

# DBE TECHNOLOGY NEWS

2017

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Verantwortung  
für Generationen  
Responsibility  
for Generations

**DBE TEC**  
DBE TECHNOLOGY GmbH



Participants of the IAEA workshop at our headquarters in Peine, May 2017



*national large-scale projects play a major role. These activities give us the opportunity for a direct exchange of experience and an active contribution to the advanced international state of the art in science and technology.*

*As usual, this leaflet also provides an overview of some of our recent corresponding activities. If they pique your interest and/or raise any questions, we would appreciate hearing from you.*

*Happy reading!*

*Dr. Jürgen Krone  
Managing Director  
DBE TECHNOLOGY GmbH*

## Current Restart of the German Radioactive Waste Management

In connection with the decision on the nuclear phase-out, the parties represented in the German parliament jointly agreed to interrupt the exploration of the Gorleben salt dome and to start a new site selection process for an HLW/SNF repository. One reason was to overcome the public and political controversies on the suitability of the Gorleben site that has provided the hotspot of the public debate on nuclear power for almost four decades. Thus, the German parliament adopted a site selection act (StandAG) in 2013 that aims at selecting the most suitable site in terms of safety for at least one million years in a scientifically sound, fully transparent process with appropriate involvement of the public. In a first preparatory step, a 33-person commission of politicians, various representatives of the society (e.g. church,

unions, NGOs) and eight scientists was established in order to specify the selection criteria and procedure and to assess the StandAG. Based on the commission's report, a revision of the StandAG was adopted at the end of March 2017.

At the same time, it became obvious that the complicated interfaces between the Federal Office for Radiation Protection (BfS), which has the governmental responsibility for radioactive waste disposal and concentrates all decision making competences, and the state-owned Asse-GmbH, which operates the Asse mine, and DBE TECHNOLOGY GmbH's shareholder DBE, which operates the other federal disposal projects, have considerable scope for improvement. Thus, a new state-owned corporation, "Bundesgesellschaft für Endlagerung mbH (BGE)", was established in fall 2016. It is to incorporate the full governmental responsibility and competences as well as all necessary personnel and technical resources for successfully implementing all federal radioactive waste disposal projects.



Organizational transitions regarding radioactive waste disposal in Germany

In a first step, BfS's responsibility for implementing federal radioactive waste disposal projects as well as its corresponding operational units were transferred to BGE on April 25, 2017. Before the end of this year, Asse-GmbH and DBE are to be merged with BGE. Therefore, 3 of the

4 DBE's shares that are still owned by the utilities will be transferred to the state, likely within the next weeks.

To better separate the regulatory and supervisory functions from the implementer activities, a new radioactive waste management regulator, the "Bundesamt für kerntechnische Entsorgungssicherheit" (BfE), has been established and BfS' former self-supervision unit has been transferred to BfE.

Taking into account financial weaknesses resulting from the nuclear phase-out and the new site selection programme, revisions of the legal basis for radioactive waste management funding were adopted as well. According to this, the utilities will transfer their financial provisions made for radioactive waste disposal plus a safety margin of 30 %, in total 23.3 Bill. €, into a dedicated governmental fund. In turn, their responsibility and financial liability will be limited to delivering their waste to interim storages, whereas HLW and SNF shall be placed into casks suitable for interim storage and L/ILW shall be conditioned, packaged and declared in accordance with the waste acceptance criteria for the Konrad repository, which is being constructed. The interim storage facilities, operated so far by the utilities, will be taken over by a new dedicated state-owned corporation, starting with the centralised interim storage facilities in Gorleben and Ahaus, which are currently owned by GNS, before the end of this year.

In summary, German radioactive waste management is facing significant changes in the next weeks and months. Fortunately, these changes are based on a wide political consensus and all respon-

sible actors declared their commitment to using the chances that these changes offer. Thus, BGE's CEO, Ursula Heinen-Esser, expressed the willingness to start the new site selection process without any undue delay in order to publish the first report on the regions that will be considered suitable for selecting sites for surface investigations before the end of the next election period to the German parliament in fall 2021.

## Study on the Availability of Cement Suitable for Disposal Purposes



Slump test for concrete analysis

Methods for conditioning liquid and dry radioactive waste can be its immobilization, solidification or encapsulation by means of cement mixtures. Considering the availability and quality of the raw materials, the requirements of the regulatory framework, and the specific conditions of the waste disposal cycle, a range of mixtures of cements, reactive additives, and fillers can be used.

In the last decades, the percentage of products containing latent hydraulic, pozzolanic or limestone filler has steadily increased. Moreover, innovative products have been developed, such

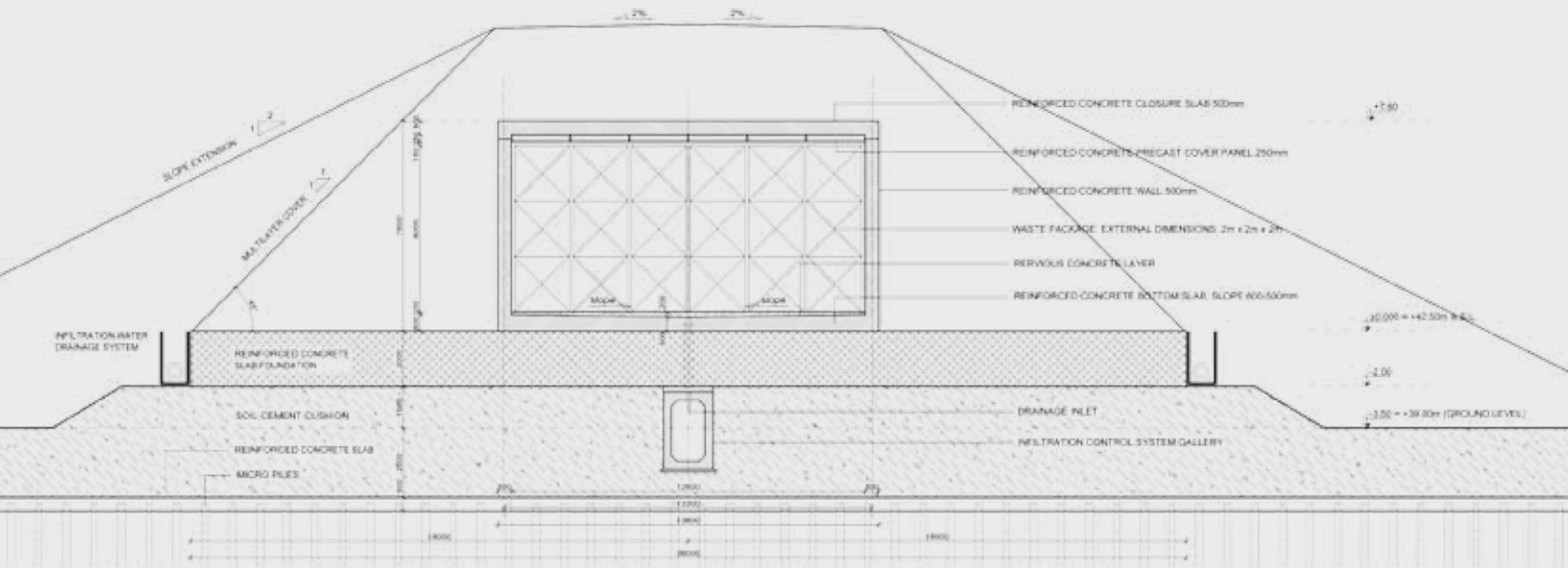
as super-plasticisers, to allow the large-scale application of ultrahigh performance and self-compacting concrete. This progress influenced the revision and the definition of standards.

NDA contracted DBE TECHNOLOGY GmbH as part of a consortium led by EDEN Nuclear and Environment, UK, with a multiphase study to analyze the development in the building sector and the availability of suitable cement compositions for encapsulation purposes. The aim of the first phase of the study is to gain an overview of the practice. Then, the requirements on the cement compositions are to be summarized, taking into account the different disposal strategies in the European countries. The scope and characteristics of the quality assurance programs and the approaches in case of an occurrence of non-conformities are reviewed as well. The aim is to make it possible to identify the need of material optimization and to guarantee a future availability of adequate high-quality cement compositions.

## Retrievability Strategy for the Belgian Repository Concept

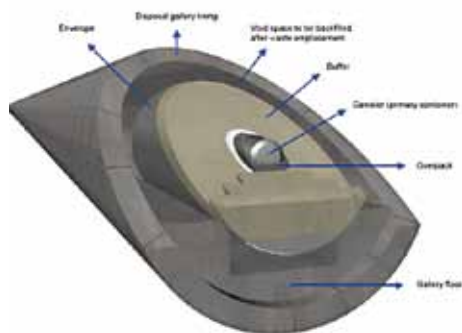
According to the Belgian disposal concept, low- and intermediate-level waste will be conditioned in concrete monoliths and high-level waste in so-called supercontainers. In the disposal galleries of the Belgian disposal facility, a trench as roadway and lateral surfaces for laying down the waste packages are provided. The system allows the reversal of the process and the safe return transport of emplaced monoliths and supercontainers until the voids will be backfilled. Thereafter, a sickle-shaped backfill body exists around the upper part of the

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Concept for disposal vault (Iraq Project)

waste packages and the filled trench of the gallery floor.



Supercontainer Concept (Source: ONDRAF-NIRAS)

Retrieval requires the establishment of safe work conditions and the removal of the narrow backfill bodies over a range of about 3 m (monoliths) to more than 6 m (supercontainers). Thus, a study was carried out to identify a suitable state-of-the-art technology. Initially, techniques commonly used in the building and mining industry were compiled and grouped according to their kind of impact on the backfill. Within the scope of a benefit analysis, a catalogue of evaluation criteria was used to develop a ranking of the techniques. For example, criteria related to the space requirements of the machines and their tools, their potential to damage the waste packages and the surrounding structures, and the

removability and amount of the residues. For reasons of workers' safety, cable- and remote-control-systems are favored. Milling is a preferred option. Based on these findings, a basic concept for waste package retrieval was developed. Using the specified technologies and procedures, the operational safety and the technical realization of waste retrieval can be assured.

## Development of a Design of a Radioactive Waste Repository in Iraq

DBE TECHNOLOGY GmbH, as part of a Consortium of western companies, is supporting the European Commission's efforts to address the urgent need for a low-level radioactive waste (LLW) repository in Iraq. The disposal facility is needed as part of ongoing nuclear facilities' decommissioning and remedial clean-up efforts initiated to address contamination resulting from military attacks and subsequent looting that occurred during the two Gulf Wars.

The largest nuclear site is located at the Al-Tuwaitha Nuclear Center near Baghdad, where a total of 18 nuclear facilities are at various stages of decommissioning. Because of the ongoing security concerns in Iraq, the Iraqi Ministry of Science and Technology selected the

well-fortified Al-Tuwaitha site as the best suited location for developing the needed LLW repository. The disposal facility is considered as an intervention measure, designed to address the urgent waste disposal needs.

DBE TECHNOLOGY GmbH is responsible for developing the conceptual-level basic engineering design for the repository as well as the preliminary and intermediate safety assessments. Based on the results of an international review of disposal options conducted by DBE TECHNOLOGY GmbH, the project beneficiaries and end-users selected a near-surface concrete vault-type facility for the site.

The Al-Tuwaitha site is not ideal from a conventional site selection perspective. The Tigris River is only about a kilometre away from Al-Tuwaitha, and the proposed site location lies within the potential flood plain of the river. As a result, the base level of the facility will need to be raised to ensure a safe distance above a potential future flooding event. To provide the necessary clearance and to ensure a stable foundation, the facility will be constructed upon a raised platform constructed from a 4-m-thick soil-cement cushion upon which a 2-m-thick concrete foundation slab will be poured prior to construction of the disposal vaults.

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