



BGE TECHNOLOGY GmbH staff at company headquarters, 2019



BGE TECHNOLOGY GmbH

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For 25 years, BGE TEC has been supporting repository programmes worldwide and contributing to the international state of science and technology through its research. This milestone provides an opportunity to reflect on these developments in this year's editions of our newsletter.

In this edition, examples of our activities in the years since the company has been renamed BGE TECHNOLOGY GmbH are presented on the last page and in the image scroll bar.



2019

Pakistani participants of a training course of BGE TECHNOLOGY GmbH on long-term safety analyses



Participants of the CNPE training course on the German repository programme with BGE and BGE TEC in Beijing



Dear business partners, dear readers, dear colleagues,

In this anniversary year, which marks the 25th anniversary of BGE TECHNOLOGY GmbH (BGE TEC), I have taken on the role of Managing Director together with Dr. von Berlepsch. I look forward to shaping the future of BGE TEC jointly with him, with

you, and with our highly committed and experienced team. My particular focus will be on commercial matters, complementing my responsibilities as Head of Finance and Accounting at our shareholder, BGE.

I would also like to express my sincere thanks to our predecessors in the management team. Throughout this anniversary year, they have shared valuable reflections in our newsletters, providing insight into the challenges, milestones, and defining moments of BGE TEC's 25-year history.

The anniversary celebrations culminated on 5 November 2025 in a symposium on geological disposal, followed by a small anniversary reception. Contributions from our guests and colleagues highlighted key aspects of international cooperation in repository development, the IAEA's perspective on disposal, the evolution of disposal research and selected technical milestones and projects of the past 25 years.

Following this year of reflection, I would like to conclude with a brief outlook. The current economic environment has become increasingly challenging due to geopolitical crises, including the war between Russia and Ukraine, and the resulting disruption of markets and international cooperation

in parts of Eastern Europe. In response, BGE TEC is working to broaden its portfolio in the medium term in order to remain resilient and competitive in the evolving disposal landscape.

Activities within the BGE organisational framework will continue to form a central pillar of our work. BGE TEC will further strengthen its core competencies in research and development, international cooperation, and the development of repository concepts. At the same time, our team intends to expand its expertise in selected adjacent technical and scientific fields and to further develop its engineering capabilities. These activities will also support the careful exploration of additional business opportunities beyond the Group structure.

We will report in greater detail on these developments in future editions of our newsletter.

I wish you continued success and good health and look forward to our ongoing cooperation.

Kind regards,

*Jörg Froböse
Managing Director BGE TECHNOLOGY GmbH*

25 Years of BGE TEC: Scientific Exchange and International Dialogue

BGE TECHNOLOGY GmbH (BGE TEC) celebrated its 25th anniversary with a scientific symposium, which was attended by around 120 guests, including former managing directors and long-standing colleagues. The event focused on technical developments, international cooperation, and the broader framework for geological disposal.

In various contributions, speakers highlighted the evolution of BGE TEC as a technology- and research-oriented subsidiary of BGE. Iris Graffunder, Chair of the Management Board of BGE, emphasised the company's strong international orientation and its role in the broader disposal community.

Dr. Thilo von Berlepsch, Managing Director of BGE TEC, explained that the company's achievements are based on the expertise and commitment of its employees, combined with the consistent strategic support provided by BGE over the years.

International cooperation emerged as a central theme. Emiliano Stopelli, Coordinator for International Cooperation at Nagra, outlined Switzerland's site selection process and the ongoing refinement of its repository concept, emphasising the importance of continued cross-border exchange.

Early research and development projects at BGE TEC were presented by Philipp Herold and Wolfgang Filbert. The topics ranged from the direct disposal of spent fuel elements to the engineering design of shaft hoisting systems for the underground transport of heavy waste containers. Ear-

ly experimental work demonstrated the safe handling of 65-tonne containers and showed that sustainable technical solutions depend not only on economic efficiency but also on verified quality and reliability.

Juliane Leonhard and Tilman Fischer presented current projects, demonstrating how increased computational capacity has fundamentally transformed methodological approaches. Today, simulations of emplacement techniques are largely conducted in virtual environments, which reflects the digital advancement of engineering practice.

Professor Klaus-Jürgen Röhligh highlighted the importance of socio-technical research, emphasising that geological disposal is not solely a technical challenge but also one shaped by public perception and societal acceptance.



Courtesy of GeoReN

2021

First virtual session of the 11th US-German Workshop on Salt Repository Research, Design, and Operation due to COVID-19 restrictions

Stefan Mayer of the International Atomic Energy Agency addressed cost estimation methodologies for repository projects and acknowledged BGE TEC's contribution to the development of international guidance in this field.

The symposium concluded with a lecture by astronomer and author Dr. Florian Freistetter on the "History of the Universe in 100 Stars". Reflecting on our perspective of the cosmos, he noted that while the total number of stars is vast, as many as 9,096 can be observed with the naked eye under ideal conditions. The evening concluded with a buffet dinner in a relaxed atmosphere.

The anniversary symposium thus provided a forum for scientific exchange and international dialogue, underscoring BGE TEC's continued commitment to research excellence and cooperation in the field of radioactive waste management.

KI-Stoff Update: AI-assisted Calibration of the VIBE Model

The KI-Stoff research project advances machine-learning methods for the automated selection and calibration of constitutive models for bentonite in repository applications. A current focus is the double-structure viscohydroplastic bentonite model (VIBE), which enables detailed representation of coupled thermo-hydro-mechanical behaviour.

Due to the large number of material parameters and the natural variability of bentonite, calibration of advanced models such as VIBE is time-consuming and sensitive to incomplete datasets. KI-Stoff therefore develops AI-assisted workflows for parameter identification, sensitivity analysis, and structured comparison of model variants, with the aim of improving reproducibility and reducing the gap between laboratory data and numerical simulation.

Implementation is carried out in the Open GeoSys (OGS) platform. The VIBE model is implemented in MFront and coupled via MGIS, which enables calibrated parameter sets to be directly applied in finite-element simulations for repository-relevant analyses.

2023

Renewal of the cooperation agreement between BGE, BGE TEC, and RWMC in Tokyo

KI-Stoff is a joint project of TU Braunschweig, TU Bergakademie Freiberg, and BGE TECHNOLOGY GmbH. The project runs from 2025 to 2028 and is funded by the German Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN) and managed by the Karlsruhe Project Management Agency (PTKA).

Launch of the KerWerk Research Project

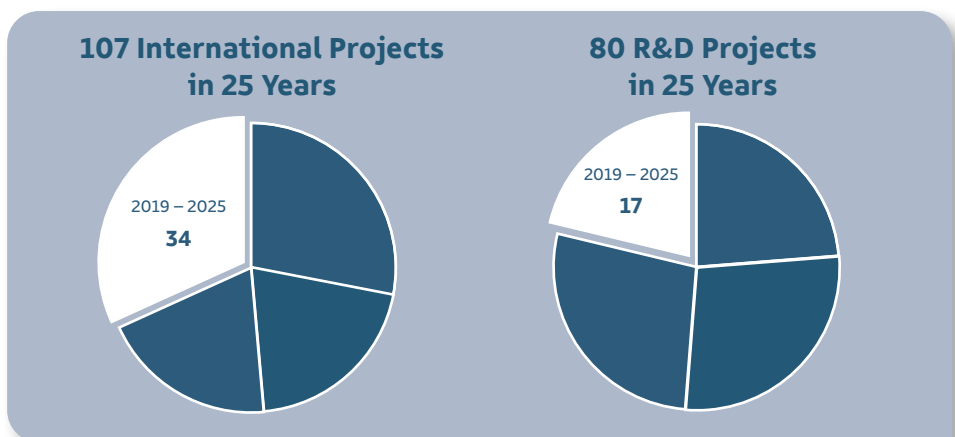
In December 2025, the research project "Investigation of the corrosion stability of silicon carbide ceramics under conditions relevant to geological disposal and derivation of potential container concepts" (KerWerk Stability) was launched. KerWerk is a joint project of the Fraunhofer Institute for Ceramic Technologies and Systems (IKTS) in Dresden and BGE TECHNOLOGY GmbH (BGE TEC) and is supported by BMUKN and managed by PTKA.

Technical ceramics, and in particular silicon carbide (SiC) ceramics, exhibit high corrosion

resistance under the anticipated conditions of geological disposal. Due to their extremely low diffusion coefficients for radioactive isotopes, they also provide an effective diffusion barrier for environmentally hazardous components of spent nuclear fuel. Consequently, they represent a promising candidate material for waste containers.

Despite these generally favourable material properties, reliable data on the long-term chemical-mechanical stability of ceramic materials under repository conditions are not yet available. Such data are essential for the development and engineering design of ceramic container concepts. The KerWerk project aims at closing this knowledge gap.

The required corrosion investigations are being carried out by Fraunhofer IKTS. BGE TEC will subsequently carry out an engineering assessment of the results and evaluate the suitability of the investigated ceramic materials for use as container materials.



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

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2023

Meeting between BGE TECHNOLOGY GmbH and KORAD representatives in the course of a HotBent meeting in Braunschweig



2024

BGE TECHNOLOGY GmbH staff visiting the construction site of Konrad Shaft 2, Germany's repository for low- and intermediate-level radioactive waste



2025

Meeting between BGE TEC and Egolesi representatives in Muscat to discuss cooperation on repository technologies

Following the reorganisation of the waste management sector in Germany, BGE TEC developed and implemented an independent quality management system and established a new organisational structure. At the same time, new actors in the R&D landscape and evolving international project structures required the company to adapt its R&D focus and establish new international partnerships. As a result, R&D activities at BGE TEC increasingly focused on developing and refining repository concepts for all three potential host rocks: rock salt, claystone, and crystalline rock.

For rock salt, research activities focused on resolving the remaining key questions concerning long-term sealing. In the joint projects KOMPASS and the ongoing MEASURES project, the compaction and sealing behaviour of crushed salt is investigated at the microstructural level and translated into model-based descriptions. Complementary projects such as UVERSTOFF addressed the mechanical behaviour of cement- and Sorel-based sealing materials, while STROEFUN and FUNGUS examined the evolution of permeability in the contact zone between sealing structures and host rock.

In parallel, significant methodological progress was achieved for claystone research. In the European Joint Programme EURAD, BGE TEC colleagues supported BGE and contributed to advances in modelling gas transport and THM coupling processes in claystone and bentonite. The models developed are currently being applied and refined in the HOTBENT and BENTEREST projects, which are supported by BGE. Validation against data from a long-running in-situ heater experiment conducted by NAGRA represented an important step towards enhanced predic-

tive capability under repository-relevant thermal loading.

For crystalline rock, the focus has been on establishing the methodological foundations for safety assessments under German boundary conditions. In the R&D projects CHRISTA I and II, a safety and verification concept for a repository in crystalline formations was developed. The particular challenge of demonstrating barrier integrity in fractured rock was addressed in the R&D projects SUSE, BARIK and PRECODE, which focused on developing modelling approaches that represent fracture systems realistically while reliably describing the anisotropic hydraulic and mechanical behaviour of the rock mass. A further key achievement of the PRECODE project was integrating the fracture inventory mapped in the Bedretto Underground Laboratory (CH) into a representative discrete fracture network (DFN), including methods to evaluate the fit of fracture orientations in the model against field observations. The project also included in-situ validation of injection materials and technologies for fracture treatment and investigated the transferability of established processes from salt to crystalline environments.

Beyond long-term safety analyses, technical development of emplacement and retrieval systems continued. In TREND, the development status of emplacement concepts across all host rocks was harmonised. Existing designs for drift and vertical borehole emplacement of POL-LUX® casks were revised in accordance with the current state of the art and regulatory requirements. The development process was accompanied by iterative risk assessments addressing operational safety.

The topic of retrievability, which had been examined in earlier project phases for salt and clay, was extended to crystalline host rock in the KOREKT project. The process steps for the retrieval of waste packages were defined, and thermo-mechanical analyses were carried out to assess the behaviour of backfilled emplacement boreholes and the expected underground conditions. The results demonstrated the technical feasibility of retrieval for the considered concepts and ensured methodological consistency across host rocks.

Container development also progressed further. Building on the systematic derivation of container requirements in Ko-BRA, the developed methodology was applied to different host rocks. This included the development of container concepts for a salt repository in the Netherlands, for a deep borehole concept in Norway, and for crystalline rock for BGE.

In addition to research on long-term safety, BGE TEC addressed questions of operational safety in repository mines. Engineering analyses were performed on seismic loading of underground installations, settlement processes in shafts, and the effects of fire on support structures. These investigations were carried out in close cooperation with BGE and contributed to the technical robustness of repository concepts.

Although radioactive waste disposal in Germany is to take place in deep geological formations, BGE TEC is further developing solutions for near-surface repositories for LILW. Projects in the Middle East focus on early concepts and safety analyses for such facilities, accompanied by training courses. BGE TEC staff members also provide training courses for DGRs, for example within IAEA training programmes or at universities.