirements in SKIFS 2002:1 concern final disposal of nuclear material and nuclear waste, which includes spent nuclear fuel.

The safety of the system of barriers on which the KBS-3 method is based will be examined under the Nuclear Activities Act and the Environmental Code.

3.71 Despite the lack of knowledge and safety assessment of deep boreholes, it is claimed that a canister only needs to last 1,000 years. Where is this requirement made and why isn't the canister in the deep boreholes concept defined as a barrier in the same way as in the KBS-3 repository? (Oss)

The deposition process for deep boreholes is complicated, at the same time as it is not possible to inspect deposited canisters in the same way as for the KBS-3 method. In view of this and the salinities, temperatures, pressures and stresses that prevail at a depth of 2,000–4,000 metres in the bedrock, even the assumption of a canister life of 1,000 years appears rather optimistic.

3.72 SKB asserts that no other strategies or methods than KBS-3 satisfy all parts of the requirements that are specified in Chap. 2, and that they can therefore not be regarded as alternative methods in a strict sense. If we disregard the requirements and premises formulated by the company that are only relevant for the KBS-3 concept and the proposed siting and instead consider the requirements stipulated by the legislation and the relevant environmental objectives, this argument does not hold.

Oss is of the opinion that the EIS must clearly state what basic and general requirements are not met by e.g. deep boreholes. (Oss)

The KBS-3 method has been designed with respect to the overall requirements and principles specified in Chapter 2 of the consultation material. As far as the deep boreholes method is concerned, it is SKB's opinion that it does not satisfy the requirement that "safety shall rest on multiple barriers". This is also made clear in the consultation material.

SKB has started a project to structure different issues and different types of supporting material so that the packaging of the application documents will be clear, concise and consistent. SKB intends to apply for a permit for the KBS-3 method. SKB further intends to give an account of the methods that have been studied within the RD&D process in connection with the applications under the Environmental Code and the Nuclear Activities Act in 2009.

3.73 In order for the Environmental Court to be able to determine in the coming licensing process whether the environmentally best method (BAT) has been chosen, the alternatives report must primarily be based on comparative analysis of the long-term safety of the alternative methods. (Oss)

SKB will apply for permits for the facilities and the activities required to implement final disposal according to the KBS-3 method. In a special appendix to the applications, SKB will argue that the KBS-3 method meets the requirements on BAT, among other things.

3.74 In its background material for the consultation meeting, SKB AB has chosen to focus on technical feasibility and time aspects, with the obvious purpose of only arguing for why the company has dismissed other methods. Since there is information suggesting that a comparative analysis of deep boreholes could show that the method is superior to the KBS-3 concept in many ways, we want to present an example here of such a comparison that demonstrates the uncertainties with the chosen method.

We wish to point out that Oss does not recommend any single method as long as comparable data are lacking for several alternative solutions. With our comparison table we would merely like to show that SKB AB's argumentation on behalf of the KBS-3 method is not tenable based on the basic principles of the methods, and that it cannot possibly be the best alternative even based on SKB AB's own performance criteria. This clarifies the uncertainties of the KBS-3 concept.

The basis for the comparison consists of the requirements in current legislation and the national environmental objectives Sweden has adopted. The comparison is based on an evaluation of which method can be expected to best satisfy the various requirements, based on today's low knowledge level.

The comparison shows that the KBS-3 method is associated with such great uncertainties that it can only be seen as a poor compromise as long as data are lacking for comparative safety assessments.

The EIS must be supplemented by an in-depth scientific comparison and analysis that permits an assessment of whether the chosen method meets the fundamental requirements. (Oss)

	DjB	KBS	DRD
Requirements of Nuclear Activities Act and Radiation Protection Act			
Long-term safety	X		
Prevent unpermitted proliferation of nuclear material	X		
Requirements of environmental legislation			
Sustainable development	X		
BAT – best available technology	X		
Eliminate/minimize releases	X		
EC directives			
Water Framework Directive	X		
Environmental conventions			
Eliminate/minimize releases to Baltic Sea, BAT	X		
Eliminate/minimize releases to North Sea and Atlantic, BAT	X		
Other			
No monitoring and maintenance	X		
Undue burdens on future generations	X		
Information transfer in long time perspective	X		
Stigmatization of site/municipality	X		
Dumping in marine environment (possible future sea level rise due to climate change)	X		
Minimize risks of intrusion	X		
Dystopic future scenario	X		
Retrievability (if KTL is amended and with new directives)			X
Provision for expansion due to continued nuclear power and/or multinational solutions	X		

SKB does not share Oss's conclusions, but notes the viewpoints. SKB has been assigned the task of managing and disposing of Sweden's spent nuclear fuel in a safe manner. A large project was commenced in the late 1970s for the purpose of developing a method and find a suitable site for a final repository. Overviews of different disposal strategies and methods have been presented on a number of occasions within the framework of the RD&D process. Their ability to meet the requirements defined in Swedish legislation and international agreements and conventions has been evaluated, which is how the KBS-3 method was arrived at. The most recent extensive analysis is reported in R-00-32. The conclusion SKB has drawn from these studies is that the KBS-3 method is the environmentally most suitable method, particularly with a view to long-term safety.

As far as the EIS is concerned, it can be noted that according to Chap. 6, Sec. 7 of the Environmental Code, the EIS shall always contain an account of alternative sites, if such are possible, and alternative designs of the applied-for activity, together with the reasons why a certain alternative was chosen, as well as a description of the consequences if the activity or measure is not implemented. SKB intends to fulfil these requirements.

3.75 SKB AB refers to limited knowledge concerning deep boreholes and asserts without references that at least 30 years and SEK 4 billion are required to achieve the same level of knowledge as for KBS. This is an unreasonable argument, since much of the knowledge included in the KBS-3 project can be applied to deep boreholes, and because the same level of knowledge as for the KBS-3 method today is obviously not needed to make an assessment of the possible environmental advantages of the alternative.

In the accounts of conditions at great depths, no evaluation is made of the possible advantages of these conditions from an environmental and safety viewpoint in the same way as the technical factors are constantly evaluated and compared with KBS. The recurrent argument is that knowledge is lacking to assess the safety aspects.

The results and conclusions of the calculation cases which Kemakta reported to the company and the regulatory authorities at the meeting on 21 February 2006 indicated that the rock barriers perform very well and that there may therefore be environmental advantages with deep boreholes. Kemakta said they had refrained from performing a sensitivity analysis, since it has not been deemed meaningful due to the robustness of the results. (SKB EIA/2006/10 page 2)

Why hasn't SKB reported this in its consultation material, and why haven't these assumptions been weighed against equivalent conditions for the KBS-3 method? (Oss)

In August 2000, SKB published a report (SKB R-00-28) that described the focus of the scope and content of the research and development programme scope that would be required to permit comparison of the deep boreholes method with the KBS-3 method. The conclusion was that it would take more than 30 years and cost more than SEK 4 billion. The most important environmental aspect is the long-term safety of the final repository, and SKB judges that the work reported in R-00-28 is what is needed to make a relevant analysis of the long-term safety of deep boreholes and the method's technical and geoscientific prospects.

It is correct that Kemakta's calculations show that if the bedrock and the hydrogeochemical conditions at the depths in question are as assumed, very long estimated flow times are obtained for the groundwater to the surface. However, no geoscientific observations exist from these depths in Swedish bedrock of the type that could be considered for final disposal. It says in the consultation material that "Preliminary calculations suggest that if conditions can be shown to be more stable, the exchange of water between the deep system and the more superficial system is very limited," in other words SKB has reported the aspects of the deep boreholes method that could be advantageous.

The results and conclusions that were reported on 21 February 2006 have since been supplemented with, among other things, a sensitivity analysis.

3.76 In a rebuttal posted on SKB AB's website to a DN debate article from 1 June questioning the choice of method, the company writes: "The environment at these depths is unfavourable for both canister and buffer with respect to e.g. salinity, temperature and pressure". This is in Oss's opinion deliberately misleading, since no unbiased safety assessments have been conducted of deep boreholes, and because Kemakta's and SKB's own studies of conditions at the depth in question contradict this. (Oss)

Salinity, temperature and pressure with increasing depth in the bedrock. This generally leads to a less favourable environment for canisters and buffer. Due to the unfavourable conditions for canister and buffer and the technical uncertainties associated with deposition, deep boreholes is a method where the rock must be considered to be the

only long-term barrier against the dispersal of radioactive substances. SKB believes that in order to be robust and provide long-term protection for man and the environment, a final repository must be based on multiple barriers – which is also a legislative requirement.

3.77 In the section on drilling technology the time aspects and the number of boreholes are discussed as if these factors are of crucial importance for long-term safety. It is obvious that the time aspects and the focus on drilling technology are being used in a non-credible fashion as an argument in favour of the KBS-3 method. (Oss)

SKB notes the viewpoint.

3.78 The destructive technology factor – retaining the performance of the undisturbed rock as long as possible – is of importance for long-term safety. In order to be permit a comparative analysis of the long-term safety of the different methods, the EIS must include a comparative study of the consequences of destructive technology for the KBS-3 concept and for deep boreholes. (Oss)

In the safety assessments being done of KBS-3, the possible transport pathways from a deposited canister are evaluated. The consequences of deposition holes and tunnels are thus taken into account in the assessment of the long-term safety of the KBS-3 repository that has been done (SR-Can). When it comes to deep boreholes, the borehole in which the canister is planned to be deposited constitutes a disturbance of the rock barrier.

According to Chap. 6, Sec. 7 of the Environmental Code, the EIS shall always contain an account of alternative *sites*, if such are possible, and alternative designs of the applied-for activity, together with the reasons why a certain alternative was chosen, as well as a description of the consequences if the activity or measure is not implemented. SKB intends to fulfil these requirements.

SKB has started a project to structure different issues and different types of supporting material so that the packaging of the application documents will be clear, concise and consistent. SKB intends to apply for a permit for the KBS-3 method. SKB further intends to give an account of the methods that have been studied within the RD&D process in connection with the applications under the Environmental Code and the Nuclear Activities Act in 2009.

3.79 The paragraph [refers to the paragraph on safety evaluation on page 16 in the consultation material] shows clearly that SKB AB in this alternatives report mainly focuses on pointing out the weaknesses of other possible alternatives, instead of highlighting the sought-after environmental advantages of the alternatives so that it is possible to make a comparative analysis. (Oss)

It says on the following page in the consultation material that "Preliminary calculations suggest that if conditions can be shown to be more stable, the exchange of water between the deep system and the more superficial system is very limited," in other words SKB does indeed highlight the aspects of the deep boreholes method that could be advantageous.

3.80 SKB dismisses the deep boreholes alternative with the argument that it does not meet the stringent requirements made by the legislation and the regulatory authorities. They do this despite the fact that Kemakta has pointed out that the requirement satisfaction part for the alternative remains to be done (SKB EIA/2006/10 page 3). (Oss)

The document to which Oss refers is the minutes of a reconciliation meeting on 21 February 2006. The requirement satisfaction part has been concluded since then.

3.81 In the paragraph on safety evaluation it says that it cannot be assumed that the canisters will remain intact in the long term or that the buffer will retain the desired properties. (Sid. 16). This is a very dubious statement, since nothing can be assumed without knowledge and without long-term and adequate experiments. Since it is not possible without long-term experiments to assume the equivalent for the KBS-3 method either, it is not a relevant argument. (Oss)

There is no technology for depositing spent nuclear fuel in deep boreholes. Even if such a technology were to be developed, there remains the problem of being able to inspect the canisters to make sure they are still intact when they have come down to the intended depth, that the buffer really surrounds the canisters in the borehole, etc. Such inspection cannot be done satisfactorily at great depth in a borehole. The problem thereby remains that you cannot assume that the canisters are intact when they have been deposited or that they have not been damaged during deposition in a way that affects their lifetime.

In a KBS-3 repository the canisters can be inspected even after they have been placed in the deposition hole.

3.82 SKB AB contends that since no practical knowledge exists of drilling and emplacement of canisters in the borehole, there is not basis for crediting the canisters with any effect as a barrier, so the method is defined as being of the single-barrier type. The method is therefore dismissed due to the supposed requirement that all methods must be based on the multiple barrier principle (SKB AB's material, page 17).

On what grounds does SKB AB assert that all methods must be based on the multiple barrier principle, when unbiased studies of the specific pros and cons of different alternatives are lacking? (Oss)

The Swedish Nuclear Power Inspectorate's code of statutes (SKIFS 2002:1) states: "Safety after the closure of a repository shall be maintained by a system of passive barriers."

3.83 IIt says in the consultation material that transmutation ultimately entails larger quantities and more hazardous waste. It says on SKB AB's website regarding transmutation that "some" waste remains to be disposed of. Kasam says that the quantity of radioactivity could be reduced radically (SOU 2004:67 page 325), and in the description of the advantages of the method that "the final repository can be made substantially smaller". (SOU 2004:67 page 380)

How do the previously advanced promotional arguments that transmutation produces less waste tally with this new information? This must be clarified in the EIS. (Oss)

SKB agrees that the information is contradictory and clarification is needed, but not necessarily in the EIS.

Transmutation results in a larger total quantity of radioactive waste. The quantity of decommissioning waste in particular increases. Furthermore, low- and intermediate-level waste and depleted uranium from reprocessing must also be disposed of, as well as low- and intermediate-level waste from fabrication of fuel for the transmutation reactors. Moreover, the radioactivity in the waste increases in the short term (the first few hundred years), while the radioactivity in the waste decreases radically in the longer term (thousands of years and more). So even with transmutation there is a need for an advanced final repository.

3.84 The Nuclear Activities Act requires that the waste be managed and disposed of in a safe manner and to make it inaccessible for proliferation. The ethical discussion of recent years and the international trend towards final disposal

solutions with retrievability have created uncertainties around the performance requirements for the Swedish solution. Retrievability has come to be a decisive argument for KBS-3, primarily for the purpose of creating acceptance on the part of the public and local politicians in the municipalities in question, despite the fact that the legislation requires inaccessibility. (Oss)

By "retrievability" SKB means that it is possible to retrieve individual canisters during deposition or a number of deposited canisters during the operating period of the final repository. Retrieving deposited canisters after the repository has been closed is possible, but requires a considerable effort. In other words, SKB sees no conflict between relative simple retrievability during the operating period and the fact that the final repository should be inaccessible after closure.

3.85 DRD may be the optimal method if the purpose is to dispose of the waste while keeping the options open for future generations. In the absence of political directives concerning whether the waste is to be regarded as waste or as a potential resource, DRD must continue to be treated as a possible alternative to the KBS-3 method. (Oss)

SKB has been assigned the task of managing and disposing of Sweden's spent nuclear fuel in a safe manner.

Monitored storage is not final disposal, but merely permits a postponement of finding a solution that meets the requirements on a final repository. This conflicts with the requirement in the Nuclear Activities Act and the nuclear waste convention that appropriate steps shall be taken to avoid imposing undue burdens on future generations.

3.86 Based on the reasoning surrounding the risks of interim storage in Clab and the negative scenario which SKB AB now takes as an argument for the KBS-3 method, it is clear that the description of the zero alternative in the EIS must be supplemented. It must also describe DRD in detail to permit a comparative analysis of whether the method can be an alternative to the interim storage that now takes place in Clab. (Oss)

According to Chap. 6, Sec. 7 of the Environmental Code, the EIS must contain a description of the consequences if the activity or measure is not implemented. SKB intends to fulfil this requirement.

Monitored storage (for example DRD) merely permits a postponement of finding a solution that meets the requirements on a final repository. SKB has shed light on this in its RD&D work.

3.87 According to SKB AB, many countries are planning final disposal solutions of the KBS-3 type. The supply of such raw materials as copper and bentonite clay in the world must therefore be evaluated in relation to the requirement of sustainable development from a global resource perspective. The EIS should therefore include a calculation of the total global need of copper and bentonite clay. (Oss)

Final disposal according to the KBS-3 method involves the use of copper and bentonite clay, among other raw materials. Which final disposal method and which canister material is best suited in other countries depends on, among other things, local geological conditions. SKB cannot speculate on this.

3.88 IMuch of the consultation material is devoted to once again describing how SKB AB has arrived at the two sites that are now the subject of site investigations, adjacent to the nuclear power plants in Forsmark and Simpevarp.

The account gives the impression that SKB AB has proceeded systematically in the siting work to find a suitable site for the enterprise. It is closer to the truth to say that the company has changed strategy and selection criteria on several occasions due to the opposition they have met in the concerned municipalities. Of 22 municipalities, 2 have been dismissed due to unsuitable geological conditions, 2 have said no after referendums, 16 have for various reasons backed out after municipal decisions, and only 2 municipalities have declared their willingness to participate in the site investigation phase. From a search for safe rock, the decisive siting factors became local acceptance and industrial factors.

SSI pointed this out in its statement of comment on RD&D-K, where the Authority stated "that it has not been clarified how the industrial and societal advantages of such a siting have been weighed against the requirements of good radiation protection in the short and long term". Further "that the question of the long-term safety of the repository should be given priority in the assessment of which site is suitable. SSI wishes to point out that SKB's safety assessment SR 97 showed that considerable differences can exist between different sites, and does not consider that SKB can disregard such differences in its choice of site". (SSI's statement of comment on RD&D-K, Dnr 6240/3487/00, pages 31-32, in Swedish only)

The Environmental Code requires that the site that results in the minimum damage and detriment shall be chosen. SSI interprets the siting rule as follows: "The suitability of the site can be said to emerge from a two-step process. The first step – which in itself contains a number of judgements – entails primarily determining that the selected site does not conflict with the goals of the Environmental Code, for example the protection of human health and the environment against damage and detriment and sustainable development (this definition can be regarded as embodying the concepts of long-term safety and radiation protection). Furthermore, the rules regarding land use in Chap. 3 and 4 shall be complied with."

SSI's interpretation is further that "the suitability of the site as such is determined primarily based on the Environmental Code's goal section (Chap. 1, Sec. 1). Secondarily, the suitability of the site is judged in competition with other interests and the need that measures be implemented (Chap. 3 and 4)." (SSI's statement of comment on RD&D-K, Dnr 6240/3487/00, page 27, in Swedish only)

It says in the Environmental Code Bill 1997/98:45, part 1, page 290, that "Reporting of alternatives is an important prerequisite for achieving the purpose of the EIS. However, in the Government's judgement, alternative sites only need be reported if such are possible. In most cases, this should be possible and necessary in order for the EIS to serve its purpose."

Oss is of the opinion, with the support of Section 3 of the Ordinance on Environmental Impact Statements, Appendix 1, that tougher reporting requirements should be made on alternative sitings for facilities for radioactive waste. (Oss)

It is not correct that 16 municipalities have for various reasons backed out after municipal decisions and only 2 municipalities have declared their willingness to participate in the site investigation phase. It is made clear in the consultation material that SKB has held more or less extensive discussions on feasibility studies with some twenty-odd municipalities in different parts of the country, and that this led to a easibility study being carried out in eight cases. In other cases the discussions were discontinued, either because SKB found that a feasibility study was not warranted, or because the municipality in question chose to decline.

SKB has judged local acceptance to be essential, since it is a prerequisite for the Government's permissibility decision (cf. Chap. 17, Sec. 6 of the Environmental Code).

Other viewpoints are noted by SKB. SKB intends to report alternative sitings in the applications to the extent required by law.

3.89 Studies show that it can make a great difference for long-term safety in the event of leakage whether a repository is placed in typical recharge or discharge areas. SKB AB's own studies confirm this. Coastal areas normally constitute discharge areas and can therefore be expected to be less suitable for siting of a final repository of the KBS-3 type than an inland area. However, SKB AB believes that it is the local groundwater pattern and the topography on the chosen site that are of importance. The company further judges that the flow pattern and salinity of the groundwater are not of any great importance and merely constitute one siting factor among many.

SKB AB should explain in the EIS how they have ranked the various siting factors they have considered so that it is possible to determine whether the environmentally best site has been chosen.

Since opinions differ as to the importance of groundwater flows for long-term safety, SKB AB should explain in the EIS on what environmental grounds they have rejected an inland alternative.

In order for two different sites to be able to constitute alternatives to each other, they should have clearly distinguishing characteristics. It is therefore our opinion that Forsmark and Simpevarp cannot be considered to be alternatives to each other. (Oss)

SKB does not share the opinion that Forsmark and Simpevarp cannot be considered to be siting alternatives to each other. In the applications to the Government, SKB will explain how SKB satisfies the siting principle in the general rules of consideration in the Environmental Code.

3.90 Climate researchers believe the sea level may rise considerably due to melting of the glaciers and that this could happen quickly. Since the proposed sites for a final repository are both located on the Baltic Sea coast, these harbours may end up below sea level in the foreseeable future, even before the time for the planned closure of the repository.

SKB AB must recognize these theories, take them seriously and describe the possible consequences for the project in the EIS. (Oss)

The final repository is expected to be closed within 100 years. The most pessimistic scenarios for melting of the continental ice sheets point towards a maximum sea level rise of 1–2 metres during this period. The final repository's surface facilities are planned to be built above this level on both sites, so this is not expected to affect the operation of the final repository. The importance of future climate change for the post-closure function of the final repository is analyzed in the safety assessment (SR-Can), which will be updated for the applications under the Environmental Code and the Nuclear Activities Act in 2009.

3.91 At the consultation meeting on 1 June, SKB AB presented, together with the consulting firm EuroFutures, a study of possible future threats. The outcome of the discussion was that a negative scenario should be taken seriously by disposing of the waste as quickly as possible – by means of the KBS-3 method, it was implied. This argument was backed up by reference to "the precautionary principle", which dictates that the waste be disposed of promptly as a precaution in the face of a negative scenario.

We would like to point out that the precautionary principle is linked to the environmental objective of sustainable development and responsibility for future generations and is not a tool for achieving acceptance.

SKB's conclusion in this line of reasoning is "that there is a risk that society's capability to achieve a final repository for the spent nuclear fuel in a time frame of 75–100 years will be seriously weakened. Deciding to postpone the construction of a final repository could therefore turn out to be risky." (Consultation material, page 37). Oss cannot see any other reason for SKB AB's emphasis on a negative scenario than that they want to rush through the KBS-3 project at the expense of a comprehensive alternatives report.

If this dystopia is to be taken seriously and constitute a factor in the choice of method, it should of course also be applied to other nuclear installations. In other words, nuclear power should be phased out immediately for the same reason. The dystopia must then also serve as a basis for the evaluation of possible consequences if the planned final disposal solution is not implemented, i.e. the zero alternative. (Oss)

SKB notes these viewpoints. SKB has been assigned the task of managing and disposing of Sweden's spent nuclear fuel in a safe manner. A large project was commenced in the late 1970s for the purpose of developing a method and find a suitable site for a final repository. Overviews of different disposal strategies and methods have been presented on a number of occasions. Their ability to meet the requirements defined in Swedish legislation and international agreements and conventions has been evaluated, which is how the KBS-3 method was arrived at.

A final repository according to the KBS-3 method could be built, operated and closed within a time period of about 50 years. Achieving this requires institutional capacity, financial capacity and technical capacity.

SKB had ordered a study that was supposed to cover a timespan of 75 – 100 years and focus on two questions:

– Does society have the capacity and capability to guarantee protection against unwanted access and use on this timescale
– Will society have the capacity and capability to achieve a final repository in 75 – 100 years??

The study was conducted by means of literature surveys and interviews with 15 persons who are experts in different fields, for example from the Swedish Defence Research Agency (FOI), the Institute for Future Studies, the Swedish Institute of International Affairs and the Riksbank. The results of the study are based on the opinions of these individuals. It is then up to everyone to draw their own conclusions based on the results of the study.

3.92 The line of reasoning concerning the time scale is tendentious and manipulative with the obvious purpose of supporting the chosen method and site. If the time scale is to be a factor in method and site selection, SKB AB must state this in the EIS in such a way that it is possible to evaluate this factor against long-term safety, against the objective of sustainable development and against our responsibility for future generations. (Oss)

SKB notes these viewpoints.

3.93 …the KBS-3 method, which is based on traditional mining technology, makes excessively high demands on the rock and the groundwater conditions, and the method's dilution principle means that it is not compatible with modern-day environmental principles. For these reasons the method can hardly become an international standard.

More and more countries are therefore turning their attention to deep boreholes. The most recent example is the UK, where the NDA (Nuclear Decommissioning Authority) is urging CoRWM (Committee on Nuclear Waste Management) to keep the option of deep boreholes open as an alternative disposal method for high-level radioactive waste and spent nuclear fuel. (Oss)

The KBS-3 method is not based on the dilution of any leaking radionuclides by the groundwater, but rather on isolation as the primary safety function and retardation and dispersal as secondary safety functions. Dilution is not credited as a safety function, but in order to calculate the consequences quantitatively, for example of releases to a well or a stream, dilution effects must be taken into account.

In this context it can be noted that Chapman and Gibb, who authored background reports for CoRWM, refer to SKB's Pass study as the most extensive examination of the deep boreholes concept. One of CoRWM's conclusions is that deep boreholes could be of interest for small waste volumes and special waste types. Deep boreholes are not recommended for large quantities of spent nuclear fuel.

Summary of written viewpoints and questions from MKG and SKB's replies from public meetings (open house) in Östhammar Municipality (12 August) and Oskarshamn Municipality (13 August)

1 Encapsulation plant

No questions or viewpoints were expressed pertaining solely to the encapsulation plant.

2 Final repository for spent nuclear fuel

2.1 Passing on information about the final repository for nuclear waste to the future.

A final repository for spent nuclear fuel poses a threat to man and the environment for more than 100,000 years. A final repository must furthermore survive an ice age. After closure of a final repository there are various alternatives for how information on the final repository is to be passed on to the future.

One alternative is to remove all evidence that there is a final repository and hope that neither intentional nor inadvertent intrusions in the final repository will release radioactivity to the environment. An inadvertent intrusion could occur if people in the future drilling for geothermal heat accidentally drill into the final repository, causing a leak. An intentional intrusion could occur if someone wants to get at the copper present in the final repository, which could be detected by prospecting. Another intentional intrusion could be the result of a myth about the final repository claiming that what was buried there is valuable.

Another alternative is to try to pass on information about the final repository to the future. The information may include particulars about siting, design, contents and radiotoxicity. There will be less risk of the above intrusion scenarios, but a greater risk that the nuclear material (plutonium) present in the final repository will be misused or that the radioactivity in the final repository will be used for the purpose of terrorism.

MKG wonders what the nuclear power industry thinks about passing on information to the future? Is it good or should it be avoided?

If information about the final repository is to be preserved and passed on to the future, it must be kept intact and be comprehensible over long periods of time. If the information is to be preserved for the entire time span during which the waste is hazardous to man and the environment, the information system has to last for over 100,000 years and withstand an ice age.

What does the nuclear power industry think is the best way for information about the final repository to be passed on to the future?

The issue of information transfer has two parts: documentation and communication. As far as documentation (records) is concerned, for example what type of fuel is deposited where, this is governed by SSI's regulations. The communication issue, i.e. whether information on the final repository is to be preserved for posterity, if so how this should be done and under what forms it should be preserved, is being studied both in Sweden and internationally.

The issue of information transfer will undergo final legal examination at closure, i.e. during the latter part of this century.

2.2 Environmental advantages of siting a final repository in a recharge area with long breakthrough times.

Studies have shown that there may be environmental advantages to siting a siting final repository of the type the nuclear power industry wants to build (KBS method) in a groundwater recharge area with longer breakthrough times, longer flow lengths and smaller specific flows. At the consultation meeting on 13 August in Oskarshamn, MKG posed the question of what the groundwater flow looks like at the two sites being investigated by the industry for a final repository. No one at the consultation meeting on 13 August could answer the question orally, so MKG is now asking the question again. The question is similar to but expands on the question MKG posed at the consultations in May and June to which MKG has not received an answer.

What does the groundwater flow look like at the two sites (Forsmark and Laxemar) that are being investigated by the industry today and where the industry may build a final repository for spent nuclear fuel? What does the groundwater flow look like in an area with a diameter of 5 km and a depth of 1 km around the envisioned repository areas? What is the size of breakthrough times, flow lengths and specific flows on each site?

Can the pattern and velocity of the flow at each site be determined with a high degree of accuracy and certainty? How is the flow pattern dependent on the hydrogeological understanding of the site? If either the hydrogeological understanding or knowledge of the flow field is uncertain, how does this affect the safety assessment of the site?

What is the importance of the regional and local groundwater flow for the safety of a final repository? Would the safety of the repository be affected if the flows were different compared with the existing flows in the site investigations?

The groundwater flow in Oskarshamn is described in SKB R-06-10. In this report, figures 8–37 to 8–40 in chapter 8.5.4 show the natural (undisturbed) velocity of the Darcy flow at levels of –10, –100, –500 and –1,000 metres and recharge and discharge areas for particles released at repository depth. As is evident from the figures of Darcy flow, the groundwater flow decreases with increasing depth below the ground surface. An equivalent report for Forsmark is provided in R-05-18, where figure 8-63 shows the flow pattern for two different calculation cases.

The flow pattern and the velocity can be determined with relatively high accuracy and certainty as a statistical measure for the area (mean value and standard deviation). The investigations that are conducted when access tunnels and deposition tunnels are built then provide good opportunities to measure water-conducting properties to compare and, if necessary, correct calculations from the investigations on the ground surface.

The hydrogeological understanding of the site is important for the estimated or calculated flow pattern. The hydrogeological understanding is the basis for the (general) hydrogeological descriptive model, usually referred to as the "conceptual model", and comprises a basis for both how investigations are planned and how detailed calculation models are constructed.

The groundwater flow pattern and the transport properties of the rock are of importance for safety. These conditions are thoroughly analyzed in the safety assessment (SR-Can) and various assumptions and uncertainties in models and input data are evaluated with regard to their importance for safety and radiation protection. SKB's conclusions from these analyses are that the hydraulic conditions and transport proper-

ties nearest the repository are of the greatest importance and that the regional groundwater flow plays a subordinate role. One way to handle uncertainties in the safety assessment is to make pessimistic assumptions, i.e. if it cannot be shown that a barrier has advantageous properties then assumptions are made that it is not better than what can be proven. With this safety philosophy we cannot take credit for assumptions of long regional flow paths in a safety assessment, since it can never be shown that a flow path from a given point has a length of tens of kilometres and travel times of thousands of years.

3 Common issues

3.1 Lack of background reports for consultation material.

MKG notes that only one of the ten background reports cited in support of the nuclear power industry's background material for the consultation meeting was available at the time of the meeting.

How does the nuclear power industry think consultations can be held on important issues concerning the final repository for spent nuclear fuel if the industry's background material for the consultations is not available?

The purpose of the consultations is not that they should be an occasion for review of SKB's reports. The consultations shall, according to the Environmental Code (Chap. 6, Sec. 4), be concerned with the siting, scope, design and environmental impact of [the applied-for] activity and the content and design of the environmental impact statement. Prior to the consultation meetings we compile background material concerning relevant studies. SKB's goal is that any background reports should also have been printed prior to the consultations. But this will not always be the case. The reports that served as a basis for the background material for the meetings in May/June will be published in the autumn. If there are questions concerning these reports/studies, other reports/studies or SKB's work in general, they can be taken up at a consultation meeting, for example. The consultations will continue until at least the first quarter of 2009.

If you would like to read more

Some brochures and reports from SKB with a bearing on the ongoing consultations and site investigations are mentioned below. All are available at www.skb.se or can be obtained on request.

Encapsulation plant

In November 2006, SKB submitted an application under the Nuclear Activities Act for a permit to build and own an encapsulation plant for spent nuclear fuel and to operate it integrated with Clab. An environmental impact statement (EIS) and a consultation report were appended to the application. Printouts of these documents can be obtained on request (in Swedish only).

Annual reports

Site investigations are being conducted in Oskarshamn and Forsmark. Each site has its own annual report describing the past year's activities (available in English).

SKB's social science research is available in an annual report, *Social Science Research 2006* (in Swedish only).

Safety assessment

The safety assessment, SR-Can (where Can stands for canister) was published in November (TR-06-09). SR-Can is a preparatory step for the safety assessment SR-Site, which will serve as a basis for SKB's applications in 2009 for a permit to build a final repository. (SR-Can is written in English.)

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