BGE TECHNOLOGY NEWS 3 2018

9th US-GERMAN WORKSHOP ON SALT REPOSITORY RESEARCH, DESIGN, AND OPERATION

DRIFT SEAL CONSTRUCTION AT THE ASSE MINE

LOGISTIC STUDY OF THE BELGIAN REPOSITORY CONCEPT

RESEARCH AND DEVELOPMENT ACTIVITIES CARRIED OUT AT UNDERGROUND RESEARCH FACILITIES

BGE TECHNOLOGY GmbH

Participants of the 9th US–German Workshop on Salt Repository Research, Design, and Operation at BGR, Hanover (Germany)

Cutting at a drift seal location. Asse mine (Germany).

Dear friends of
BGE TECHNOLOGY GmbH,

The new national implementer for the radioactive waste disposal programme, BGE, is currently going through a fundamental and deep change process.

Due to the merger of the former ASSE-GmbH and DBE into BGE, the full operational responsibilities for the four geological installations in the field of radioactive waste disposal in Germany – the Morsleben repository, the Asse mine in decommissioning, the Gorleben mine in care and maintenance status, and the first commercial deep geologic repository in the world licensed under nuclear law, the Konrad repository, which is currently under construction – are now in one hand. This growth of responsibility additionally includes combining the formerly split responsibilities of licensee and asset owner on the one hand (former BfS) and EPC managers (former Asse-GmbH and DBE) on the other hand.

In addition to this, BGE has been tasked with further important activities of the national disposal programme, the most visible one of which is the site selection for a repository for heat-generating radioactive waste.

Hence, BGE is now in a position to streamline its processes and to implement a new, more efficient corporate structure. Important steps towards the new structure have already been made. Just recently, BGE was able to announce the completion of the staffing of the highest management level after having developed the new organisational structure. As a consequence, BGE can strengthen its capability to deliver safe, technically excellent, and economic solutions in the field of nuclear waste repositories.

In this context, BGE TECHNOLOGY GmbH is BGE's representative to many national and international stakeholders. The strong organisational backing of BGE TECHNOLOGY GmbH by BGE is appreciated by the whole radioactive waste disposal community, and the feedback of the disposal community through BGE TECHNOLOGY GmbH into the new organisation is highly valued by us.

As a consequence of BGE's new role in the German radioactive waste programme, BGE TECHNOLOGY GmbH is even more able to support its clients and partners in developing safe solutions for the management of radioactive waste. So please have a look at and enjoy this brief excerpt of BGE TECHNOLOGY GmbH's current activities.

I am looking forward to further good bidirectional collaboration with you, dear friends of BGE TECHNOLOGY GmbH.

Happy Reading and „Glückauf"!

Dr. Thomas Lautsch
Managing Director
BGE TECHNOLOGY GmbH and BGE

9th US–German Workshop on Salt Repository Research, Design, and Operation

This year, the US-German Workshop on Salt Repository Research, Design, and Operation took place in Germany at the premises of BGR (Federal Institute for Geosciences and Natural Resources) in Hanover. For two days, more than 60 scientists and engineers from Germany, USA, The Netherlands, Poland, and Austria discussed their experience and new findings in the field of radioactive waste disposal in salt formations. The workshop was kicked off by Mrs. Ursula Borak (Federal Ministry for Economic Affairs and Energy, BMWi), Mr. Wilhelm Hund (Federal Company for Radioactive Waste Disposal (BGE)), Mr. Timothy Gunter (U.S. Department of Energy, DOE) and Mr. Gerhard Enste (BGR).

Facilities in deep geological salt formations for the disposal of low- and intermediate-level radioactive waste and non-heat generating waste from defence activities have been operated in Germany (ERAM, Asse) and the United States (WIPP) for decades. The Netherlands and Poland also consider rock salt formations as suitable for the disposal of radioactive waste.

The workshop started with updates on the developments of the national waste management programs of Germany, the USA, and Poland. Other topics of the workshop were the concepts, material selection, and integrity demonstrations for engineered barriers, and repository designs in salt formations. In this context, BGE and BGE TECHNOLOGY GmbH reported on their experience gained during the design and construction of more than 30 drift seals in the Asse mine and on the prototype drift seal in the Morsleben repository. In addition, IfG Leipzig and BGE TECHNOLOGY GmbH presented the results of the R&D project KOSINA on technical concepts, geomechanical integrity analyses, and radiologic consequences analyses for a HLW repository in flat-bedded salt and salt pillows. Other topics dealt with operational safety, retrievability, geochemistry, and geomechanics. The workshop was closed with a session on a comparison of repositories in flat-bedded salt and domal salt.

The organisers and participants thanked BGR for hosting the event and appreciated in particular that it was combined with the 6th SaltMech Conference, which took place at the same venue on the following days. The next US-German-Workshop will be held at the South Dakota School of Mines & Technology in Rapid City (USA) on May 28th and 29th, 2019.

Drift Seal Construction at the Asse Mine

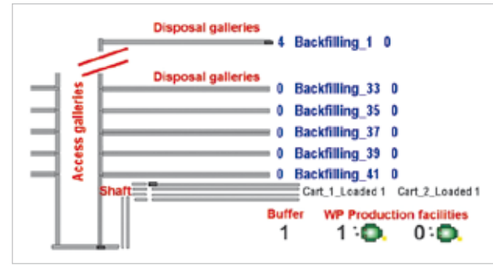
Drift seals ("flow barriers") are components of the backfilling and sealing concept for the closure of the Asse mine. BGE and BGE TECHNOLOGY GmbH have more than a decade of experience in the planning and construction of these barriers at the mine, as the barriers have been constructed in the mine workings since 2003. The basic construction concept consists of a core barrier fixed by abutments and adjacent supporting backfill on both sides. The barrier design had to take into account the intensive excavation work and potash extraction that had taken place in former times. After more than 100 years of mine operation, the rock is damaged in some areas. Furthermore, radioactive waste has been disposed in the course of R&D work. In 1988, brine intrusion was discovered in the southern flank of the mine. Although the inflow rate is quite constant (approx. 12m³/d), it could change at any time and increase to amounts that exceed the mine's pumping capacity.

Since 2013, there has been a legal mandate to close and decommission the Asse mine – the radioactive waste has to be retrieved. Thus, the preparation of an emergency plan to minimize the probability of brine inflow and to minimize the consequences of excessive brine inflow was essential. This emergency plan includes precautionary measures to stabilize the mine workings and to protect the emplacement chambers. Essential measures are the installation of flow barriers, which are made of magnesium oxychloride concrete in order to guarantee chemical long-term stability against $MgCl_2$ solutions as well as the compatibility with the host rock. To impede fluid flow, the construction material has to have a low permeability. In order to achieve quick rock pressure build-up, the material has to have sufficient mechanical strength and stiffness. Furthermore, it has to be at least constant in volume, i.e. it is not to shrink, and – ideally – the material has swelling capability. In addition to this, the material is to be easy to handle, which means that it has to be transportable over distances of several hundred meters.

The first horizontal flow barrier was installed at the beginning of 2007. By now, about 48,100 m³ of sorel concrete have been used for flow barriers and abutments, which is about 14% of 342,000 m³ of sorel concrete that have been placed in total. So far, 32 flow barriers have been installed in the Asse mine. For 16 barriers, it has been demonstrated that they have been constructed according to the requirements. Further demonstrations are in preparation. According to the current plan, 21 flow barriers still need to be installed.

Logistic Study of the Belgian Repository Concept

The Belgian Agency for Radioactive Waste and Enriched Fissile Materials, ONDRAF/NIRAS, plans to carry out waste conditioning and interim storage of the resulting waste packages next to the Belgian deep geological facility (DGF). First, low- and intermediate-level waste will be conditioned in concrete monoliths and then stored in a buffer storage area. After transfer of a specific number of waste packages into the DGF and their emplacement, the remaining voids in the disposal galleries will be backfilled. It is planned to mix the backfill material at the surface and to pump it into the sections to be backfilled. An underdimensioned buffer storage area, low efficiency, or insufficient coordination of the work would cause inter-



Model for the logistic study

Heater test at the Asse URF (Germany)

ruptions of the work flow. In order to evaluate the overall system behaviour, BGE TECHNOLOGY GmbH carried out a study of the dynamic processes.

As disposal and backfilling starts in the backmost part of the emplacement field, the production rate will at first marginally exceed the emplacement rate due to the long transport routes. The buffer will be filled with waste packages. With ongoing operation, the emplacement and backfilling rates will increase as the transport routes and transfer times for the waste packages will become shorter. The buffer stock will be reduced and – until the end of the disposal phase – all waste packages can be emplaced in accordance with their production rate.

Interruptions due to repair work or maintenance do not have significant effects on the work flow. If the buffer facility is filled to its capacity, a variety of operational measures can be realised to increase the speed of emplacement and backfilling after work is resumed after an interruption. One example is a temporary change from single-to two-shift operation of the disposal facility. The study shows a system disposal performance of a total number of 4,012 waste packages in a time period of slightly less than 13 years.

Research and Development Activities Carried out at Underground Research Facilities

IAEA intends to publish a new report in its Nuclear Energy Series. The report is to summarise the results of research activities carried out at underground research facilities (URFs) over the past 50 years. It is intended to support Member States that would like to initiate or elaborate their geological disposal programmes by providing a reference source for more in-depth information on URF RD&D results. The report is to provide an overview of the existing URFs around the world and of the main RD&D results obtained until today. Furthermore, it is to illustrate how these results contribute to the scientific and technical basis for the feasibility and safety of geological disposal in a range of host rocks. For this reason, the Member States with advanced nuclear waste disposal programmes were asked to give overviews of their research, development, and demonstration activities in national URFs.

BGE TECHNOLOGY GmbH participated in the preparation of the URF compendium and reported about the German waste disposal programme for salt formations. The Asse mine used to be a URF where a broad spectrum of R&D work to analyse disposal strategies for different kinds of radioactive waste was carried out. The rock salt properties and their interactions with emplaced radioactive waste were studied and the feasibility of suitable sealing constructions to isolate radionuclides from the biosphere was demonstrated.

A comprehensive investigation programme to characterise the salt formations at the Gorleben site has been carried out, while at the Morsleben site, waste/host rock interactions have been investigated and the functionality of sealing constructions has been demonstrated.

In this context, a Technical Meeting on the Compendium of Results of Research, Development and Demonstration Activities Carried out at Underground Research Facilities for Geological Disposal took place at the Vienna International Centre, Austria, from September 3 to 7, 2018. The objectives of the meeting were to collect Member States' feedback on the draft of the Compendium Report as well as to gather additional information on URFs. It also was an opportunity for all participants to share Member States' experience and national updates relevant to URF activities and to geological disposal programmes.

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

BGE TECHNOLOGY GmbH

Published by: BGE TECHNOLOGY GmbH
Eschenstraße 55 · D-31224 Peine
www.bge-technology.de
November 2018
Edited by: Dr. André Lommerzheim
Production: Agentur Spezial, Braunschweig