

disposal conditions in general the rate of gas production and release from rock salt is low and represents no safety problem.

Regarding the radiation damage in the solid salt, the obtained results, aided by computational models that have also been improved during this research, lead to the conclusion that radiation damage produced by *gamma* rays does not constitute a safety problem in cases of the disposal of vitrified High Level Waste (HLW) in boreholes or of the direct disposal of spent fuel in a salt formation.

Before the disbandment of the international group involved in the project it was decided to produce this summarizing volume. Many amongst the involves investigators are now busy with other activities. Unfortunately, Mr. L. Vons who has always been so inspiring left the ECN recently with a well deserved retirement. We are very thankful for his contributions and therefore dedicate this volume to him.

Braunschweig, September 29, 1995

T. Rothfuchs
GSF.
(Project Leader)

Petten, September 30, 1995

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RADIATION DAMAGE IN SALT

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SUMMARY

Rock salt formations are candidates for the geological disposal of High Level (radioactive) Waste (HLW). The HLW is that category of radioactive waste obtained, usually in a vitrified form, from the reprocessing of the spent fuel of light water reactors where more than 99 % of the radionuclides from these reactors are included. HLW is therefore a heat producing vitrified radioactive waste.

The existing concept designs for radioactive waste repositories in rock salt can be divided in two main groups: those based on including the HLW in thick walled containers, and those which consist of vertical boreholes where the HLW canisters are placed without additional shielding. In the first case it is obvious that radiolytic effects are negligible, provided the shielding of the containers is sufficient. In the second case radiolytic effects have to be expected as the rock salt is directly confronted with the radiation of the waste. Two types of effects can be expected in this last case, the radiation damage in the salt crystals of the rock and the radiolytic and thermal gas production and/or release.

This document deals with the general question whether these radiolytic effects can endanger the containment of the waste in a repository. To answer this question was one of the objectives of the R&D programme of the C.E.C. on Management and Storage of radioactive Waste-part B which was started in 1985. Initially within this programme an in situ irradiation experiment in the Asse salt mine in Germany (HAW project) and a supplementary laboratory irradiation programme were planned. Because of licensing uncertainties the in situ experiment was cancelled in late 1992. However, as a consequence the laboratory experiments were extended. The results of these experiments are described in this document.

Part I of this document starts with an outline of the R&D programme regarding the investigation of radiolytic effects in rock salt. To allow an evaluation of the relevance of the experimental work, this outline is followed by a discussion of the main parameters (temperature, dose rate, total dose), resulting from various conceptual repository designs, which would affect the radiolytic effects in a rock salt repository. In the last two papers of part I the general question