

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

## **General structure of the EIS for the final repository system, to be submitted with the permit applications**

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## **Administrative particulars**

Key information about the applicant, such as address/contact information, Corp. ID No., SIC code, legal representative etc.

## **The EIS**

This environmental impact statement (EIS) comprises an appendix to an application for a permit under the Nuclear Activities Act for a final repository for spent nuclear fuel and to an application for permits under the Environmental Code for a final repository for spent nuclear fuel, an encapsulation plant for spent nuclear fuel and the central interim storage facility for spent nuclear fuel (Clab).

## **Participants**

Staff at the EIA Unit at SKB.

## **Reading instructions**

The initial chapters describe SKB's mission and activities, the sites considered and the sites for which permit applications have been submitted, and the consequences if the activity or measure is not implemented, the so called "zero alternative", which is common for the entire final repository system.

In order to show what environmental impact each facility has, two separate chapters then describe the final repository and the encapsulation plant together with Clab. The chapters contain detailed descriptions of the facilities and the activities pursued at them plus an assessment of their effects and consequences.

Finally, the total consequences of the entire final repository system are described, and an overall assessment is made.

## **Non-technical summary**

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# 1 Introduction

A brief introduction to the project.

## 2 Purpose

### 2.1 The project

- What SKB are applying for
- The purpose of the final repository system

### 2.2 Environmental Impact Assessment/Statement

Description of the EIA process referred to in Chapter 6 of the Environmental Code and the purpose of the EIS.

## 3 Background

### 3.1 SKB's mission

- SKB's purpose
- SKB's research (Stripa, Äspö, Canister Lab etc.)
- The RD&D process

### 3.2 Existing waste system

Description of today's system with the nuclear power plants, Clab (Central interim storage facility for spent nuclear fuel), SFR (Final repository for radioactive operational waste), m/s Sigyn (SKB's specially designed vessel).

### 3.3 The KBS-3 method

Historical description of how the method was developed.

### 3.4 The siting process

A summary of the siting process where reasons are given for the choices. The account stops at the choice of Forsmark and Oskarshamn for site investigations.

### 3.5 The site investigations

Description of the work done during the site investigations in Forsmark and Oskarshamn.

### 3.6 Other methods

A brief summary of the other methods SKB has studied and the reasons why they have been dismissed.

## 4 Alternatives report

A brief summary of the alternatives report that is given in Chapters 9 and 10.

#### **4.1 Applied-for sites**

Description of the applied-for sites for the different facilities: the final repository, the encapsulation plant and Clab. The reasons for the choice of site are given.

#### **4.2 Considered sites**

Description of the considered sites for the final repository and the encapsulation plant. An explanation is given as to why there is no alternative site for the existing facility Clab.

#### **4.3 Applied-for method and design**

Description of the applied-for method, KBS-3, and the design of the facilities.

#### **4.4 Alternative design**

Description of alternative designs.

#### **4.5 Zero alternative**

The zero alternative is common for the entire system. The description includes:

- environmental impact, effects and consequences as well as damage prevention
- conservation of natural resources
- risk and safety issues

### **5 Scoping**

Important general delimitations and the reasons for these. An example is that the canister factory is not included in the applications.

### **6 Consultations**

A summary is given of the consultation report, which is included in its entirety as an appendix. How and with whom consultations have been held, what has emerged and how the viewpoints have been taken into account.

### **7 Site features**

#### **7.1 Oskarshamn**

- Geological conditions
- Planning and infrastructure
- National interests and protected areas
- Residential environment and health
- Noise
- Radiological checks
- Natural environment
- Cultural environment and landscape
- Outdoor activities and recreation

## **7.2 Forsmark**

- Geological conditions
- Planning and infrastructure
- National interests and protected areas
- Residential environment and health
- Noise
- Radiological checks
- Natural environment
- Cultural environment and landscape
- Outdoor activities and recreation

## **8 Risk and safety assessments**

Description of the risk and safety assessments that have been conducted, including brief method descriptions (how, what and why). These include assessment of the long-term safety of the final repository (SR-Site and its predecessors), preliminary safety analysis reports (PSARs) on nuclear risks during operation of the encapsulation plant and Clab and of the final repository, risks associated with transportation of radiological material, and an environmental risk analysis covering non-radiological consequences. With regard to long-term safety, the scenarios that have been analyzed are described. The results of the risk and safety assessments are described in Chapters 9 and 10.

## **9 Final repository for spent nuclear fuel**

### **9.1 Background**

### **9.2 Scoping**

#### **9.2.1 Chronological delimitation**

*9.2.1.1 Construction phase*

*9.2.1.2 Operating phase*

*9.2.1.3 Decommissioning/Closure phase*

#### **9.2.2 Operational delimitation**

*9.2.2.1 Activities*

*9.2.2.2 Impact, effects and consequences*

### **9.3 Description of activities**

Description of the activities at the final repository in the different phases of the project.

### **9.4 Applied-for alternative**

Description of the facilities in the different phases of the project. Transportation (radiological and non-radiological) is described, since it is considered a follow-on activity to the facilities in connection with licensing under the Environmental Code.

## **9.4.1 Geographic delimitation**

### *9.4.1.1 Siting area*

The siting area is the area where the different facilities are located (above and below ground) as well as the surrounding land areas where there is a risk of direct physical disturbance due to the civil engineering works.

### *9.4.1.2 Impact area*

The impact area is defined as the area where disturbances of various kinds (noise, vibration, emissions to air and water) can affect the environment. The impact area differs in size for different types of impact. Noise is judged to be the aspect that can have an impact furthest away. Roads for shipments to and from the various facilities are also included in the impact area since the shipments give rise to noise disturbances and atmospheric emissions.

## **9.4.2 Facility design**

## **9.4.3 Follow-on activities**

### *9.4.3.1 Transportation*

*Canister shipments*

*Other transportations and shipments (divided into phases)*

## **9.4.4 Impact and damage prevention (divided into phases)**

### *9.4.4.1 Land claim*

### *9.4.4.2 Impact on groundwater level*

### *9.4.4.3 Noise and vibration*

### *9.4.4.4 Emissions of radionuclides to air and water*

### *9.4.4.5 Emissions of other substances to air*

### *9.4.4.6 Emissions of other substances to water*

### *9.4.4.7 Light*



#### **9.4.5 Effects and consequences (divided into phases)**

##### *9.4.5.1 Residential environment and health*

*Noise and vibration*

*Emissions to air*

*Emissions of radionuclides*

*Psychosocial effects*

##### *9.4.5.2 Cultural environment and landscape*

##### *9.4.5.3 Natural environment*

##### *9.4.5.4 Outdoor activities*

#### **9.4.6 Conservation of natural resources**

##### *9.4.6.1 Waste*

##### *9.4.6.2 Energy*

##### *9.4.6.3 Water consumption*

##### *9.4.6.4 Rock spoil handling*

#### **9.4.7 Risk and safety issues**

Description of harmful events that could occur at the final repository and that have been identified as entailing considerable risks **for the site** in the relevant site safety assessment. Adopted preventive, remedial and compensatory measures are described. With regard to long-term safety, the evolution of the site and dose releases in the various scenarios are described.

### **9.5 Considered alternative**

#### **9.5.1 Geographic delimitation**

##### *9.5.1.1 Siting area*

##### *9.5.1.2 Impact area*

#### **9.5.2 Facility design**

#### **9.5.3 Follow-on activities**

##### *9.5.3.1 Transportation*

*Canister shipments*

*Other transportations and shipments (divided into phases)*

#### **9.5.4 Impact and damage prevention (divided into phases)**

*9.5.4.1 Land claim*

*9.5.4.2 Impact on groundwater level*

*9.5.4.3 Noise and vibration*

*9.5.4.4 Emissions of radioactive substances to air and water*

*9.5.4.5 Emissions of other substances to air*

*9.5.4.6 Emissions of other substances to water*

*9.5.4.7 Light*

#### **9.5.5 Effects and consequences (divided into phases)**

*9.5.5.1 Residential environment and health*

*Noise and vibration*

*Emissions to air*

*Emissions of radionuclides*

*Psychosocial effects*

*9.5.5.2 Cultural environment and landscape*

*9.5.5.3 Natural environment*

*9.5.5.4 Outdoor activities*

#### **9.5.6 Conservation of natural resources**

*9.5.6.1 Waste*

*9.5.6.2 Energy*

*9.5.6.3 Water consumption*

*9.5.6.4 Rock spoil handling*

#### **9.5.7 Risk and safety issues**

### **9.6 Summarizing conclusions**

### **9.7 Uncertainties**

Description of uncertainties associated with, for example, the long time perspectives.

### **9.8 Monitoring**

How the environmental consequences will be monitored in each phase.

## **9.9 References**

# **10 Encapsulation plant and Clab**

## **10.1 Background**

## **10.2 Scoping**

### **10.2.1 Chronological delimitation**

*10.2.1.1 Construction phase*

*10.2.1.2 Operating phase*

*10.2.1.3 Decommissioning phase*

### **10.2.2 Operational delimitation**

*10.2.2.1 Activities*

*10.2.2.2 Impact, effects and consequences*

## **10.3 Clab – description of activities**

Description of design, activities, transportation etc. in the different phases of the project.

## **10.4 The encapsulation plant – description of activities**

Description of design, activities, transportation etc. in the different phases of the project.

## **10.5 Oskarshamn**

### **10.5.1 Geographic delimitation**

*10.5.1.1 Siting area*

*10.5.1.2 Impact area*

### **10.5.2 Facility design**

A description of how the encapsulation plant will be designed.

### **10.5.3 Follow-on activities**

*10.5.3.1 Transportation*

*Shipments from the nuclear power plants*

*Other transportations and shipments (divided into phases)*

#### **10.5.4 Impact and damage prevention (divided into phases)**

*10.5.4.1 Land claim*

*10.5.4.2 Impact on groundwater level*

*10.5.4.3 Noise and vibration*

*10.5.4.4 Emissions of radioactive substances to air and water*

*10.5.4.5 Emissions of other substances to air*

*10.5.4.6 Emissions of other substances to water*

*10.5.4.7 Light*

#### **10.5.5 Effects and consequences (divided into phases)**

*10.5.5.1 Residential environment and health*

*Noise and vibration*

*Emissions to air*

*Emissions of radionuclides*

*Psychosocial effects*

*10.5.5.2 Cultural environment and landscape*

*10.5.5.3 Natural environment*

*10.5.5.4 Outdoor activities*

#### **10.5.6 Conservation of natural resources**

*10.5.6.1 Waste*

*10.5.6.2 Energy*

*10.5.6.3 Water consumption*

*10.5.6.4 Rock spoil handling*

#### **10.5.7 Risk and safety issues**

Description of harmful events at the encapsulation plant and Clab that have been identified as entailing considerable risks **for the site** in the relevant site safety assessment. Adopted preventive, remedial and compensatory measures are described.

## **10.6 Considered alternative – Forsmark**

### **10.6.1 Geographic delimitation**

*10.6.1.1 Siting area*

*10.6.1.2 Impact area*

### **10.6.2 Facility design**

A description of how the encapsulation plant will be designed.

### **10.6.3 Follow-on activities**

*10.6.3.1 Transportation*

*Shipments from the nuclear power plants*

*Other shipments (divided into phases)*

### **10.6.4 Impact and damage prevention (divided into phases)**

*10.6.4.1 Land claim*

*10.6.4.2 Impact on groundwater level*

*10.6.4.3 Noise and vibration*

*10.6.4.4 Emissions of radioactive substances to air and water*

*10.6.4.5 Emissions of other substances to air*

*10.6.4.6 Emissions of other substances to water*

*10.6.4.7 Light*

### **10.6.5 Effects and consequences (divided into phases)**

*10.6.5.1 Residential environment and health*

*Noise and vibration*

*Emissions to air*

*Emissions of radionuclides*

*Psychosocial effects*

*10.6.5.2 Cultural environment and landscape*

*10.6.5.3 Natural environment*

*10.6.5.4 Outdoor activities*

## **10.6.6 Conservation of natural resources**

*10.6.6.1 Waste*

*10.6.6.2 Energy*

*10.6.6.3 Water consumption*

*10.6.6.4 Rock spoil handling*

## **10.6.7 Risk and safety issues**

Description of harmful events at the encapsulation plant and Clab that have been identified as entailing considerable risks **for the site** in the relevant site safety assessment. Adopted preventive, remedial and compensatory measures are described

## **10.7 Summarizing conclusions**

### **10.8 Uncertainties**

Description of uncertainties associated with, for example, the long time perspectives.

### **10.9 Monitoring**

How the environmental consequences will be monitored in each phase.

### **10.10 References**

## **11 Combined consequences of the entire system**

Here the combined consequences resulting from the entire system (encapsulation plant/Clab – final repository – transportation) are described.

## **12 Overall assessment**

An overall assessment of the system showing important differences between the alternatives. The zero alternative is compared with the applied-for alternative. Other important conclusions concerning, for example, the consequences of the final repository system over time and for different interests will be summarized here.

## **13 Uncertainties**

## **14 Monitoring**

How the environmental consequences will be monitored during the construction phase, the operating phase, decommissioning and closure as well as after closure.

## **15 Fulfilment of environmental objectives**

A cross-check against existing national, regional and local environmental objectives.

## **16 Transboundary environmental impact**

The main environmental impacts due to the Encapsulation plant and the Final repository for spent nuclear fuel will be non-radiological consequences related to increase in traffic, transportations (noise, light, vibrations) due to handling of rock spoil and impact on groundwater table. Noise is judged to be the aspect that can have an impact furthest away. Elevated sound levels will be noticed a few kilometres from the facilities and along the roads.

The only possible activities or measures that might have an impact in other countries are related to release of radionuclides from the final repository. This will be described in safety assessments, see chapter 9.

## **17 Glossary**

## **18 References**