



Öppen

Rapport

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Interim storage facility, encapsulation plant and final repository for spent nuclear fuel

Transboundary environmental impact

Account of consultation in accordance with the Espoo Convention

Part 1 – 2008

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Reading instructions

This document deals with the consultation held during the first half of 2008 with the countries around the Baltic Sea regarding Sweden's plans to create an encapsulation plant and a final repository for final disposal of the spent nuclear fuel from the Swedish nuclear reactors.

The document is available in its entirety in Swedish and in English. Statements received are in four different languages. The statements are attached in the original language in both the Swedish and the English version. Both versions are available on SKB's website. The English version has been sent for information to all countries around the Baltic Sea.

Summary

Swedish Nuclear Fuel and Waste Management Co. (SKB) has been assigned with managing and disposing of the waste from the Swedish nuclear power plants. For its final management and disposal of the spent nuclear fuel SKB is planning to build an encapsulation plant where the spent nuclear fuel will be encapsulated in copper, and a final repository at a depth of about 500 metres in the bedrock.

Through the Swedish Environmental Protection Agency (EPA), SKB has carried out the first part of a written consultation with the countries around the Baltic Sea in accordance with the Espoo Convention. In December 2005 the EPA submitted a notification and an enquiry as to whether the following countries were interested in taking part in consultations regarding Sweden's plans for an encapsulation plant and a final repository: Denmark, Estonia, Finland, Latvia, Lithuania, Poland, Russia and Germany.

Finland, Lithuania, Poland, Russia and Germany replied that they wanted to take part in the consultation. The other countries (Denmark, Estonia and Latvia) did not want to take part in the consultation, but wanted to be kept informed.

In February 2008 the Swedish EPA sent documentation for written consultation to the countries that had declared interest to participate (Finland, Lithuania, Poland, Russia and Germany). The documentation focused on aspects that may result in transboundary environmental impact in conjunction with construction and operation and after the sealing of a final repository for spent nuclear fuel. The documentation included the SR-Can safety assessment (Can as in canister), which provides an initial evaluation of the long-term safety of a final repository in Forsmark (Östhammar municipality) and Laxemar (Oskarshamn municipality). The same documentation was sent for information to Denmark, Latvia and Estonia.

The received opinions mainly concerned the risk for and consequences of transboundary dissemination of radioactive substances, in the short term (e.g. in conjunction with accidents) and in the long term (after sealing of the repository). A desire for a consultation meeting was expressed.

In November 2006 SKB submitted an application in accordance with the Nuclear Activities Act to build and own an encapsulation plant for spent nuclear fuel and to operate it integrated with the interim storage facility for spent nuclear fuel (Clab) in Oskarshamn.

In June 2009 SKB selected Forsmark in Östhammars municipality for the location of the final repository for spent nuclear fuel. SKB is planning to make an application in mid-2010 for permits in accordance with the Swedish Environmental Code for the encapsulation plant and the interim storage facility in Oskarshamn municipality and for the final repository in Östhammars municipality. SKB is simultaneously applying for permits in accordance with the Nuclear Activities Act to build and run the final repository.

A joint environmental impact statement (EIS) will be attached to the applications. In connection with the applications a long-term safety assessment of the final repository (SR-Site) will be submitted. The intention is that SR-Site and extracts from the EIS attached to the applications will constitute the main documentation for the second and concluding part of the consultations with the Baltic Sea countries, the start of which is planned for the latter part of 2010. A meeting may be arranged in conjunction with this consultation. This would then probably take place during 2011.

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The Swedish Environmental Protection Agency's notification

Appendix 1 The Swedish Environmental Protection Agency's notification and enquiry regarding participation in consultations, December 2005

Written consultation

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Appendix 3 Swedish Environmental Protection Agency's covering letter (information) – February 2008

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5A Finland

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1 Background

If an activity is likely to have a significant environmental impact in another country, the Swedish Environmental Protection Agency (EPA) shall, according to the Convention on Environmental Impact Assessment in a Transboundary Context, known as the Espoo (EIA) Convention, “inform the competent authority in that country about the planned activity or measure and give the country concerned and the citizens who are affected the opportunity to take part in a consultation procedure concerning the application and the environmental impact assessment” (Environmental Code Chap. 6 Sec. 6).

Swedish Nuclear Fuel and Waste Management Co. (SKB) has been assigned with managing and disposing of the waste from the Swedish nuclear power plants. For its final management and disposal of the spent nuclear fuel SKB is planning to build an encapsulation plant where the spent nuclear fuel will be encapsulated in copper, and a final repository at a depth of about 500 metres in the bedrock.

In November 2006 SKB submitted an application in accordance with the Nuclear Activities Act to build and own an encapsulation plant for spent nuclear fuel and to operate it integrated with the interim storage facility for spent nuclear fuel (Clab) in Oskarshamn.

Investigations have been carried out in Forsmark (Östhammar municipality) and Laxemar (Oskarshamn municipality) regarding the possibility to locate the final repository. Both Laxemar and Forsmark are located on the Baltic Sea coast in southern Sweden. The only possible activities or measures that could affect other countries are if radionuclides are released from the final repository to the surrounding groundwater and to the Baltic Sea. During 2008 SKB thus carried out the first part of the written consultation with the countries around the Baltic Sea.

In June 2009 SKB selected Forsmark in Östhammars municipality for the location of the final repository for spent nuclear fuel. SKB is planning to make an application in mid-2010 for permits in accordance with the Swedish Environmental Code for the encapsulation plant and the interim storage facility in Oskarshamn municipality and for the final repository in Östhammars municipality. SKB is simultaneously applying for permits in accordance with the Nuclear Activities Act to build and run the final repository.

A joint environmental impact statement (EIS) will be attached to the applications. In connection with the applications a long-term safety assessment of the final repository (SR-Site) will be submitted. The intention is that SR-Site and extracts from the EIS attached to the applications will constitute the main documentation for the second and concluding part of the consultations with the Baltic Sea countries, the start of which is planned for the latter part of 2010. A meeting may be arranged in conjunction with this consultation. This would then probably take place during 2011.



Figure 1. Two sites – Forsmark in Östhammar Municipality and Simpevarp/Laxemar in Oskarshamn Municipality – have been investigated for siting of the final repository. In June 2009 SKB decided to select Forsmark.

2 Enquiry regarding participation in consultation

In December 2005 (Doc. No. 121-6695-05, dated 13.12.2005) the Swedish EPA submitted a notification and an enquiry as to whether the following countries were interested in taking part in consultations regarding Sweden's plans for an encapsulation plant and a final repository: Denmark, Estonia, Finland, Latvia, Lithuania, Poland, Russia and Germany, see Appendix 1. A background material was enclosed, "Encapsulation plant and final repository for spent nuclear fuel", where activities, environmental impact, etc. of the proposed facilities were described.

Finland, Lithuania, Russia, Poland and Germany replied that they wanted to take part in the consultation. The other countries (Denmark, Estonia and Latvia) did not want to take part, but wished to be kept informed.

3 Background information for the consultation

In February 2008 (Doc. No. 121-6695-05, dated 11.02.2008), see Appendix 2, the Swedish EPA sent the following documentation for consultation with the countries that had declared interest to participate in the consultation (Finland, Lithuania, Poland, Russia and Germany):

- Proposed table of contents in the coming EIS document for the final disposal system.
- Updated version of the document 'Encapsulation plant and final repository for spent nuclear fuel'
- SR-Can safety assessment
- Extract from the SR-Can safety assessment

The consultation documentation focused on possible transboundary environmental impact in conjunction with building and operation and after the sealing of a final repository for spent nuclear fuel. It is only if radionuclides were to spread from the final repository to the surrounding groundwater and to the Baltic Sea that other countries could be affected. The documentation included the SR-Can (as in canister) safety assessment, which provides an initial evaluation of the long-term safety of a final repository for spent nuclear fuel in Forsmark and Laxemar.

The material was in English and was distributed on CD. The material was also available through SKB's website during the consultation. At Finland's request parts of the consultation documentation were translated into Finnish and Swedish.

The countries that had expressed that they did not want to take part in the consultation, but wanted to be kept informed, received the same material. The registration number of the covering letter is Doc. No. 121-6695-05, and it is dated 11.02.2008, see **Appendix 3**.

The consultation was concluded in June 2008. Replies were received from the countries that had expressed that they wished to take part in the consultation, apart from Russia.

4 Received statements and SKB's response

Statements were received from Finland, Lithuania, Poland and Germany. Table 4.1 provides a brief compilation of the contents.

Table 4.1 Brief compilation of received statements.

Finland	The EIS should deal with possible transboundary environmental impact. (Reply in Swedish, Finnish and English)	
Lithuania	The EIS should deal with the effect in the Baltic Sea and long-distance transportation of radionuclides. (Reply in English)	Interested in a meeting.
Poland	Generally interested. (Reply in Polish)	Possibly interested in a meeting
Russia	No reply.	
Germany	Questions related to transboundary environmental impact. (Reply in English)	Interested in a meeting.

Statements and SKB's response/comments are to be found below. The replies are found in the original language in **Appendix 4** and translated into English in **Appendix 5**.

4.1 Finland

The consultation within Finland was handled by the Ministry of the Environment. Referral statements received and the Ministry of the Environment's summary as well as Finland's statement in its entirety in the original languages (Finnish, Swedish and English) is available in **Appendix 4A** and translated to English in **Appendix 5A**.

The Ministry of the Environment received seven statements. These came from: The Ministry of Employment and the Economy, the Ministry of the Interior, the Radiation and Nuclear Safety Authority, Southwest Finland Regional Environment Centre, the State Provincial Office of Western Finland and the Government of Åland. The Ministry for Foreign Affairs stated that they do not have any viewpoints.

The Ministry of the Environment made a compilation based on the received statements with reference to the Ministry of the Environment's own opinions. The compilation states that Finland wishes to stress the importance of thorough analyses of the risk and safety issues, and want a full and clear description of them in the environmental impact statement (EIS). It is important that the results of the analyses show what transboundary environmental impact the project may entail.

The Ministry of the Environment requests that other factors presented will be given sufficient consideration. The Ministry of the Interior states that the EIS should include an evaluation of possible effects on the emergency services' arrangements in the area and the possible regional risks of the project during both building and operation. The need for protection of the population and evacuation in the event of an accident and effects of the emergency services should also be evaluated. The Ministry of the Interior stresses the importance of close collaboration between the local emergency services and the project manager in these issues.

SKB's response: The risk and safety issues, including the question of transboundary environmental impact, will be thoroughly analysed and described. Summarising results will be reproduced in the environmental impact statement (EIS), whilst the detailed analyses and descriptions will be reported in separate documents. An important document in this context is the SR-Site safety assessment, in which the final repository's long-term safety will be described.

With regard to radiological risk and safety issues during construction and operation, SKB will be preparing preliminary safety reports (PSAR) for the facility in question. In these we will analyse the extent to which the surroundings could be affected by disturbances or mishaps during operation of the encapsulation plant and the final repository.

Construction and operation of the encapsulation plant and the final repository are also associated with risks that are not only connected with radiation from spent nuclear fuel. Accidents of various kinds may occur. Work is in progress on investigating these so called non-radiological risks, describing the possible consequences and proposing preventive measures. SKB will also take this into consideration in the work on describing the environmental impact.

It can furthermore be stated that in Sweden it is the Radiation Safety Authority's task to protect people and the environment from the consequences of radiation accidents. The authority thus has a preparedness plan for dealing with events such as accidents when transporting radioactive material and nuclear accidents. As an expert in the field of radiation protection and nuclear technology the authority gives advice and offers recommendations, primarily to those in charge of handling the event or accident.

The Swedish preparedness plan comprises a network of authorities at all levels in the society. They have different areas of responsibility and roles, and in the event of accidents they will collaborate to best protect people and the environment against any unnecessary effects of radiation.

In Sweden it is the county administrative board in the county in question that is responsible for a programme for the emergency services in the event of an accident involving emission of radioactive substances from a nuclear facility, whether this is in Sweden or abroad. The county administrative board is responsible for the emergency services in the event of such an accident, and it appoints an emergency manager and sets up emergency management and the relevant staff. On the basis of documentation from various expert authorities the county administrative board decides on warnings, information and advice to the general public, and on measures to protect people, animals and the environment. The county administrative board decides on radiation measurements and decontamination. The county administrative board is also responsible for issuing alarms, distributing iodine tablets, evacuation and organising staff standby.

SKB:n vastaus: Riskit ja turvallisuuskysymykset, mukaan lukien kysymys rajat ylittävistä ympäristövaikutuksista, analysoidaan ja selvitetään perusteellisesti. Tulosten yhteenveto esitellään ympäristövaikutusten arviointiselostuksessa, YVA-asiakirjassa. Yksityiskohtaiset analyysit ja kuvaukset puolestaan selostetaan erillisissä asiakirjoissa. Yksi tärkeä asiakirja tässä yhteydessä on turvallisuusanalyysi SR-Site, jossa kerrotaan loppusijoituspaikan turvallisuudesta pitkällä aikavälillä.

Rakentamisen ja käytön aikaisten radiologisten riskien ja turvallisuuskysymysten osalta SKB laatii laitokselle alustavia turvallisuusselvityksiä (PSAR). Selvityksissä analysoidaan, missä määrin kapselointilaitoksen ja loppusijoituspaikan käytön aikana tapahtuvat häiriöt tai onnettomuudet vaikuttaisivat ympäristöön.

Kapselointilaitoksen ja loppusijoituspaikan rakentamiseen ja käyttöön liittyy käytetyn ydinpolttoaineen säteilyn ohella muitakin riskejä, sillä myös erilaiset onnettomuudet ovat mahdollisia. Näitä niin kutsuttuja ei-radiologisia riskejä kartoitetaan parhaillaan. Samalla selvitetään niiden seuraukset ja mietitään ennaltaehkäiseviä toimenpiteitä. SKB ottaa nämä seikat huomioon laatiessaan ympäristövaikutusten arviointiselostusta.

Todettakoon lisäksi, että Ruotsissa ihmisten ja ympäristön suojeleminen säteilyonnettomuuksien seurauksilta on Ruotsin säteilyturvaviranomaisen (Strålsäkerhetsmyndigheten) tehtävä. Siksi sillä on valmius käsitellä erilaisia tapahtumia, kuten ydinonnettomuuksia ja radioaktiivisten materiaalien kuljetuksen yhteydessä sattuvia onnettomuuksia. Säteilysuojauksen ja ydintekniikan asiantuntijana viranomaisen antaa neuvoja ja suosituksia ensisijaisesti niille, jotka johtavat tapahtuman tai onnettomuuden käsittelyä.

Ruotsin valmius muodostuu viranomaisverkosta, joka toimii kaikilla yhteiskunnan tasoilla. Viranomaisilla on eri vastuualueita ja tehtäviä, ja onnettomuustilanteissa ne tekevät yhteistyötä suojatakseen ihmiset ja ympäristön mahdollisimman hyvin säteilyn haitallisilta vaikutuksilta.

Ruotsissa läänien lääninhallitukset vastaavat siitä, että pelastuspalvelulla on ohjelma sellaisen onnettomuuden varalta, jossa Ruotsissa tai ulkomailla sijaitsevasta ydinlaitoksesta on vuotanut radioaktiivisia aineita. Tällaisessa onnettomuustilanteessa vastuu pelastuspalvelusta (valtiollisesta pelastuspalvelusta) on lääninhallituksella. Lääninhallitus myös nimittää pelastusjohtajan ja perustaa pelastusjohdon henkilöstöineen. Eri asiantuntijaviranomaisilta saaman tuen perusteella lääninhallitus päättää varoituksesta, tiedotuksesta ja yleisölle annettavista ohjeista sekä ihmisten, eläinten ja ympäristön suojaamiseksi tarvittavista toimenpiteistä. Lääninhallitus päättää säteilymittauksista ja dekontaminaatiosta. Lääninhallituksella on myös vastuu hälytyksen tekemisestä, joditablettien jakamisesta, evakuoinnista ja henkilöstön valmiuden organisoinnista.

4.2 Lithuania

Lithuania's statement is available in its entirety in the original language (English) in **Appendix 4B**. The statement from Lithuania came from the Ministry of Environment and comprises two aspects.

Lithuania is especially interested in emission of radionuclides into water and the air. The EIA must thus include a detailed analysis of any effect on the Baltic Sea and long-distance transport of radioactive emissions.

SKB's response: The SR-Site safety analysis that is to be carried out for the final repository will concern the final repository's long-term safety and thus also deal with issues associated with any emissions from radionuclides in the Baltic Sea.

Lithuania also state an interested in a consultation meeting regarding the proposed activities' effect on the environment, and that such a meeting should ideally be held after the environmental impact assessment has been reviewed by the general public and the authorities in Lithuania.

SKB's response: Lithuania's proposal is very much in line with SKB's planning.

In June 2009 SKB selected Forsmark in Östhammars municipality for the location of the final repository for spent nuclear fuel. (Note: Prior to the site selection SKB published a compilation of questions and answers from the consultations in 2008. The wording regarding the site selection has been changed after the selection.) SKB is planning to submit an application in mid-2010 for permits in accordance with the Swedish Environmental Code for the encapsulation plant and the interim storage facility in Oskarshamn municipality and for the final repository in Östhammars municipality. SKB is simultaneously applying for permits in accordance with the Nuclear Activities Act to build and run the final repository.

A joint environmental impact statement (EIS) is being attached to the applications. An analysis of the final repository's long term safety (SR-Site) will be submitted in connection with the applications. The

intention is for that analysis and extracts from the EIS attached to the applications to constitute the main documentation for the second and concluding part of the consultations with the Baltic Sea countries, the start of which is planned for the latter part of 2010. A meeting may be arranged in conjunction with this consultation. This would probably be during 2011.

4.3 Poland

The statement from Poland came from Minister Środowska (Ministry of the Environment). Poland's statement is available in its entirety in the original language (Polish) in **Appendix 4C** and translated to English in **Appendix 5B**.

Poland does not feel the need to be involved in the assessment of the effect on the environment, but is interested to receive information on planned activities and the results of the meetings. Poland also requests the opportunity to take part in meetings, depending on which subjects are dealt with.

SKB's response: Poland will be kept informed of planned activities and the continued consultation. And Poland is of course welcome to take part in the continued consultation, including the meeting planned for after submission of the applications.

4.4 Germany

The consultation with Germany resulted in a statement from Mecklenburg-West Pomerania's Ministry of the Interior. The statement comprises a number of questions and requests, which are reported and commented on below. The statement is available in its entirety in the original language (English) in **Appendix 4D**.

I need statements about a possible release of radioactive substances when accidents occur during transportation and storage of fuel (e.g. in the event of a plane crash).

SKB's response: The magnitude of a possible leakage in the event of various types of mishap is described in safety reports. Safety reports have been drawn up for the transport system, interim storage (Clab) and the encapsulation plant. The safety report for the joint facility Clab and the encapsulation plant will be submitted to the authority during 2009. The safety report for the final repository for spent nuclear fuel will be attached to the application, submission of which is planned for mid 2010.

The analysis of environmental safety for the transport system includes a description for the environment impact due to a radiological accident. Such an eventuality would require a barrier breakthrough, i.e. the transport cask would need to be damaged, causing dissemination of radioactive substances. Such damage to the cask is not envisaged in the design criteria, but it must be assumed so as to facilitate a listing of radiological consequences. Thus occurrence of this type of event is presupposed, and is called a hypothetical accident. The hypothetical accident scenarios that have been analysed are mechanical damage to the cask, prolonged fire and the cask sinking to the bottom of the sea. The analysis shows that the consequence for people's health and the environment is negligible, despite very conservative assumptions regarding emission of radioactivity.

The safety report for Clab includes analysis of a worst-case scenario, assuming loss of about 25 fuel assemblies containing fuel far fresher than the fuel that will be handled in the encapsulation plant. These analyses show that the emissions into the environment would not be high.

With waste deposited in a final repository at a depth of 500 metres in the bedrock, a plane crash would not have any consequences for the final repository.

Antwort von SKB: Wie umfassend eine Freisetzung bei unterschiedlichen Arten von Unfällen gegebenenfalls ist, ist in den Sicherheitsberichten beschrieben. Sicherheitsberichte wurden für das Transportsystem, das Zwischenlager Clab und die Kapselungsanlage ausgearbeitet. Der Sicherheitsbericht für die angebaute Anlage Clab und die Kapselungsanlage wird der Behörde 2009 vorgelegt. Der Sicherheitsbericht für das Endlager für gebrauchten Kernbrennstoff wird dem Antrag beigefügt, der voraussichtlich Mitte 2010 eingereicht wird.

Die Analyse der Umgebungssicherheit des Transportsystems umfasst ein Folgszenario für die Umgebung bei einem radiologischen Unfall. Ein solcher Unfall setzt einen Barrieredurchbruch voraus, das heißt die Transportbehälter müssten so stark beschädigt werden, dass sich radioaktives Material ausbreiten kann. Diese Art von Behälterschäden sind nicht Bestandteil der Konstruktionskriterien, doch man muss sie in die Annahmen einschließen, um die radiologischen Folgen beschreiben zu können. Darum geht man davon aus, dass solche Ereignisse eintreffen können, und bezeichnet sie als hypothetische Unfälle. Der analysierte hypothetische Unfallverlauf ist ein mechanischer Schaden am Behälter, ein langwieriger Brand und das Hinabsinken des Behälters auf den Meeresboden. Die Analyse zeigt, dass die Folgen für die menschliche Gesundheit und die Umwelt trotz sehr konservativer Annahmen im Hinblick auf radioaktive Emissionen vernachlässigbar sind.

Im Sicherheitsbericht für Clab hat man unter anderem den so genannten „worst case“ analysiert. Hierbei geht man von der Annahme aus, dass man ca. 25 Brennelemente verliert, die Brennstäbe enthalten, welche wesentlich frischer sind als diejenigen, von denen wir in Zusammenhang mit der Kapselungsanlage sprechen. Diese Analysen zeigen, dass die Emissionen in die Umgebung nicht hoch wären.

Da sich das Endlager, in dem der Abfall gelagert wird, in 500 Metern Tiefe im Grundgestein befindet, hat ein möglicher Flugzeugabsturz für das Endlager keine Folgen.

What are the ocean currents in the Baltic Sea between Sweden (Forsmark and Oskarshamn) and Germany (in particular the Mecklenburg West Pomeranian coast)? To what extent could radioactive substances affect us?

SKB's response: The currents in the Baltic Sea are largely governed by prevailing winds. There can be currents between Forsmark/Oskarshamn and the German coast. There is not, however, any constant direct current linking Forsmark or Oskarshamn with the German coast.

Future emissions to the water recipient from a fully developed Clab, including the encapsulation plant, are estimated to about 2 GBq/year. This can be compared with measured emissions from the current Clab, which during the period 1997-2007 have averaged 0,55 GBq/year, with a downward trend. The estimated emission of 2 GBq/year is equivalent to an annual dose of about $2 \cdot 10^{-6}$ mSv to members of the critical group. This dose is more than one order of magnitude lower than the initial licensing value for Clab. The radionuclides that give dominant contribution to the dose are Co-60 and Cs-137.

SKB must show that the final repository will meet the risk criterion forming part of one of the regulations of the Swedish Radiation Safety Authority (SSM). The risk criterion states that the annual risk of harmful effects must not exceed 10^{-6} for a representative individual in the group who is exposed to the biggest risk. 'Harmful effects' means cancer and hereditary damage. According to SSM the risk limit corresponds to a dose limit of about $1.4 \cdot 10^{-2}$ mSv/year, i.e. about one per cent of the natural background radiation in Sweden.

Antwort von SKB: Die Wasserströmungen in der Ostsee werden weitgehend durch die herrschenden Windverhältnisse bestimmt. Es kann Strömungen zwischen Forsmark/Oskarshamn und der deutschen Küste geben. Es gibt jedoch keine ständige Direktströmung zwischen Forsmark oder Oskarshamn und der deutschen Küste.

Man schätzt die radioaktiven Emissionen, welche die voll ausgebaute Anlage in Clab einschließlich der Kapselungsanlage an den aufnehmenden Wasserkörper abgeben wird, auf ca. 2 GBq/Jahr. Dieser Wert ist vergleichbar mit den gemessenen Emissionen der jetzigen Anlage in Clab, die im Zeitraum von 1997 – 2007 im Schnitt bei 0,55 GBq/Jahr gelegen haben, wobei die Tendenz abnehmend war. Die geschätzten Emissionen von 2 GBq/Jahr entsprechen für Mitglieder der kritischen Gruppe einer jährlichen Dosis von ca. $2 \cdot 10^{-6}$ mSv. Diese Dosis ist mehr als eine Grösse kleiner als der ursprüngliche Lizenzierungswert für das Clab. Die Radionuklide Co-60 und Cs-137 werden die dominierende Beiträge zur Dosis geben.

Eine Vorschrift der Strahlensicherheitsbehörde (SSM) enthält ein Risikokriterium, welches das Endlager erfüllen muss. Hierüber hat SKB einen Nachweis zu erbringen. Das Risikokriterium lautet: „Das jährliche Risiko schädlicher Einwirkungen darf 10^{-6} bei einem repräsentativen Individuum einer Gruppe, die dem höchsten Risiko ausgesetzt ist, nicht übersteigen.“ Der Begriff „schädliche Einwirkungen“ bezieht sich auf Krebs und erbliche Schäden. Die Risikogrenze entspricht laut SSM einer Dosisgrenze von ca. $1,4 \cdot 10^{-2}$ mSv/Jahr, d. h. ca. einem Prozent der natürlichen Hintergrundstrahlung in Schweden.

Can one define the main wind directions between the areas concerned? If so, to what extent could radioactive substances affect us?

SKB's response: The predominant wind direction in both Forsmark and Oskarshamn is south southwesterly.

Air emissions from Clab including the encapsulation plant are through ventilation chimneys. The estimated future annual airborne emission of radioactivity is about 840 GBq, which is 50% higher than the measured average from Clab during the period 1997–2007.

The activity emission is dominated by the noble gas Kr-85, which however has a relatively small radiological environmental impact. The expected annual air emission excluding Kr-85 is about 27 MBq. The estimated activity-related emission means an average annual dose of about $3 \cdot 10^{-6}$ mSv to members of the critical group. The dose is dominated by contributions from the radionuclides Co-60 and Cs-137. The contribution from the encapsulation plant is considered to be small, the expected future weak growth, in comparison with previous experience from Clab, is mainly due to an increase of Cs-137 activity in the storage pools in Clab.

The final repository will be sited far below the water table. Any emission of radionuclides from the final repository will be into the groundwater, not into the air.

Antwort von SKB: Die vorherrschende Windrichtung sowohl in Forsmark als auch Oskarshamn ist Süd-Südwest.

Luftemissionen von Clab einschließlich der Kapselungsanlage bahnen sich ihren Weg über Lüftungsschächte. Die künftigen radioaktiven Luftemissionen werden auf ca. 840 GBq pro Jahr geschätzt, was 50 % über dem gemessenen jährlichen Durchschnittswert von Clab im Zeitraum 1997 – 2007 liegt.

Das Edelgas Kr-85 wird die Aktivitätsemissionen dominieren. Das hat aber relativ kleine radiologische Umweltauswirkungen. Die erwartete jährliche Dosis, Kr-85 exkludiert, ist ca. 27 MBq. Es wird geschätzt, dass die Aktivitätsemissionen für Mitglieder der kritischen Gruppe einer durchschnittlichen

jährlichen Dosis von ca. $3 \cdot 10^{-6}$ mSv entsprechen. Die Dosis wird durch Beiträge des Radionuklid Co-60 und Cs-137 dominiert sein. Bewertete Emissionen zur Luft von der Kapselungsanlage sind wenige. Der zukünftige Anstieg, der in Vergleich früheren Erfahrungen von dem Clab schwach erwartet ist, hängt hauptsächlich auf eine ringe Zunahme der langlebige Cs-137-Aktivität in den Lagerungsbäcken Clabs ab.

Das Endlager wird weit unter dem Grundwasserspiegel angelegt. Emissionen von Radionukleiden aus dem Endlager werden gegebenenfalls ans Grundwasser, nicht an die Luft abgegeben.

Is the encapsulation plant designed for a plane crash?

SKB's response: The encapsulation plant is not designed to withstand a plane crash. The magnitude of a possible leakage in the event of various types of mishap is described in safety reports. There will be relatively little spent nuclear fuel in the encapsulation plant.

Antwort von SKB: Die Kapselungsanlage ist nicht so konzipiert, dass sie Flugzeugabstürzen standhält. Wie umfassend eine Freisetzung bei unterschiedlichen Arten von Unfällen gegebenenfalls ist, geht aus dem Sicherheitsbericht hervor. Es werden nur relativ geringe Mengen an gebrauchtem Kernbrennstoff in der Kapselungsanlage aufbewahrt.

How strong is the throughflow of water in the bedrock? What will be the resultant flowpaths of water into the Baltic?

SKB's response: Water that precipitates as rain and snow only partially infiltrates into the rock. The deeper part of the rock, where the repository is located, has a very slow groundwater flow, with a flux in the order of 10^{-11} m³/m²,s. Some of the flowpaths will end up in the Baltic Sea.

Antwort von SKB: Wasser, das in Form von Regen und Schnee niedergeht, infiltriert nur zum Teil in das Gestein. Im tieferen Teil des Grundgesteins, wo sich das Endlager befindet, ist der Grundwasserfluss sehr langsam. Die Fließgeschwindigkeit beträgt hier ca. 10^{-11} m³/m², s. Einige der Fließwege enden in der Ostsee.

I would appreciate answers to our questions in German. Or I would like German translations of the EIA documents, especially the parts referring to my questions.

SKB's response: The replies to Germany's questions have been translated into German.

The EIS will be written in Swedish. The summary of the EIS will be translated into English. SKB has no plans for translations into other languages.

Antwort von SKB: Die Antworten auf die Fragen aus Deutschland wurden ins Deutsche übersetzt.

Das UVP-Dokument wird auf Schwedisch ausgearbeitet. Die Zusammenfassung des UVP-Dokumentes wird ins Englische übersetzt. SKB plant keine Übersetzungen in andere Sprachen.

A consultation meeting could be helpful.

SKB's response: Germany's questions are associated with the transboundary environmental impact caused by emissions into air and water.

In June 2009 SKB selected Forsmark in Östhammars municipality for the location of the final repository for spent nuclear fuel. (Note: Prior to the site selection SKB published a compilation of questions and answers from the consultations in 2008. The wording regarding the site selection has been changed after the selection.) SKB is planning to make an application in mid-2010 for permits in accordance with the Swedish Environmental Code for the encapsulation plant and the interim storage facility in Oskarshamn municipality and for the final repository in Östhammars municipality. SKB is simultaneously applying for permits in accordance with the Nuclear Activities Act to build and run the final repository.

A joint environmental impact statement (EIS) will be attached to the applications. In connection with the applications a long-term safety assessment of the final repository (SR-Site) will be submitted. The intention is that SR-Site and extracts from the EIS attached to the applications will constitute the main documentation for the second and concluding part of the consultations with the Baltic Sea countries, the start of which is planned for the latter part of 2010. A meeting may be arranged in conjunction with this consultation. This would then probably take place during 2011.

Antwort von SKB: Die Fragen aus Deutschland beziehen sich auf grenzüberschreitende Umweltauswirkungen infolge von Luft- und Wasseremissionen.

Im Juni 2009 SKB ausgewählten Forsmark in Östhammars Gemeinde für den Standort des Endlager. Mitte 2010 wird SKB für die Kapselungsanlage und das Zwischenlager in der Gemeinde Oskarshamn sowie für die Endlageranlage in der Gemeinde Östhammar. Gleichzeitig wird SKB eine Genehmigung laut schwedischem Kerntechnikgesetz für den Bau und Betrieb eines Endlagers beantragen.

Den Anträgen wird ein gemeinsamer Umweltverträglichkeitsprüfungsbericht (UVP-Bericht) beigelegt. Im Anschluss an die Anträge wird eine Analyse der langfristigen Sicherheit (SR-Site) eingereicht. Die Analyse und der Auszug aus dem UVP-Bericht, der den Anträgen beigelegt ist, sollen als Hauptunterlage für den zweiten und abschließenden Teil der Beratungsgespräche mit den Ostseeländern, die in der zweiten Jahreshälfte 2010 geplant sind, dienen. Bei dieser Gelegenheit kann ein Gespräch stattfinden. Dies wäre voraussichtlich im Jahr 2011 der Fall.

5 Continued consultation with the Baltic Sea countries

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