DBE TECHNOLOGY NEWS

4

2015

FEASIBILITY STUDY FOR DEVELOPING A SAFETY DEMONSTRATION CONCEPT FOR A HLW REPOSITORY IN GERMAN CRYSTALLINE ROCK

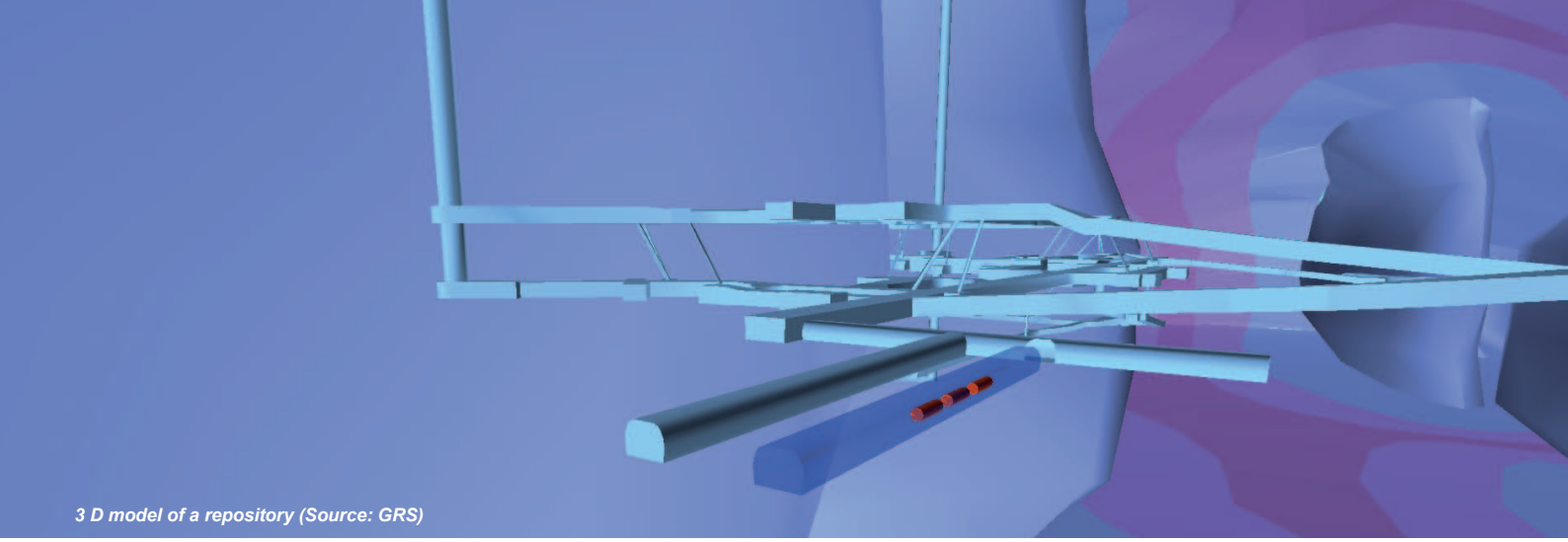
EUROPEAN STUDY ON DEVELOPMENT AND DEMONSTRATION OF MONITORING STRATEGIES

DEVELOPMENT OF A GENERIC REPOSITORY CONCEPT AS WELL AS A SAFETY AND DEMONSTRATION CONCEPT IN BEDDED SALT

REDESIGN AND MODERNIZATION OF UKRAINE'S RADWASTE MANAGEMENT ORGANIZATION

Verantwortung für Generationen
Responsibility for Generations

DBE TECHNOLOGY GmbH



3 D model of a repository (Source: GRS)

Research and development activities play an important role when it comes to the development of safety assessment concepts for high-level radioactive waste repositories. In recent years, the methodology of safety demonstration has been substantially improved. For a long time, meeting a radiological release limit demonstrated by long-term calculations was the main component of the safety demonstration. Currently, these calculations are seen as one part of a line of arguments belonging to an integrated methodology (Safety Case). The strength of this holistic methodology lies in the strong link between legal and geologic boundary conditions, disposal and closure concept, demonstration of barrier integrity, and long-term analysis of probable and less probable repository evolutions.

For the last decade, DBE TECHNOLOGY GmbH has been coordinating the development of the new safety assessment concepts, working together with BGR, Hanover, and GRS, Braunschweig. Following comprehensive research in rock salt, the first safety assessment concept was developed for domal rock salt during the R&D projects ISIBEL and, taking into account more site-specific aspects, during the preliminary safety analysis of the Gorleben site (VSG). To cover all types of rock salts in Germany that may host a repository for high-level radioactive waste, bedded salt formations are considered as well and a project, called KOSINA, for setting up a safety assessment concept has been launched recently.

In the past years, the research activities in other potential host rocks like clay and crystalline rocks have been intensified significantly. Extensive participation in European underground research laboratories built up the knowledge in Germany on the general sealing abilities of clay host rocks. As a logical consequence, this knowledge led to the development of a new safety assessment concept for clay host rocks in Germany. This concept is currently being developed in the course of the R&D project ANSICHT.

In the framework of the German-Russian cooperation in the fields of radioactive waste disposal, DBE TECHNOLOGY GmbH together with its partners BGR and GRS have been involved in investigations of crystalline rocks for hosting radioactive waste repositories in the Russian Federation. Following the idea of investigating all potential host rock options in Germany, this knowledge gained is currently used to check whether a safety assessment concept for crystalline rocks can be developed for German hard rock formations analogous to the ones in salt and clay. The corresponding R&D project is called CHRISTA and was been launched in July this year. The provision of safety assessment concepts applicable to all potential host rock formations in Germany builds a sound basis when it comes to a comprehensive and transparent comparison of repository systems.

Happy Reading!
Michael Jobmann

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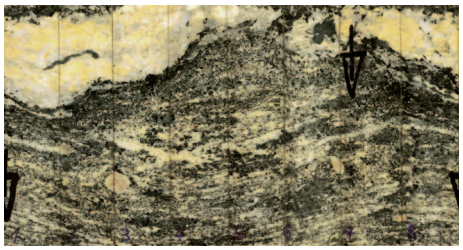
Feasibility study for developing a safety demonstration concept for a HLW repository in German crystalline rock

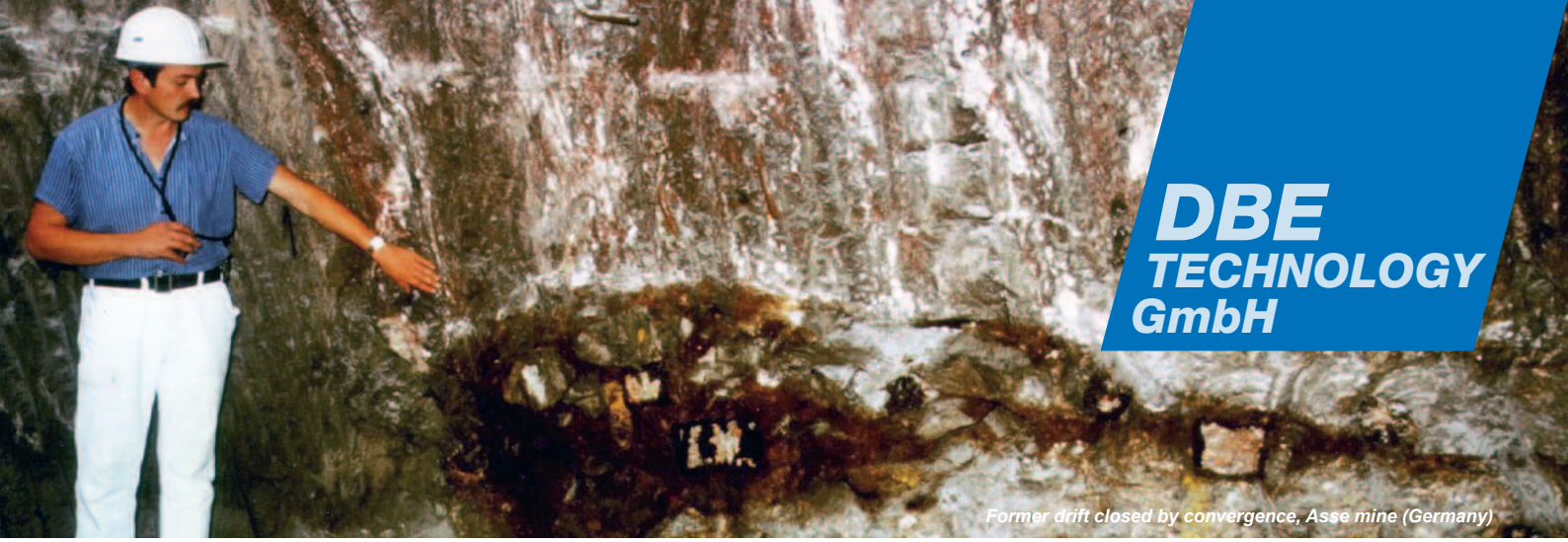
Due to the reorientation of the search for a site for a final repository for heat-generating radioactive waste, which was initiated by the German Repository Site Selection Act as of July 23, 2013, all possible host rocks; i.e. salt, clay, and crystalline rock, become important. However, for an objective comparison of repository systems in different host rocks and an eventual assessment, adequate background knowledge is required.

Any safety and safety demonstration concept must be based on the Safety Requirements Governing the Final Disposal of Heat-Generating Radioactive Waste issued by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety in 2010. These safety requirements comprise the so-called “CRZ concept” that stipulates that any applicant for a final repository for heat-generating radioactive waste needs to demonstrate that a containment providing rock zone (CRZ) is present that – together with the technical barriers – ensures the safe containment of the radioactive waste. The containment capacity of the CRZ (integrity) must be guaranteed for the reference period of one million years.



Example of a potential crystalline host rock: a biotit-plagiogneis, Yeniseysky (Russian Federation)

In summer 2015, the Project Management Agency Karlsruhe on behalf of the Federal Ministry for Economic Affairs and Energy contracted DBE Technology GmbH, BGR and GRS with the R&D project CHRISTA to start a feasibility study for developing a safety demonstration concept for a HLW repository in German crystalline rock. One characteristic of crystalline rock is the presence of fractures. Thus, if this rock type is considered as host rock, one has to be aware that the integrity as such may be impaired from the outset. If and to what extent the “CRZ concept” can be applied to this type of rock and how the integrity requirement has to be defined in this case, is to be determined within the scope of this project. Regarding



Former drift closed by convergence, Asse mine (Germany)

the integrity analysis, the basic question will be discussed, how important integrity can be for the description of the barrier function of a host rock that may contain fractures. What are the criteria that can be derived for the assessment of the integrity? The involvement of DBE TECHNOLOGY GmbH and its partners in tests in the URL Äspö in Sweden and the long-term experience gained in the German-Russian cooperation with regard to the site exploration and repository design in crystalline rock in the Russian Federation are a sound basis for this purpose. *(M.J.)*

European study on development and demonstration of monitoring strategies and technologies for geological disposal

The successful implementation of a repository programme for radioactive waste relies on both the technical aspects of a sound safety strategy and scientific and engineering excellence as well as on social aspects such as stakeholder acceptance and confidence. Monitoring is considered key in serving both ends. Not only is it essential to underpin the technical safety strategy and quality of the engineering. It can also be an important tool for public communication, contributing to public understanding of and confidence in repository behaviour.

MODERN 2020
Development and Demonstration of monitoring strategies and technologies for geological disposal

Following the results of the MoDeRn project, which was finished in 2013, and providing an international reference framework for monitoring high-level waste repositories, MODERN 2020 aims at providing the means for developing and implementing an effective and efficient repository monitoring programme that takes into account the requirements of specific national programmes. The work allows advanced national radioactive waste disposal programmes to design monitoring systems suitable for deployment when repositories start operating and supports less developed programmes and stakeholders by illustrating how the national context can be taken into account in designing monitoring programmes tailored to their national needs.

A strong focus of MODERN 2020 is set to the development of conceptual approaches for monitoring specific engineered barrier systems (EBS) without impairing their sealing functions. Research and development work aims at improving and developing innovative repository monitoring techniques, e.g. wireless data transmission systems. Full-scale in-situ demonstrations of innovative monitoring techniques will further broaden the knowledge about the operational implementation of specific disposal monitoring.

Finally, MODERN 2020 has the objective to effectively engage local citizen stakeholders in the R&D monitoring activity by involving them at an early stage in a repository development programme in order to integrate their concerns and expectations into monitoring programmes. *(M.J.)*

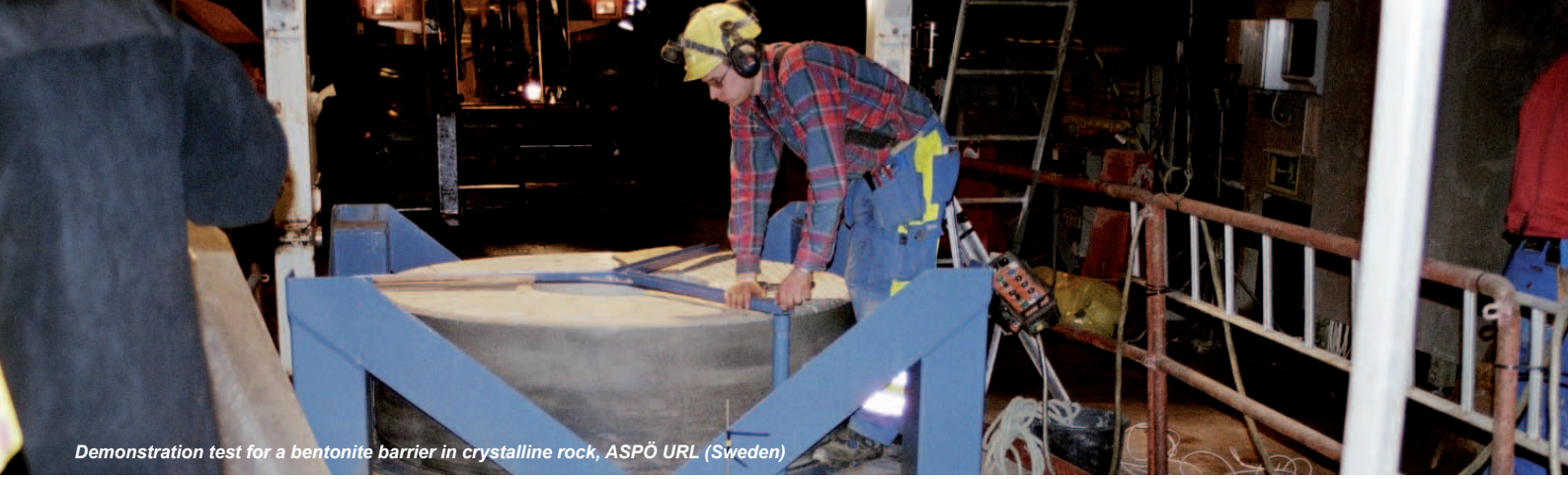
Development of a generic repository concept as well as a safety and demonstration concept for heat-generating waste in bedded salt in Germany

According to the Repository Site Selection Act (StandAG), a repository site has to be found that provides the optimal level of safety for at least one million years. This approach requires a comparison of different alternative repository systems in different host rocks. From the very beginning in the early 1960s, rock salt has been considered to be the best option because of the favorable salt features and because of more than 100 years of experience in salt mining. Thus, repository designs and safety and demonstration concepts were developed for salt domes. In a period of more than 15 years, generic conceptual designs and safety investigations have been prepared for repositories in clay and crystalline rock in the course of R&D work funded by BMWi (Federal Ministry for Economic Affairs and Energy). Very recently, BMWi decided to start safety investigations on repository systems in bedded salt as well, in order to complete the set of repository designs in potential host rock formations in Germany. In this context, BMWi entrusted DBE TECHNOLOGY GmbH in July 2015 to lead a R&D project called KOSINA.


Drilling site, Morsleben Repository (Germany)

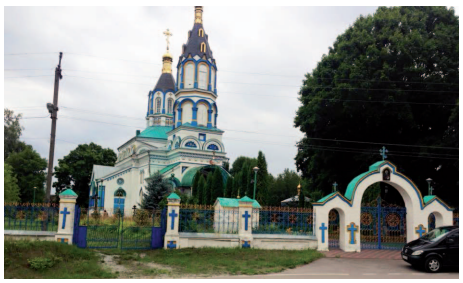
The objective of the R&D project KOSINA is to develop a generic technical concept for a repository for heat-generating waste and spent fuel on the basis of generic geologic models for bedded salt that is independent of the site. This should include a safety and demonstration concept as well. The expected project results should provide a technical-scientific basis for the safety-oriented evaluation of repository systems in different host rocks in accordance with the Site Selection Act.

To achieve these objectives, BGR (Federal Institute for Geosciences and Natural Resources), GRS (Gesellschaft



Demonstration test for a bentonite barrier in crystalline rock, ASPÖ URL (Sweden)

für Anlagen- und Reaktorsicherheit (GRS) gGmbH, IfG (Institute for Rock Mechanics), and DBE TECHNOLOGY GmbH combined their scientific and engineering competences, and a suitable working programme was set up. The work programme consists of elaborating and compiling the basic data (types and amounts of waste, design requirements), description of a generic but suitable geologic situation, review of existing safety and demonstration concepts. The next steps are the development of generic geologic models, including derivation of model parameters, development of a safety and demonstration concept and analysis of the geomechanical integrity. DBE TECHNOLOGY GmbH is entrusted with the development of technical repository concepts, which includes the consideration of four different variants (drift disposal of POLLUX® casks, vertical and horizontal borehole disposal, and direct disposal of CASTOR® casks). The evaluation of the long-term radiological consequences as well as investigations on operational safety will complete the work programme. Eventually, a synthesis report will be prepared and published. The KOSINA project was launched in July 2015 and will be finished by the end of February 2018. *(W.B.)*



Church of Chernobyl (Ukraine)

DBE TECHNOLOGY GmbH leads Consortium of European RadWaste Management Companies in the redesign and modernization of Ukraine's RadWaste Management Organization

The Consortium led by DBE TECHNOLOGY GmbH and joined by ANDRA of France, SKB International AB of Sweden, COVRA of the Netherlands, and ENRESA of Spain is tasked under contract by the European Commission with providing expert support to the Ministries of Ukraine in reshaping and modernizing the national radioactive waste management organization in that country. The overall goal of the project is to bring about significant improvements in radioactive waste management in Ukraine through the development of concrete recommendations designed to address problems and issues specific to radioactive waste management facing the Ukrainian Ministries. The recommendations include a number of detailed changes to the organizational and institutional structures as currently established in Ukraine. The specific goal of the current effort defined under Task 3 of the project is to establish a national waste management organization appropriately structured and focused to develop, construct, operate and ultimately close the required facilities needed to adequately dispose of radioactive waste in Ukraine.

DBE TECHNOLOGY GmbH has led the Consortium's efforts with respect to establishing an independent, efficient and capable waste management organization (WMO) with a secure and stable financial foundation that is best suited to manage Ukrainian radioactive waste through final disposal. A particular emphasis in the management model proposed by the Consortium was placed on focusing the WMO's efforts on waste disposal with an assurance of adequate financial stability. Over a series of workshops held at Chernobyl, the Consortium worked closely with the Ukrainian project beneficiaries in order to ensure that the special circumstances of Ukrainian waste management were properly considered. The goal is to develop a model for restructuring the WMO into a focused organization in line with international best practices capable of addressing the waste management issues in Ukraine.

The new organization shall concentrate those capabilities and competencies needed to effectively manage and oversee the entire radioactive waste lifecycle development, including all phases of long-term storage and disposal; specifically from site selection and concept development (i.e., designing, licensing, construction and operation) through site closure and post closure monitoring, including responsibility for public relations. In addition to restructuring the WMO, the Consortium has also introduced fundamental recommendations for remodeling the radioactive waste fund in order to ensure that adequate funds are available when needed. *(G.N.-W.)*

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