



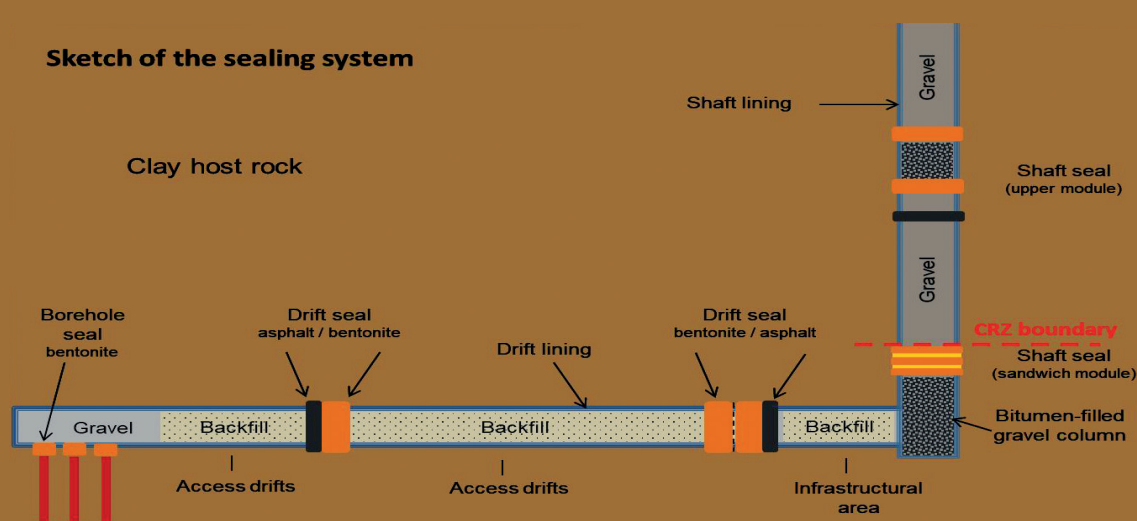
Underground test area for construction materials – Morsleben repository



BGE TECHNOLOGY GmbH

- REPOSITORY RESEARCH IN CLAYSTONE – THE ANSICHT-II PROJECT
- BGE AND BGE TECHNOLOGY GMBH INTENSIFY THEIR COOPERATION WITH NUMO
- WASTE PACKAGE DESIGN FOR THE DUTCH DISPOSAL CONCEPT IN ROCK SALT
- START OF ANOTHER 5-YEAR-CONTRACT FOR TECHNICAL SUPPORT TO ONDRAF/NIRAS
- DESIGN AND PERFORMANCE ASSESSMENT OF ENGINEERED BARRIER SYSTEMS IN A SALT REPOSITORY FOR HLW/SNF

Sketch of the sealing system



Generic closure concept for clay formations (R&D project ANSICHT)



Dear Readers,

These days, I often have to think of presentations by Hans Codee, the former CEO of the Dutch Waste Management Organisation COVRA, given several years ago where he emphasised the safety relevance of deep geological repositories, irrespective of national interests. He usually led into his presentations by showing the development of national boundaries within Europe over the last centuries. While at those days, the slides put smiles on everybody's faces, news would nowadays cause these smiles to freeze immediately on our lips. Especially in Western Europe, we are currently being painfully reminded that peace and democracy – and thus nation-

nal borders – cannot be taken for granted. We realise that risks that threaten national security must be minimised by active and passive means.

We, BGE TECHNOLOGY GmbH, see our work on the safe disposal of radioactive waste as a modest contribution to minimising national risks worldwide. Ideally, our solutions allow the permanent disposal of the waste, taking into account national requirements, of course. Once again, we would like to present some of our current projects to you. The projects shown span a wide range from the general approach to demonstrating safety in the ANSICHT project, to the design of barriers in the work with Sandia National Labs, USA, and for COVRA, to the operational work for the Japanese waste management organisation NUMO and the Belgian WMO ONDRAF/NIRAS.

In addition to the project work, we faced two major internal changes over the past months. Governmental rules on managing its shareholdings apply now directly to us. Respective reporting and governance processes had to be developed and have been implemented last year. We also observe that repository projects have become much more demanding and extensive over the last years. We responded to this last year

by restructuring our company according to areas of expertise and by organising our work more in the form of a project company. Accordingly, as of this year, our organisation has been divided into the specialist areas of Repository Technologies, Numerical Modelling, and Geotechnical Engineering. In order to be able to meet the specific requirements of different clients, we will establish contact persons for research projects, for work at our parent company, and for international activities. Through this reorganisation, we shall be able to continue to meet our and our customers' high demands on the quality of our services for the tasks to come. In this context, most importantly, a great thanks goes out to all colleagues of BGE TEC who again did a marvellous job over the last months despite having to compensate for additional burdens caused by COVID restrictions and the involvement in internal working groups on the reorganisation efforts.

But for now, lean back and enjoy a little excursion into our projects on the following pages.

Happy Reading!

Thilo Berlepsch

Repository Research in Claystone – The ANSICHT-II Project

Within the scope of the preceding research project ANSICHT, a draft for a methodical approach to demonstra-

te the safety of repository systems in claystone in Germany was developed. On behalf of the Federal Ministry for Economic Affairs and Energy (BMWi), the Project Management Agency Karlsruhe (PTKA) commissioned BGE TECHNOLOGY GmbH, the Federal Institute for Geosciences and Natural Resources

(BGR), and GRS gGmbH with the joint project ANSICHT-II in order to test this methodology in detail and to develop it further.

Taking into account the Ordinance on Repository Safety Requirements (EndlSiAnfV), specific individual assess-



Large-scale test of shaft hoisting system for heavy payloads

ments were developed and presented, thus illustrating the respective nature of the safety assessment. The aim was to identify and clearly present open questions that need to be clarified for carrying out a safety assessment and to evaluate the methodology by means of various individual assessments in order to identify any weaknesses and to provide approaches for improvement.

To achieve these goals, the existing modelling concept was applied, tested, and revised. In addition to this, analyses of uncertainties as well as of the influence of heterogeneities within the host rock on the compliance with the criteria for the evaluation of the containment providing rock zone (CRZ) were carried out. Even the best-suited site with a corresponding CRZ can only host a safe repository if it is possible to seal the necessary excavations in the CRZ in a long-term safe manner after emplacement has been completed. In this context, the closure concept was revised, while an evaluation of which barriers are essential to ensure safe containment was carried out. The work was rounded off with an analysis of the robustness of the geotechnical barrier system. Finally, it was described how and in which way an assessment of the radiological safety can be carried out based on the indicators specified in the EndSiAnfV.

BGE and BGE TECHNOLOGY GmbH Intensify Their Cooperation with NUMO

Since 2018, BGE – including with its subsidiary BGE TECHNOLOGY GmbH

– have maintained a bilateral cooperation agreement with the “Nuclear Waste Management Organization of Japan (NUMO)”. NUMO is the Japanese counterpart of BGE. The cooperation is intended to establish a highly effective and structured exchange of experience in the field of radioactive waste management between the organisations. Among other topics, engineering technology for repositories are in the focus of this agreement. Within this context, a joint project to exchange information on the state of the art in science and technology concerning the underground transport of waste containers for high-level radioactive waste has been started. The work is divided into three work packages. First, BGE TECHNOLOGY GmbH will document the state of the art in the shaft hoisting technology for high-level waste containers and heavy payloads. In addition to the technical description of such a hoisting system, the concepts for demonstrating operational safety are illustrated by summarising the analyses carried out to demonstrate how the shaft hoisting concept meets operational safety requirements. Furthermore, the drafts for the shaft and ramp transportation technology developed by the Japanese colleagues will be reviewed. Last but not least, the latest developments regarding emplacement devices for containers for low- and intermediate-level waste will be exchanged. The cooperation will thus provide an insight into the respective planning states and the technical solutions for the individual technical challenges.

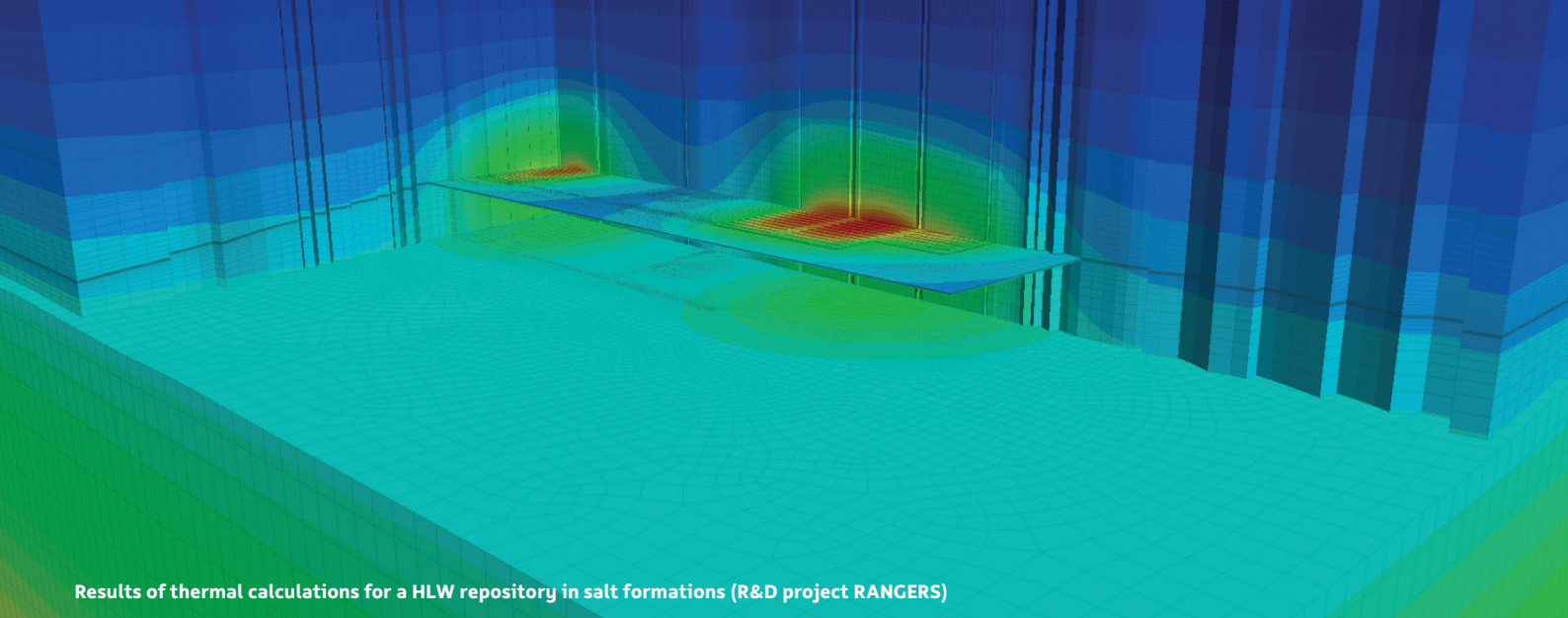
Waste Container Design for the Dutch Disposal Concept in Rock Salt

In the Netherlands, the Central Organisation for Radioactive Waste (COVRA) is responsible for the collection, processing, and storage of all kinds of radioactive waste. COVRA already realised a storage and processing facility for the long-term storage of all kinds of radioactive waste.

Two disposal concepts are considered by COVRA: disposal in poorly indurated clay or disposal in rock salt, either in embedded salt or in a salt dome. For disposal in clay, a waste container in the form of a super container has already been developed. For disposal in rock salt, no waste container has been developed yet. Thus, COVRA recently commissioned BGE TECHNOLOGY GmbH with the design of such a container.

In the first phase of the project, BGE TECHNOLOGY GmbH will describe the requirements for the container and will do a literature research on shielded waste containers developed internationally. We will then start developing an own design for a shielded container tailored to COVRA’s requirements. Additionally, we will examine if the already developed super container could also be used in rock salt.

In the second phase of the project, BGE TECHNOLOGY GmbH will further detail its proposed container design. The design will undergo mechanical, shielding, corrosion, and degradation analyses. Furthermore, we will examine how the waste container’s long-term behaviour can be implemented in a future safety case. In addition to this, we will prepare a cost estimate for the waste container.



Results of thermal calculations for a HLW repository in salt formations (R&D project RANGERS)

Start of another 5-Year-Contract for Technical Support to ONDRAF/NIRAS

The Belgian waste management organisation ONDRAF/NIRAS is tasked with the management of radioactive waste present on Belgian territory. Primarily, this involves the transport, processing, packaging, storage, and disposal of radioactive waste.

BGE TECHNOLOGY GmbH has supported ONDRAF/NIRAS in the planning of the operation of the future geological disposal facility through two subsequent framework contracts on "Technical support for conducting studies in the field of radioactive waste management" since 2009.

In 2021, ONDRAF/NIRAS launched the public tender procedure for the new 5-Year-framework contract, which was again awarded to us despite strong international competition.

The main tasks of the new framework period will be

- Design and feasibility assessment of the disposal and closure operations

for the underground facilities (transport of disposal packages, ventilation, backfilling, sealing of galleries, etc.)

- Analysis of the operational risks involved in the operation of the disposal facility and adaptation of the operational processes to reduce the identified risks

- Evaluation of the associated costs

The Kick-off Meeting to discuss the next steps connected to the planned operational safety assessment was held as a virtual meeting with representatives of the two organisations on March 9, 2022.

Design and Performance Assessment of Engineered Barrier Systems in a Salt Repository for HLW/SNF

Within the framework of the project RANGERS, a methodology for preparing a generic design and performance assessment of engineered barrier systems (EBS) in a repository in salt has been developed. The methodology consists of a workflow to assess the in-

tegrity of engineered barrier systems and also proposes to take into account the EBS within the scope of integrated performance assessments. To apply this methodology, a modelling and verification concept is recommended. The methodology is currently being applied on a generic repository system in a bedded salt formation. Based on this, a global model has been developed to carry out different numerical assessments that have been derived from the application of the modelling concept. Two of these assessments have been realised so far. One of them tries to assess the effect of the temperature evolution within the EBS because high temperature can affect the long-term performance of the EBS materials. The results show a temperature increase of 30K in the drift seals and only 5 K in the shaft seals. Based on these results, it can be concluded that the effect of the temperature on the EBS is negligible. Further assessments will be carried out in the next phase of the project to completely design the EBS according to the regulations in force. The role of these barriers and the uncertainties concerning their treatment within the scope of performance assessments will also be investigated.

For further information, visit www.bge-technology.de or scan the QR code below.

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