

DEVELOPMENTS IN THE REGULATORY PROCESS FOR THE SAFETY ASSESSMENT OF A SPENT FUEL REPOSITORY IN SWEDEN

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ABSTRACT

The Swedish Nuclear Power Inspectorate, SKI, is developing the regulatory process for the planned repository for spent nuclear fuel. The regulatory process will include safety assessment procedures, scenario development and development of acceptance criteria. International cooperation will also be important in the field of regulatory procedures.

INTRODUCTION

According to the requirements in the Swedish Act on Nuclear Activities the reactor owner has the primary responsibility for the management and final disposal of HLW and other wastes from the reactor operation. The reactor owners have formed a joint company, the Swedish Nuclear Fuel and Waste Management Co, SKB, to meet requirements in the Act. SKB is licensed to operate a repository for nuclear waste, SFR, near the Forsmark nuclear power plant. SKB is also licensed to operate an intermediate storage for spent fuel, CLAB, near the Oskarshamn nuclear power plant.

SKB has presented a programme and a time schedule for the necessary R&D activities (1). According to this time schedule the siting process for a repository for spent fuel will start at the beginning of the 1990'ies, the repository design will be decided upon about 1995 and the decision on the actual site will be taken about the year 2 000. Then a licensing period of about 10 years will follow.

There is a need to specify regulatory requirements to be met by the nuclear power industry represented by SKB in matters on final disposal of HLW. Therefore, the Swedish Nuclear Power Inspectorate, SKI, has started activities to develop the regulatory process.

THE REGULATORY PROCESS

As a safety authority the SKI has a responsibility to review and supervise the nuclear activities of the nuclear industry. According to SKB's plans for the final disposal of spent fuel a repository will be taken into operation in the year 2020. At a first look it seems to be a very long time to prepare for the licensing procedure to come.

There are however many steps to be taken before the licensing procedure for the repository is finished. According to the time schedule the siting process will start in the beginning of the 1990'ies, a few potential sites will be decided upon in the middle of the 1990'ies and one or two sites will be chosen at the end of the 1990'ies. A procedure for licensing the construction and operation of the final repository will go on for many years. The construction work is

planned to start 2010 and continue for about ten years and then the operation period, according to SKB, will start in 2020.

In all these different phases there is a need for regulatory guidance by the SKI so that SKB is given the necessary advice on what documentation that has to be given in to SKI.

There are also other Swedish authorities with regulatory responsibilities in the field of HLW disposal than the SKI namely the National Institute of Radiation Protection, SSI, and the National Board for Spent Nuclear Fuel, SKN. SSI is the responsible authority according to the Act on Radiation Protection. SKN is the responsible authority according to the Financing Act, which stipulates that future costs for final disposal of HLW must be funded by reactor owners.

One important task for the authorities is to review SKB's R&D program which is presented every third year. The first R&D program was presented 1986 and the second program is now being reviewed. The SKN has the main responsibility for the review and SKI gives comments regarding safety related R&D issues to SKN.

PROJECT-90

In a special project, Project-90 (2), the SKI is carrying through a performance assessment on a synthetic site, defined by SKI, using the Swedish KBS-3 repository design (3). Within the frame of Project-90 many research projects of different character are coordinated. The main objective of this project is to develop a basis for regulatory guidelines. The aim is also to insure that the SKI staff together with its consultants has the competence and the tools (e.g. models and computer codes) to carry through a performance assessment for a HLW repository. In the project the need for

further research and developments in different areas can be identified.

Project-90 will be finalized in 1990 and the results will be reported during 1991.

SCENARIO DEVELOPMENT

To carry through a performance assessment, scenarios to be used in the assessment have to be defined. An important task is therefore the development of a relevant set of scenarios for the performance assessment of repositories for spent fuel.

In cooperation with SKB the SKI is evaluating and further developing a methodology for scenario identification and formulation (4). The work is performed following the main features of the Sandia methodology. Features, events and processes (FEPs) are identified. Screening criteria are formulated and a screening procedure to eliminate less important FEPs is then employed. As far as it is possible FEPs are then grouped together to reduce the number of FEPs. Remaining FEPs are combined to scenarios. These scenarios could then be used in the performance assessment for a repository.

SKI is planning to continue this scenario development process and involve broader groups in society. This might also be a way to get a better public understanding of a field that comprises so many scientific disciplines and very long time spans.

GUIDELINES

It is obvious that the safety authority should issue guidelines on what requirements that have to be met by the organization that is responsible for the implementation of a HLW repository. One such activity could be to issue guidelines on documentation of data, models and calculations in the performance assessment of final repositories. SKI has already issued preliminary guidelines on how hydrological models and data to be used in the safety assessments for a final repository should be reported to SKI. It is clearly stated that the guidelines are limited in scope and are of provisional character and that they therefore have to be further developed. SKI has asked SKB for comments on the issued preliminary guidelines.

SKI recognizes the need to further develop guidelines for the different phases of the process for siting and licensing of a repository for HLW. The results from SKI's Project-90 and from the review of SKB's R&D program will be of importance for the future work.

CRITERIA

It is foreseen that guidelines and criteria for HLW disposal will be developed in several phases during the 1990's. SKI is taking part in a working group together with

corresponding authorities in the Nordic countries to develop criteria for HLW disposal. The work has mainly been performed in cooperation between the SKI, the Swedish National Institute of Radiation Protection, SSI, and the Finnish Center for Radiation and Nuclear Safety, STUK. The emphasis in the report is on radiological protection criteria. Qualitative technical criteria are however proposed. The complete set of criteria would have to provide more specified guidelines on how to demonstrate that a specific site and technical design complies with the general radiation protection criteria stated. To specify such guidelines is the task of the concerned authorities.

The nordic document is primarily directed to the authorities but can also be of interest to the nuclear power industry in their planning of disposal facilities. It can also be used by politicians and by the public as an information on the complex safety issues regarding HLW disposal and on possible principles to solve them. Because many issues connected with HLW are controversial and include aspects of not only radiation protection and nuclear safety but also ethical, societal and other questions, the document may contribute to a broad discussion and development of new ideas.

The criteria document will be published in the beginning of 1990 and it will be distributed for comments to organizations and experts active in the field of nuclear waste disposal (5).

INTERNATIONAL COOPERATION

Many safety related issues are of interest to all countries with a nuclear program. In waste disposal issues as well as in many other areas international cooperation is of great importance. SKI as well as the Swedish nuclear industry is active in international organizations such as the International Atomic Energy Agency and the Nuclear Energy Agency of the OECD. SKI has also initiated international projects to contribute to evaluation of models and computer codes used in performance assessments for waste repositories. One example is the INTRAVAL project that was started 1987 as an international validation effort for geosphere models used in performance assessment (6).

In the regulatory field there are many differences between the separate countries. The basic issues, e.g. the identification and understanding of processes of importance for repository performance and safety, are however common to all countries and international discussions and cooperation between countries could also influence and improve regulatory procedures.

CONCLUSIONS

In Sweden the plans for realization of a repository for spent fuel, including the siting procedure, is underway. Safety assessment procedures are being developed to con-

firm and demonstrate that an acceptable safety level can be reached. It is the responsibility of the regulatory body to develop a regulatory procedure that is appropriate for this process.

The development of safety assessment techniques, guidelines and criteria and the development of the regulatory procedure should be done in parallel. This process has started but in many respects the procedures must be further developed.

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