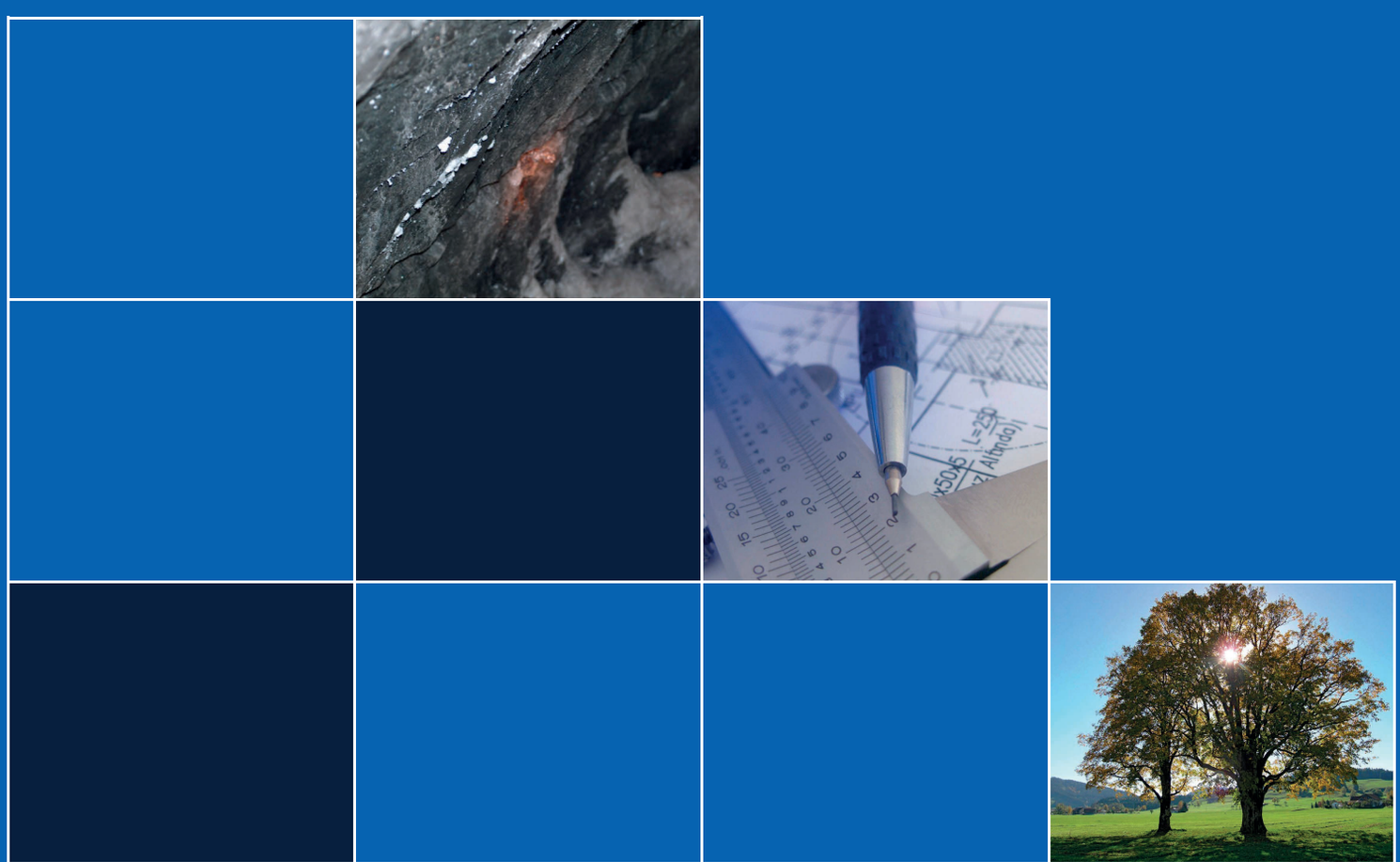
Brenk Systemplanung

Consulting Engineers & Scientists

Consultancy in Disposal of Radioactive Waste



INDEPENDENT – RELIABLE – INNOVATIVE

Made in Germany

From site selection and conceptual planning ...

Conceptual planning
The Netherlands

In The Netherlands the Centrale Organisatie Voor Radioactief Afval (COVRA) is responsible for the collection, treatment, storage and disposal of radioactive waste. Within the conceptual phase of the geological disposal process, the Dutch research programme Onderzoeks Programme Eindberging Radioactief Afval (OPERA) has been initiated, focusing on the conditional safety cases for a generic repository in the host rock formations Boom Clay and Zechstein rock salt.

Examples of our work:

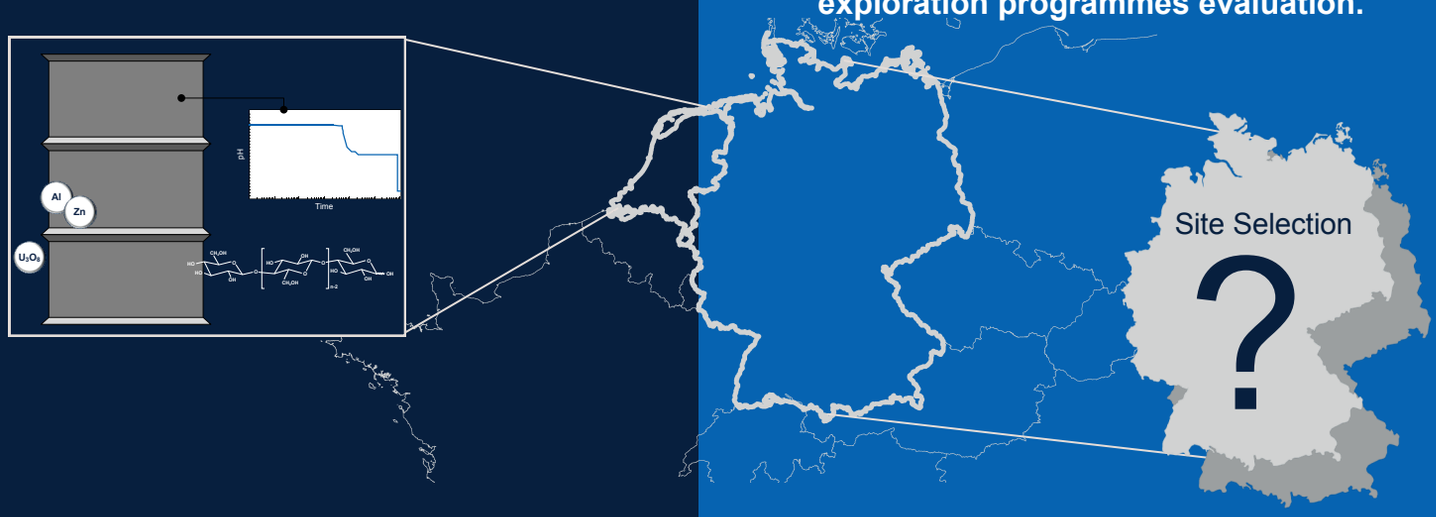
- **identification of degradation processes and products of low- and intermediate-level waste,**
- **quantification of safety-relevant parameters,**
- **investigation of ranges for corrosion and release rates from vitrified waste and spent nuclear fuel of safety-relevant radionuclides.**

Site selection process
Germany

Within the framework of the site selection process for a repository for high-level radioactive waste in Germany, the surface exploration programmes, proposed by the Federal Company for Radioactive Waste Disposal (BGE), are of major importance for the safety analyses and for the selection of the sites to be explored underground subsequently. The Federal Office for the Safety of Nuclear Waste Management (BfE) reviews and evaluates the aboveground exploration programmes.

Examples of our work:

- **determination of the relevant aboveground parameters in the German Repository Site Selection Act,**
- **assignment of exploration methods to parameters in accordance with the state of the art in science and technology,**
- **development of an orientation framework, supporting BfE in the proposed exploration programmes evaluation.**



Exploration and Planning

Selecting and designing future repositories for radioactive waste requires highest standards of scientific and technical know-how.

In the earliest stages of disposal projects we provide benchmarking studies to identify and assess the state of the art in science and technology for near-surface and deep geological repositories.

Considering the geological settings of the given host rock formation, we offer technical assistance within the framework of the site selection process.

We conduct safety analyses and ensure compliance with the respective safety requirements for conceptual and existing repositories by

- implementation and evaluation of radiological modelling,
- evaluation and calculation of exposure pathways,
- assessment of the pollutants or contaminants transport in groundwater and the atmosphere.

One of the challenges when planning a repository is matching the requirements of both mining and radiation protection regulations according to the respective national legislative framework, laying the foundation for a successful application and licensing process.

We are experienced specialists both in mining and radiation protection and can therefore provide a combined expertise for our customers.

During the planning and licensing process, a careful and complete documentation is essential and serves for quality assurance. For this we offer our customers standardized as well as tailor-made solutions to ensure an effective project flow.

… through a safe and efficient waste management …

Konrad Repository
Germany

The Konrad repository is a former iron ore mine with a licence granted for the construction and operation as a deep geological repository for radioactive waste with negligible heat generation. The total volume to be stored amounts to 303,000 m³.

Examples of our work:

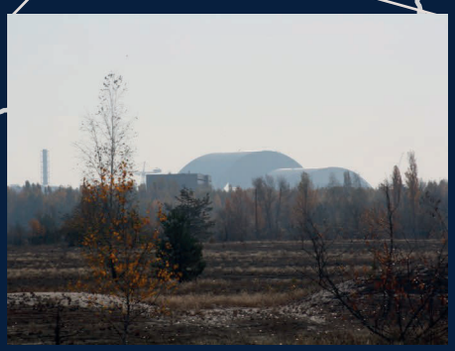
- **support in the compilation of the documentation for application and licensing processes and approvals according to mining law,**
- **consult in the fields of mining and technical measures in re-engineering procedures throughout the conversion process into a repository for radioactive waste,**
- **simulate the acceptance and emplacement process taking into account the entirety of all boundary conditions.**

Chernobyl Exclusion Zone
Ukraine

Funded by the European Commission a project (U4.01/10 C D F) has been initiated for the support of Ukraine regarding the management of radioactive waste resulting from the Chernobyl NPP accident in the territory of the Chernobyl Exclusion Zone (ChEZ).

Examples of our work:

- **accomplish individual safety assessments for makeshift disposal sites for radioactive waste (including contaminated topsoil from fallout) and near-surface disposal facilities in the ChEZ,**
- **combine all source terms into a comprehensive safety assessment for all relevant exposure pathways,**
- **conduct capacity building for the beneficiary's personnel to perform their own safety analyses in future.**



Operation and Optimisation

The operation of a repository is subject to ongoing monitoring and optimisation measures. We therefore offer both the operators and supervising authorities a comprehensive project management support including

- documentation as well as content management,
- implementation and evaluation of environmental and radiation monitoring programmes,
- mine water control measures,
- support in licensing procedures.

Within the scope of operational safety, we develop concepts for

- the emergency management and procedures,
- occupational health and safety and
- escape ways.

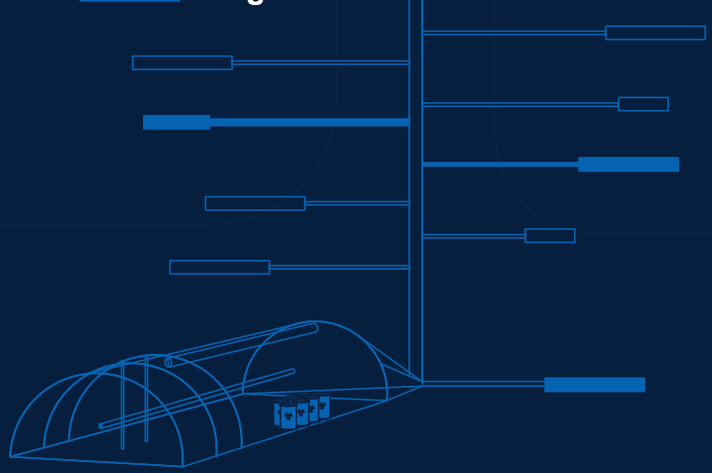
We ensure our clients to be able to optimally monitor both the operating procedure and the radiation exposure from the beginning of operation.

For the sustainable optimisation of operational processes before and during the operation of a repository, we offer our support both in the organisational optimisation of

- capital and operational costs,
- shift plans and scheduling,
- logistics of hoisting and transports

and in the technical optimisation of

- barrier and design concepts,
- ventilation systems and
- backfilling methods.



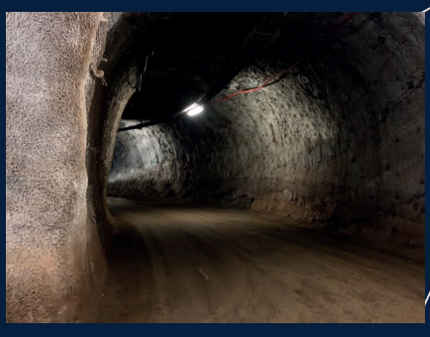
… to a final stage of long-term safety.

Asse II mine
Germany

The Asse II mine is a former potash and salt mine, which was used to test the handling and storage of low- and intermediate-level radioactive waste in a repository between 1967 and 1978. About 47,000 m³ of radioactive waste were emplaced. Due to brines entering the mine and stability concerns, the facility is to be decommissioned once the radioactive waste has been retrieved.

Examples of our work:

- **execute various tasks in the field of radiation protection, measuring techniques and working procedures,**
- **perform source-term calculation for the long-term release of radionuclides,**
- **supervise the planning and verification of decommissioning activities,**
- **assess the consequence analyses,**
- **evaluate concepts for waste retrieval.**

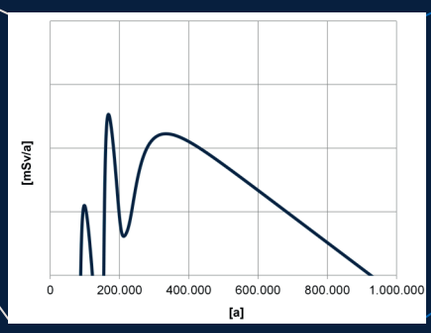


Repository Morsleben
Germany

The Morsleben repository was the central repository for low- and intermediate-level radioactive waste in the former GDR.
In the previous potash and rock salt mine a total volume of 36,754 m³ of radioactive waste is stored in the caverns. The operation of the repository has currently been reduced to keeping the mine open. Once the planned closure has been licensed, decommissioning works will start.

Examples of our work:

- **support the licensing authority in the plan approval procedure,**
- **deliver expert judgements in accordance with § 20 of the German Atomic Energy Law,**
- **check compliance with the dose criteria by means of forecasts of the radiation exposure of the population,**
- **conduct integrated modelling to detect threats on long-term safety for an effective planning and technical countermeasures,**
- **evaluate possible discharges of non-radioactive substances into the groundwater.**



Decommissioning and Closure

A responsible closure concept for a repository must take into account the respective geological, geotechnical, mining and long-term safety requirements and has to fulfil the defined protection targets.

For a reliable waste management we evaluate and document the existing and future waste inventory. This also includes a comprehensive clearance management, where we offer

- the planning and performing of clearance measurements for materials and buildings,
- software support systems for the clearance process,
- the planning and implementation of decontamination and disposal measures and
- the planning and monitoring of decommissioning activities.

In the context of analysing the safety of radioactive waste treatment, conditioning, storage and disposal sites, it is necessary to investigate whether an acceptable level of protection of human health and the environment will be achieved both now and in the future.

We carry out safety assessments for the analysis of the long-term behaviour of nuclear facilities and installations, including repository systems, under various load situations, taking into account data uncertainties, malfunctions and possible development scenarios.

We follow the developments of the state of the art in science and technology with regard to the relevant safety requirements and safety assessments in order to maintain our high standards for our clients.

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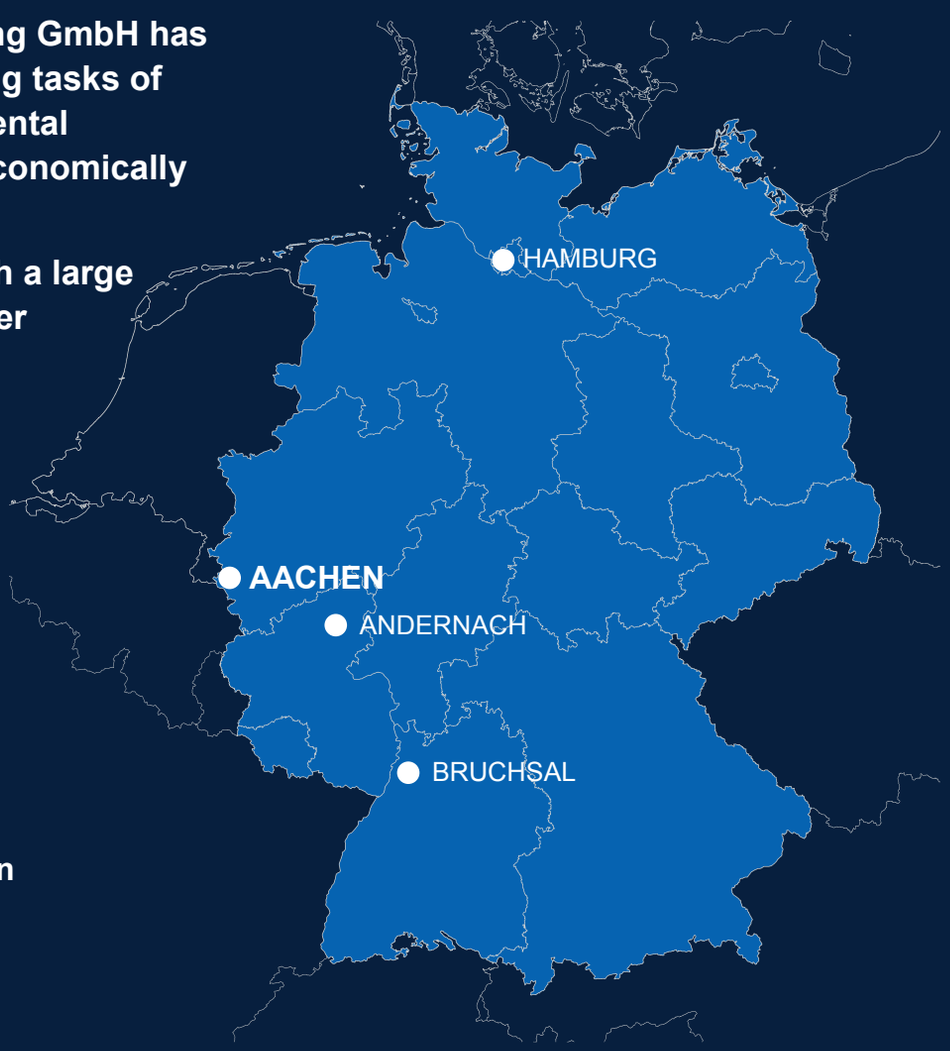
Since 1979 Brenk Systemplanung GmbH has been dedicated to the demanding tasks of mining, radiation and environmental protection as a politically and economically independent expert company.

As an interdisciplinary team with a large know-how and expertise, we offer our customers innovative and reliable all-round services.



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