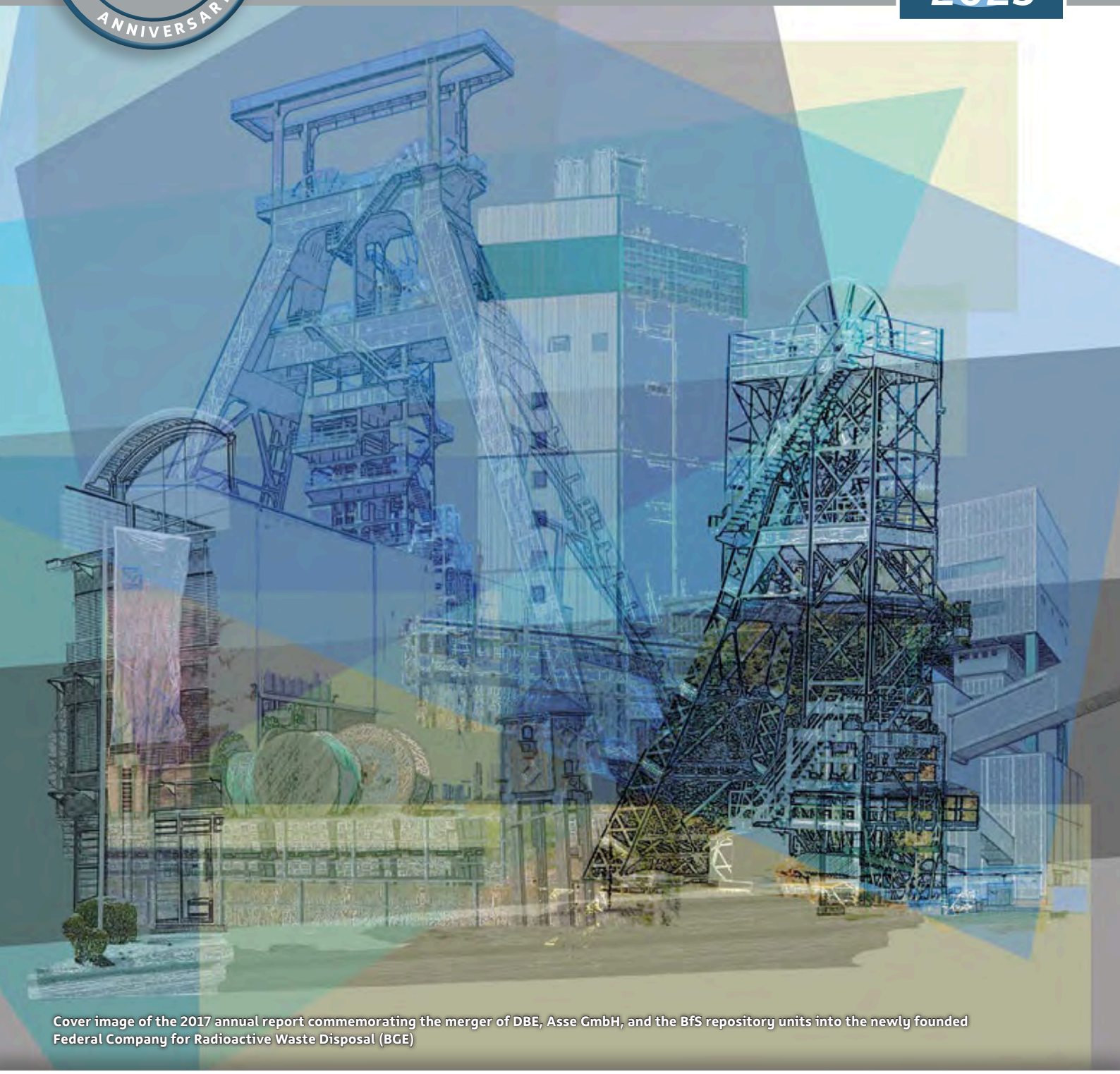
BGE TECHNOLOGY NEWS

3
2025



Cover image of the 2017 annual report commemorating the merger of DBE, Asse GmbH, and the BfS repository units into the newly founded Federal Company for Radioactive Waste Disposal (BGE)

BGE TEC

BGE TECHNOLOGY GmbH

For 25 years now, BGE TEC has been supporting radioactive waste disposal programmes worldwide, thus contributing through its research to the international state of science and technology. In this year's newsletter editions, we take this opportunity to look back on our achievements.

Both in the image scroll bar and on the last page, you will find an overview of our activities from 2013 to 2018, a period marked by significant changes in the German radioactive waste disposal sector.

2014
DBE TECHNOLOGY GmbH represents Germany at IAEA General Conference in 2014

Information booth of DBE TECHNOLOGY GmbH during the Annual Meeting on Nuclear Technology 2014

Dear Readers,

I think repositories are not only complex and challenging, they are also beautiful. When everything fits together, the rock formation behaves as calculated, the materials function properly, and the operating technology purrs along, then there is a certain aesthetic that can definitely be described as beautiful. What distinguishes a geological repository from the widely used extraction mines? Technically speaking, a repository mine is always designed for backfilling, not only with backfill and supporting backfill, but also with special sealing requirements. The shafts must be suitable for downward transport of heavy goods, not for high-performance upward transport of excavated material. Numerical calculations must be performed for long periods of time, and it is very challenging to use modelling based on observations spanning years or decades to make predictions about transport of substances over hundreds of thousands of years. Last but not least, the regulatory framework is completely different from the rest of the mining world. Operational safety is assessed based on experience gained from nuclear power plants, and the defined safety targets, regulatory procedures and, above all, expert assessments are many times higher than is customary in the mining industry.

These requirements, which are typical for nuclear disposal facilities, are precisely the core competence of BGE TEC. A narrowly defined niche where our knowledge is in demand and significant.

Exchanging ideas with our peers in other countries around the world is incredibly important because the special features of repository systems are so rare that the development that otherwise takes place in standard technologies is not sufficiently implemented by the supplier companies. There is no such thing as a ready-made or off-the-shelf nuclear disposal facility.

Thanks to its association with BGE, BGE TEC has a unique asset. BGE operates repositories in Morsleben and at the Asse site. And they are constructing one in Konrad. BGE has decades of experience in working with deep underground sites and handling the mining system – under the specific requirements of a repository. This is unique. However, this only works if our colleagues from BGE TEC participate in BGE projects, and conversely, we can only leverage this strength if we also involve BGE colleagues in BGE TEC projects. This is effectively done in a project organisation with flat hierarchies, lots of communication, and participatory decision-making processes. The focus is on professionalism, not on whether one is responsible for 10, 100, or 500 people. From this perspective, I consider the introduction of a project-oriented organisation structure at BGE TEC two years ago to be particularly significant. This has made it even easier to apply the best expertise to the most important projects. A role model for the parent company BGE, too!

I wish BGE TECHNOLOGY GmbH continued success in its project work over the next 25 years.

Dr. Thomas Lautsch
Managing Director BGE TECHNOLOGY GmbH (2018 – 2025)
Managing Director DBE (2014 – 2018)
Managing Director BGE (2018 – 2025)

BGE TEC Advances Expertise in Cost Studies to Support Global Clients in the Efficient Planning of Radioactive Waste Disposal Programmes

The design of a new repository represents a major milestone in radioactive waste management. However, the associated costs are equally critical and complex. Approval to develop such a facility is not only an engineering challenge but also a significant long-term financial commitment characterised by a complex cost structure influencing all project decisions.

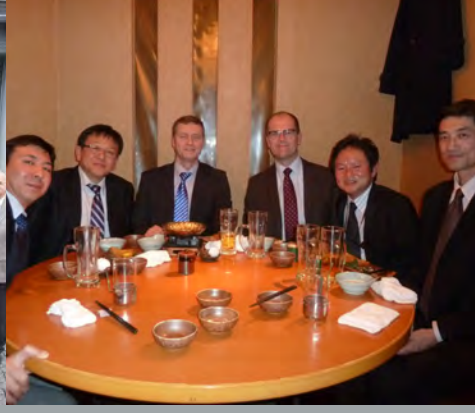
Initial investment costs, which are significant and fixed, cover the construction of the facility and all the required infrastructure. These costs are justified by the project's extended operational lifespan. Once operational, the facility incurs variable operational costs tied to the volume of waste handled and ongoing maintenance requirements. Key cost drivers include long-term personnel expenses over a project duration that exceeds a century, as well as specialised backfill materials and procedures essential for sealing, particularly in deep geological repositories.

The timing of cost expenditures is a critical factor. Delays during construction or licensing phases can substantially increase the budget by prolonging interim storage durations, thereby incurring additional costs. Such delays introduce uncertainties in future cost projections due to potential fluctuations in prices for materials, labour, and technology over extended periods.

In addition to construction and operating costs, several other significant cost categories must be considered. Research and development are essential for advancing and optimising disposal technologies. Considerable licensing costs arise from obtaining and maintaining regulatory approvals. Owner's costs include project management and administrative overheads, whereas insurance

Awarding of the Statement of Performance certificate to DBE TEC for the achievement of ISRS Level 10

2015
The DBE TECHNOLOGY GmbH Team in 2015



2016
Visit of DBE TEC colleagues at partner organisation IHI in Yokohama, Japan

costs address risk mitigation. A comprehensive costing approach facilitates the evaluation and comparison of various disposal concepts, ensuring the selection of the most viable and safe solution.

Cost studies are indispensable for informed decision-making in the development and implementation of radioactive waste disposal projects. They offer a structured and transparent framework to assess the financial implications of long-term undertakings.

Radioactive waste management encompasses a broad spectrum of complex, long-term projects. BGE TEC possesses extensive expertise across all disposal programme lifecycle stages, from site selection to long-term post-closure monitoring. Our experience is based on projects that involve both surface and geological disposal facilities.

Comprehensive cost understanding is fundamental to our work. We deliver detailed analyses of contingencies and inherent cost uncertainties typical for long-term projects. Additionally, cost benchmarking is applied to align our estimates with international standards and comparable projects. This approach guarantees that our solutions are safe, technically robust, economically justified, and transparent.

Over the past decade, BGE TEC's cost studies have successfully benefited multiple private companies and public entities across Europe, the Middle East, and the Asia-Pacific region.

Advancing International Collaboration in Salt Repository Research: Review of the 15th US-German Workshop 2025

The 15th US-German Workshop on Salt Repository Research, Design, and Operation took place online from 7 to 9 October 2025. Over three days, the sessions focused on key topics including engineered barrier systems, crushed salt backfilling, and modelling approaches for repository development.

The first session addressed engineered barrier systems, with contributions from BGE TECHNOLOGY GmbH on the potential application of molten salts (Project SalVE) and on the mechanical and fluidic investigation of a half dam constructed of MgO-concrete (Project FUNGUS).

The second session on crushed salt backfilling featured a detailed presentation by the multinational team of the MEASURES project, who shared recent findings and discussed ongoing research progress. BGE TECHNOLOGY GmbH also contributed to this session with insights from its current work.

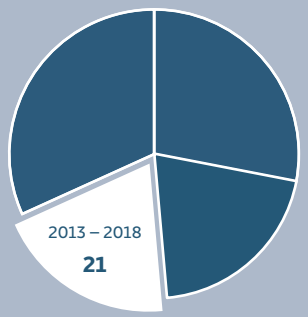
The final session, held on 9 October, focused on modelling and related research activities. Presentations were given by experts from the United States, Germany, the United Kingdom, and the Netherlands. From the UK, participants presented an overview of research infrastructure at the Boulby Mine, while colleagues from the Netherlands addressed challenges linked to the disposal of depleted uranium. US representatives highlighted current studies on disposal chamber convergence and work conducted in radiochemical laboratories.

The workshop once again brought together an expanding international community of experts. With more than 80 participants in each session, the event demonstrated the growing global collaboration in the field of radioactive waste disposal in salt formations.

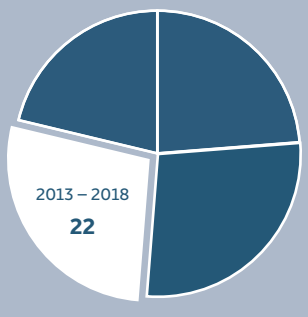
The contributions showed the significance of international cooperation in advancing safe and sustainable disposal solutions. Organised by Sandia National Laboratories, PTKA, and BGE TECHNOLOGY GmbH, the 2025 workshop provided valuable stimulus for both research and practical application.

Given the strong interest and high level of commitment, the workshop series will continue in 2026, maintaining its role as a key platform for scientific exchange and collaboration in the field of salt-based repository research.

107 International Projects in 25 Years



80 R&D Projects in 25 Years

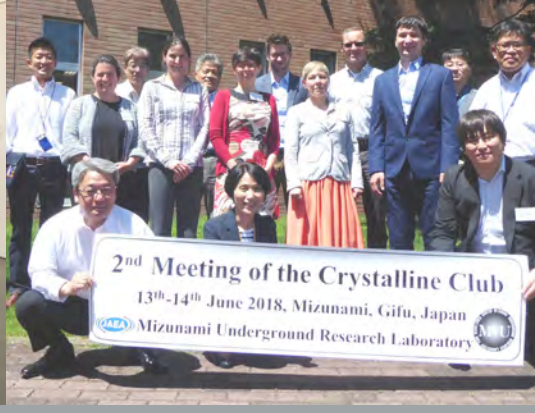


For further information, visit www.bge-technology.de or scan the QR code below.

Published by: BGE TECHNOLOGY GmbH
Eschenstraße 55 · D-31224 Peine
www.bge-technology.de
November 2025
Layout and print by: Giese & Seif GmbH, Peine

2016
Visit of the DBE TEC colleagues to the Mizunami Underground Research Laboratory in Japan

2017
RWM (UK) visitor group at Morsleben repository



2018
Participants of the second meeting of the "Crystalline Club"

Developments in the German disposal programme have always been reflected in DBE TECHNOLOGY GmbH's (DBE TEC) areas of focus. For example, requirements were introduced in 2010 by the Federal Ministry for the Environment for the first time in the German programme that the retrievability of waste is a fixed design requirement. Hence, the impact of retrievability on repository concepts was investigated in various R&D projects from 2012 onwards. ASTERIX, DBE TEC's first project in the series, aimed at investigating the effects of retrievability on existing disposal concepts and at identifying requirements for new concepts. Building on this, ERNESTA developed technical concepts for the retrieval of waste containers with heat-generating radioactive waste from disposal facilities in salt and claystone formations. Part of this development also involved questions about the ambient temperatures encountered during such retrieval operations and the determination of corresponding technical limits. In recent years, this work has been reintroduced into the discussion on the definition of threshold temperatures in the German site selection process. The R&D series on 'retrievability' was completed in 2019 by the KOREKT project with a focus on crystalline host rock.

Due to the political decision to restart the search for a site for a repository for heat-generating radioactive waste, salt, clay, and crystalline rock are to be investigated regarding their potential to host a repository. This realignment led to various R&D projects carried out between 2013 and 2018 on behalf of the Federal Ministry for Economic Affairs and Energy.

Starting from a preliminary safety analysis for a future HLW/SNF repository site in a domal rock salt formation (VSG project), the KOSINA project team of BGR, GRS, IfG and DBE TEC developed concepts for flat-bedded salt and salt pillows. For both types, safety and safety demonstration concepts as well as repository design and emplacement concepts were prepared, including geomechanical integrity analyses and studies on operational safety.

Within the scope of the ANSICHT project, jointly carried out by BGR, GRS, and DBE TEC, a methodology to demonstrate the safety of a HLW repository in claystone in Germany was prepared and tested at two generic sites. This included the development of a repository concept together with emplacement and sealing concepts. A FEP catalogue and a scenario development were derived thereof. One particular challenge was the specification of general integrity criteria for the geological barrier in such a way that their compliance can be verified by means of numerical calculations – and of course, the corresponding computational demonstration of the barrier integrity itself.

As another potential host rock for heat-generating waste in Germany, crystalline rock was increasingly investigated. The first question to be answered was whether and to what extent the concept of containment-providing rock zones (CRZ) can be applied to this type of rock and how the integrity requirement must be defined. This was answered positively within the framework of the R&D project CHRISTA.

Furthermore, colleagues at DBE TEC supported ONDRAF/NIRAS, the Belgian waste management organisation, in conducting a feasibility study on the future operation of a repository for high-level and/or long-lived radioactive waste in weakly consolidated clays. In addition to studies on shaft conveyor systems, waste emplacement technology, and repository ventilation, a key task was to develop a suitable backfill material for the emplacement drifts. It was important to ensure that the strength of the backfill material was low enough to allow the retrieval of the disposal containers. The backfill material was to be produced using above-ground equipment and pumped through the shaft and access tunnels into the emplacement drifts. The flow behaviour of the backfill material was investigated using a mock-up test. The measurement data recorded during the test were used to design mixing, pumping, and conveying equipment. A high-performance building material conveyor system was developed that enables the transport of the backfill material in the required quality and quantity, taking into account aspects of plant operation and occupational safety. The findings from national repository projects were applied, further developed and adapted to the specific requirements of the Belgian repository during these tasks.

During the period presented here, DBE TEC also refined its expertise in designing and planning types of repositories that are not included in the German programme. Particularly noteworthy in this context are near-surface repositories for LILW and, later, borehole disposal in boreholes. These projects, which were and are spread across the globe, have made BGE TEC an important source of information for international programmes.

In late 2017, DBE and related bodies merged into Bundesgesellschaft für Endlagerung (BGE), unifying radioactive waste disposal under one federal company. DBE TECHNOLOGY GmbH was renamed BGE TECHNOLOGY GmbH and remains BGE's wholly owned subsidiary.

2013–2018