

# NATURAL ANALOGUE STUDY RUPRECHTOV: AN EXPERIENCE REPORT

by

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The preferred option for the long-term management of high level and long-lived radioactive waste is disposal in deep geological formations. The realization of such disposal concepts is based on both technical feasibility and long term safety. The latter requires a wide range of technical and scientific data for assessing the long term performance of disposal systems and sites, which is supported by additional complementary information in a Safety Case. For the latter natural analogues are valuable.

The main value of natural analogue studies is to provide information about a geological system (evolution), i.e. the characteristics of processes occurring over very long time scales. In general, the direct use of quantitative information from natural analogue studies in a Safety Case has been mostly limited, because it is very difficult to extract hard numerical data from complex natural systems, where initial and boundary conditions cannot be fully defined. Indirectly this information could, however, be very valuable in a supportive sense. Therefore, natural analogues are an integral component of the Safety Case in many national repository programmes.

The experiences from more than 15 years of research with the natural analogue Ruprechtov have been compiled and documented in a joint report of GRS and ÚJV. Besides a brief overview on the different roles of analogues in national repository programmes and the evolution of analogue application in Safety Cases the intentions and objectives of this report are:

- Compile and critically discuss the decisions regarding the selection of the Ruprechtov site as a natural analogue,
- classify the Ruprechtov site with regard to the type of uranium accumulation,
- display the iterative steps, decisions and evolution of knowledge during the investigation of the site,
- describe the experiences obtained, particularly in the selection and application of experimental laboratory and field methods,
- outline the scheme by which these methods have contributed to understanding and characterizing the main features of the site,
- illustrate the main findings relevant for a Safety Case for a radioactive waste repository, and
- outline recommendations for future research and development (R&D) from the lessons learned.

The report structure reflects the experimental / methodological approach applied in conducting the project. The existing knowledge at project start is compiled and discussed. Subsequently, the methods applied and the key experiences are summarized with a corresponding standardized description of these methods in the annex. Further, the investigation of key scientific issues by application of different methods is described and major Ruprechtov results are summarized. Finally, it is discussed how these results could be used for supporting a Safety Case. One key objective of this report is also to illustrate and include experiences gathered during the project which cannot always be found in technical or scientific reports.

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