

Verantwortung für Generationen Responsibility for Generations



## **IN FIGURES**



**COSTS OF PURCHASED** SERVICES (MILLION EUR)



PERSONNEL **EXPENSES** (MILLION EUR)



**EXPENSES** (MILLION EUR)

1.2

1.2

**OTHER OPERATING** 



2012

2013

2



**EMPLOYEES** 



0.6



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## **EXECUTIVE BODIES**



#### MANAGEMENT

#### Managing Director:

Dr. Jürgen Krone, Peine (as of 1.7.2013)

## Commercial Director:

Dipl.-Kfm. Borries Raapke, Peine (until 30.6.2013)

## Technical Director:

Assessor d. Bergfachs Michael Ripkens, Peine (until 30.6.2013)

### ADVISORY BOARD (until 30.6.2013)

**Dr. Hannes Wimmer** Chairman Chief Executive Officer, GNS Gesellschaft für Nuklear-Service mbH, Essen

Georg Büth Managing Director, GNS Gesellschaft für Nuklear-Service mbH, Essen

Henry B. Cordes Chief Executive Officer, Energiewerke Nord GmbH, Rubenow

#### EXPERT CONSULTANTS TO THE ADVISORY BOARD (until 30.6.2013)

**Dr. rer. nat. Klaus-Jürgen Brammer** GNS Gesellschaft für Nuklear-Service mbH, Essen

**Franz-Gerhard Hörnschemeyer** Trade Union Secretary, IG Bergbau, Chemie, Energie, Hanover





Dear Reader,

In its 13th year of existence, DBE TECHNOLOGY GmbH can again look back on a very successful year. This is no coincidence but is rather due to the expertise and commitment of our employees. Nevertheless, 2013 brought several noticeable changes.

In our international business, this year's successful collaboration in a consortium led by the Belgian consultancy and engineering company Tractebel GDF Suez, which was commissioned with designing the French geological repository CIGÉO, marked the change from small studies and consultancy services of our early years to a significant involvement in major repository projects.

In research and development, the trend from stand-alone individual projects to participating in and leading integrated joint research projects has reached a new dimension. In other advanced countries, the scientific and technical know-how in radioactive waste disposal is concentrated in national organisations responsible for radioactive waste disposal, whereas in Germany, this know-how is spread over a number of differently structured research institutes. In order to support and further develop the collaboration of these research institutes in an independent merger against a new German law that stipulates a complete restart to implementing a repository for heat-generating radioactive waste, DBE TECHNOLOGY GmbH was one of the initiators and original members of the Deutsche Arbeitsgemeinschaft Endlagerforschung (DAEF), a German association for repository research, which was founded in January 2013.

Regarding assistance to Asse-GmbH, the work of DBE

TECHNOLOGY GmbH in 2013 focused again on the implementation of a hazard prevention and emergency concept and related planning activities. For the first time, the work included tasks regarding the legally stipulated rapid retrieval of the radioactive waste emplaced in the Asse mine.

Due to budgetary constraints, WAK GmbH – after a decade of successful collaboration – regrettably terminated the contract for the preparation of radioactive waste documentation.

Nevertheless, DBE TECHNOLOGY GmbH has orders on hand for several years. The positive overall performance convinced the management board of our sole shareholder DBE and its shareholders to make organisational changes. After completing its mission, the advisory board, which had been founded to support and control business developments in our initial years, discontinued its activities as at June 30, 2013. As the supervisory activities are now in the hand of the management of DBE, its dual role as management of DBE TECHNOLOGY GmbH and DBE was discontinued, and the management of DBE TECHNOLOGY GmbH was transferred to me.

In this context, I would like to thank the managing directors of DBE and the members of the advisory board both for the trust they have shown in me and for their outstanding contribution to the development of the company. Their support in the future would be very much appreciated.

Special thanks go to our various business partners and clients as well as to our employees who jointly contributed to our success.

Although public recognition is often hard to come by in Germany, we continue to see the focus of our activities, i.e., the final disposal of radioactive waste, as a motivating challenge that places enormous responsibility on us. We are pleased to be part of a cooperative effort that goes well beyond the boundaries of our small company and our country, working together in an interesting, interdisciplinary field on managing tasks that extend in an unprecedented manner well into the future.

Dr. Jürgen Krone

Managing Director DBE TECHNOLOGY GmbH

## **COMPANY PROFILE**

## **EXPERTISE** AND KNOW-HOW

DBE TECHNOLOGY GmbH was established in the year 2000 as a 100 per cent subsidiary of Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mbH (DBE, *German Company for the Construction and Operation of Waste Repositories*) in order to focus and further develop the scientific and technical know-how of DBE and to make it available to interested parties both nationally and internationally. Since its founding 13 years ago, DBE TECHNOLOGY GmbH has rapidly become a nationand international research projects. The company's main fields of activity today include waste disposal strategies and activities, site characterizations and evaluations, concept, design, safety, and engineering of repositories, and their closure.

On behalf of German research institutions and energy supply companies, DBE TECHNOLOGY GmbH provides services in the field of radioactive waste management,



Members of the Belgian consultancy and engineering company TRACTEBEL GDF SUEZ visiting the Konrad mine

ally and internationally recognized engineering company in the area of radioactive waste disposal.

Its activities are based on over 30 years of experience gained by its parent company in German nuclear waste repository projects as well as on the know-how gained through over 25 years of collaborative efforts in national e.g., support in collecting and documenting waste data and demonstrating that the waste packages destined for the Konrad repository meet the corresponding technical acceptance criteria.

In Germany, the legal requirements for licensing a repository stipulate that the technical feasibility of the equipment



and components to be utilized in the repository and of the intended operational processes be demonstrated before a license is granted. DBE TECHNOLOGY GmbH developed the systems and components required for operating a repository in salt, which were subsequently tested until ready for approval.

DBE TECHNOLOGY GmbH develops safety concepts for the operating and post-operating phases of repositories and plans corresponding safety measures. In this context, the company was involved in a preliminary safety analysis of a potential repository for spent fuel elements and highlevel waste in a salt formation that used the Gorleben salt dome as an example. Within the scope of an R&D project, the company also develops a safety case for a repository in clay. Thorough sealing of subsurface repositories is essential for ensuring the long-term safe isolation of radioactive waste. In this context, the company develops sealing concepts that are adapted to the site-specific requirements, to the radionuclide inventory destined for disposal, and to the disposal concept.

Throughout the world, DBE TECHNOLOGY GmbH advises and supports public and private energy, waste disposal,

and mining companies as well as testing organizations and governmental authorities in all issues concerning the disposal of radioactive waste, mining, and other related technical fields. Furthermore, the company develops and tests new materials, processes, and machinery for their practical application in repositories.

DBE TECHNOLOGY GmbH participates in research projects in underground laboratories in clay and claystone in Mont Terri (Switzerland) and Bure (France), and in crystalline rock in Grimsel (Switzerland) and Äspö (Sweden). Based on the knowledge gained in these projects, the company develops and analyses repository concepts for various host rocks (crystalline rock, clay, lime, and salt) and waste types (high-level, intermediate-level, and low-level radioactive waste). Furthermore, the company reviews repository concepts of other waste management organizations and gives recommendations for optimization measures.

Based on its comprehensive know-how, the company supports governmental institutions in the development of national waste management strategies and gives recommendations for corresponding financing strategies and pertinent legislation.

## **EVENING** OF ARTS AND SCIENCES

This year's Evening of Arts and Sciences, which took place on September 26, again provided colleagues and business partners with the opportunity to exchange ideas in a relaxed and informal atmosphere. Approximately 130 guests from 34 companies, research institutes, and government institutions attended the event. The evening started with a very interesting guest lecture by Dr. Thomas Petersen of the renowned Allensbach Institute for opinion and market research on risk perception and the relationship between science, media, and the general public - a topic that lead to lively discussions among the audience. Entertainment was provided by the Brägenwoost Bratters Orchestra from Hanover and their foot-tapping jazz music. The evening continued with an informative, yet casual exchange between the guests who came from greatly varying backgrounds both from Germany and from abroad.



Brägenwoost Bratters Orchestra and their foot-tapping jazz music

## **RESEARCH AND DEVELOPMENT**

### ASTERIX

## CONSEQUENCES OF RETRIEVABILITY FOR EXISTING REPOSITORY CONCEPTS AND REQUIREMENTS FOR NEW CONCEPTS

The aim of the R&D project ASTERIX, which was funded by the Bundesministerium für Wirtschaft und Energie (BMWi, *Federal Ministry for Economic Affairs and Energy*), was to assess if waste container retrieval, a requirement stipulated in the "Safety Requirements Governing the Final Disposal of Heat-Generating Radioactive Waste",



Test to demonstrate the feasibility of emplacing spent fuel canisters in vertical boreholes

is technically feasible and to identify potential conflicts of retrievability with other requirements for repository safety. Furthermore, the consequences for repository concepts already existing for different host rocks were to be assessed.

As the Safety Requirements are to be considered as legally binding licensing requirements, the technical systems and related operational and safety measures have to be state-of-the-art, which has to be demonstrated within the scope of a licensing procedure. This requirement remains in effect even taking into account the new *Repository Site Selection Act* (Standortauswahlgesetz, StandAG), which entered into force in summer 2013.

For the three host rock types to be considered in Germany – rock salt, claystone, and crystalline rock – an assessment was carried out as to whether retrievability is feasible, taking into account the requirements specific to the particular host rock.

In rock salt, re-excavating backfilled disposal drifts and exposing waste containers (re-mining concept) is easily technically feasible and has no influence on the safe containment of the radioactive waste. Due to the rock stability, no extensive support systems are necessary during retrieval, however, the high temperatures in the disposal areas require a sufficiently effective ventilation and cooling system. Using corresponding excavation strategies and modified emplacement devices, retrieval of waste containers would be possible in the concepts proposing disposal in drifts and horizontal boreholes. The concept proposing disposal in vertical boreholes includes measures to facilitate retrieval (borehole liners, modified canisters) so that retrieval would be possible by reversing the emplacement process.

Retrieving waste canisters from a repository in claystone would require a modification of the re-mining concept because in clay all mine openings would have to be stabilized by means of support constructions. The disposal drifts are to be backfilled with clay material. Two aspects need to be studied in more detail as regards their relevance to safety: The removal of the backfill material and the stability of the support constructions, i.e., whether they remain in place or have to be removed.

Due to the advantageous rock mechanical properties, the retrieval of waste canisters from repositories in crystalline rock is generally possible. In this context, a workflow description has been prepared and the retrievability-related requirements for the repository design have been compiled.

The project demonstrated that retrieval of waste canisters from repositories in different host rocks is generally technically feasible. To put these concepts into practise, more detailed studies and demonstration tests are necessary.





Analysis of the characteristics of a potential site in rock salt

## **RESEARCH AND DEVELOPMENT**

## SAFETY CONCEPT AND SAFETY DEMONSTRATION CONCEPT

FOR A HLW REPOSITORY IN SALT

Within the scope of the R&D project ISIBEL (*Review and Appraisal of the Tools available for a Safety Assessment of Final Repositories for HLW*), which is funded by Bundesministerium für Wirtschaft und Energie (BMWi, *Federal Ministry for Economic Affairs and Energy*), the state of the art in final disposal of high-level radioactive waste in German salt formations was assessed. scientific and engineering data are combined with the results of iterative safety assessments in order to increase the transparency and traceability of the analysis. The new safety concept, which was developed within the scope of the ISIBEL project, takes into account the advantageous properties of the rock salt and is based on the safe containment of the radioactive waste in a particular part



of the rock – the so-called isolating rock zone. The isolating rock zone comprises the rock mass, the geotechnical barriers, and the compacted crushed salt in the backfilled mine openings.

The analysis of the future evolution of the repository system is

based on the identification of all relevant features, events, and processes (FEP), the scenario development, and numerical analyses. The safety analysis is based on analyses of the integrity of the geologic and geotechnical

Repository concept – tailored to the Gorleben site – for the emplacement of waste in boreholes. Right: Emplacement device and transport equipment

In Germany, salt formations have been favoured as host rock formations for the final disposal of high-level radioactive waste for more than 40 years. During this time, comprehensive geological surveys have been carried out, also in combination with a broad range of conceptand safety-related R&D studies. Within the scope of an assessment of the system as a whole, the behaviour of a HLW repository in a salt dome was studied. First, generic concepts, later, site-specific concepts (Gorleben example) were analysed. The technical feasibility was demonstrated, and the operational and long-term safety were assessed. Numerical simulations play an important role in a comprehensive safety assessment of a repository. In an integrated approach, the repository concept and major barriers, on an analysis of the crushed salt compaction, and on assessments of potential radionuclide releases.

Within the scope of the Preliminary Safety Analysis Gorleben, the ISIBEL methodology was developed further and applied to the conditions specific to the Gorleben site. In this context, the new safety requirements issued by Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU, *Federal Ministry for the Environment, Nature Conservation and Nuclear Safety*) were taken into account. The results of the study show that the construction of a safe repository for HLW is possible in a suitable salt dome. Long-term safety can be demonstrated based on the state of the art in science and technology.



## **CONSEQUENCES OF PARTITIONING AND TRANSMUTATION (P&T)** FOR REPOSITORY CONCEPTS AND LONG-TERM SAFETY OF REPOSITORIES FOR HEAT-GENERATING RADIOACTIVE WASTE

On behalf of Bundesministerium für Wirtschaft und Energie (BMWi, *Federal Ministry for Economic Affairs and Energy*), 12 expert organisations led by Karlsruhe Institute for Technology (KIT) and the University of Stuttgart prepared a study on Partitioning and Transmutation (P&T). Within the course of this study, scientific and technological aspects as well as socio-scientific, ecological, and economic issues were analysed. The aim of the spent fuel from research/prototype reactors, for the waste generated in the P&T processes and for shells and structural components from the dismantling of fuel assemblies and from the final loading of the transmuter.

• Irrespective of the reduction in waste volume resulting from P&T processes, 50 % of the repository footprint currently planned in a preliminary safety analysis would



Flowchart of spent fuel management applying transmutation (source: ACATECH)

study was to prepare a detailed report on the state of the art in P&T technology and to identify its potentials, opportunities, and risks. In this context, several social development scenarios were identified, and the respective consequences were compared with each other.

DBE TECHNOLOGY GmbH and Gesellschaft für Anlagen- und Reaktorsicherheit mbH (Brunswick) were involved in a major way in the evaluation of the consequences of P&T on repository concepts and the longterm safety of repositories. The results were:

• Even if P&T technology was applied, a repository for heat-generating waste would still be needed to dispose of already existing waste from reprocessing, including

• In a repository in salt, relevant radionuclide releases via a solution path are not expected (see the results of the "Preliminary Safety Analysis Gorleben"). P&T processes are most suited to transmute radionuclides that are less relevant to long-term safety while transmutation may even increase the amounts of relevant fission and activation products.

ditional repository.

• To be able to assess all the consequences of P&T including the additional repository for the secondary waste resulting from P&T. For long-term safety reasons, codisposal of heat-generating waste and secondary waste in the same repository is not advisable.

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## **RESEARCH AND DEVELOPMENT**

### MoDeRn

# MONITORING DEVELOPMENTS FOR SAFE REPOSITORY OPERATION AND STAGED CLOSURE

The successful implementation of a programme for a repository for radioactive waste relies not only on technical aspects such as scientific and engineering excellence and a sound strategy to ensure safety but on societal aspects such as stakeholder acceptance and confidence as well. Monitoring is considered key in serving both ends. It not only supports the technical safety strategy and quality of the engineering but can also be an important tool for public communication, thus contributing to public understanding of and confidence in the projected repository behaviour.

Until recently, an internationally accepted reference framework for repository monitoring had not been available. Within the scope of MoDeRn (Monitoring Developments for reference framework describes the international understanding of how monitoring of a repository can be carried out. It takes into account the different national contexts and regulations, describes the common view regarding objectives and implementation strategies, and gives recommendations for involving the public, especially local stakeholders.

In accordance with the safety requirements governing the final disposal of heat-generating radioactive waste issued by Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU, *Federal Ministry for the Environment, Nature Conservation and Nuclear Safety*), each repository operator in Germany is required to implement a monitoring programme that provides relevant metrological information



Members of the MoDeRn project group

safe Repository operation and staged closure), a collaborative research project jointly funded by the European Commission and the *German Federal Ministry of Economics and Technology* (BMWi), 18 European partners, including DBE TECHNOLOGY GmbH, as well as Sandia National Laboratories (USA) and RWMC (Japan) have developed such a reference framework for the very first time. The during the operational phase and for a pre-defined duration after repository closure. During MoDeRn, a basis for assessing which technical means can be used to gather information on the condition of a closed repository without impairing the safety of the barriers was developed. More information can be found on the website of the MoDeRn project (www.modern-fp7.eu) or in the various project reports.





Laboratory, development of construction materials

## **INTERNATIONAL PROJECTS**

### **TECHNICAL DESIGN FOR THE NATIONAL DISPOSAL FACILITY**

FOR RADIOACTIVE WASTE AT KOZLODUY, BULGARIA

To safely manage the radioactive waste from nuclear power plant operation and early decommissioning of the four WWER 440-V230 reactors of the Kozloduy NPP (KNPP), Bulgaria intends to erect a near-surface disposal facility for low and intermediate level waste at the Radiana site, adjacent to the KNPP. In 2011, the State Enterprise for Radioactive Waste (SERAW) assigned a consortium of DBE TECHNOLOGY GmbH, Westinghouse Electric Spain SAU and ENRESA (Spain) to prepare the technical planning and Intermediate Safety Assessment Report for the National Disposal Facility (NDF). Technical Design documentation consists of approximately 90 binders with more than 9,000 pages and approximately 900 diagrams, maps, and detailed drawings.

Waste for disposal at the NDF is to be delivered in cubic, reinforced concrete containers with 1.95 m side length. The containers are emplaced into disposal vaults by means of a 40-t portal crane and stacked in each vault in four layers. The disposal vaults are divided into three sections and can accommodate 288 waste packages per disposal vault. During the planned operating time of 60



Diagram of the National Disposal Facility for low and intermediate level waste at Kozloduy, Bulgaria (Source: SERAW)

The design work started in October 2011, initially focusing on the conceptual design of several repository alternatives. These alternatives were assessed in a multi-attribute analysis in order to identify the most suitable variant. In December 2012, SERAW approved the variant rated best and then authorized the Consortium to start the technical planning of the repository. Under the responsibility of DBE TECHNOLOGY GmbH, the Technical Design work was completed and submitted to SERAW for review. The work was carried out in close cooperation with the Bulgarian subcontractor EQE Bulgaria AD to ensure that the local requirements were taken into account. The complete years, a total of 19,000 waste packages can be emplaced. During operation the disposal vaults are protected against weather effects by a mobile roof.

The repository is a modular-type facility so that the waste disposal capacity can be increased if needed. The construction is planned to be carried out in three main phases, each one providing vaults with enough disposal capacity for 20 years of repository operation. According to current plans, all preliminary work and licensing issues are to be completed by the end of 2014 so that construction can start in the course of 2015.



## STUDY ON A SHAFT HOISTING SYSTEM

FOR SANDIA NATIONAL LABORATORIES

On behalf of the United States Department of Energy (US DOE), Sandia National Laboratories, Albuquerque, New Mexico assigned DBE TECHNOLOGY GmbH in spring 2013 with a conceptual study to describe the technical basis of a shaft hoisting system suitable for the transportation of very heavy payloads as needed for the emplace-

ment of Used Nuclear Fuel (UNF). In this context, Sandia is particularly interested in the technical, economic, and safety-related feasibility of the shaft transport of unshielded (85 t) and shielded (175 t) UNF containers down to a depth of approximately 500 m. Sandia needs this information as basic input data for studies of the US DOE on the final disposal of spent nuclear fuel within the context of the generic American waste management programme.

Within the scope of the R&D project DEAB (*Direct Disposal* of Spent Fuel Elements), DBE TECHNOLOGY GmbH designed a shaft hoisting system for payloads of up to 85 t, which has been successfully tested in a large-scale experiment. This system was used to describe a shaft hoisting system that meets the requirements of Sandia for transportsolution for the safe transport of radioactive waste down to depths of more than 500 m as well.

The assignment from Sandia is a first example of the good cooperation with US DOE that DBE TECHNOLOGY GmbH developed through joint US/German Workshops



Large-scale shaft hoisting test

ing unshielded containers. The shaft hoisting system for shielded containers (payload 175 t) can be extrapolated from current studies of DBE TECHNOLOGY GmbH on the disposal of CASTOR<sup>®</sup> containers.

Based on our experience and our know-how regarding the design of shaft hoisting systems, DBE TECHNOLOGY GmbH could demonstrate to Sandia and US DOE that the shaft transport of shielded and unshielded UNF containers down to the emplacement level is not only technically feasible but that this is an economically sound and feasible on the disposal of radioactive waste and the founding of the Salt Club under the leadership of the Nuclear Energy Agency (NEA). Currently, US DOE plans to ask DBE TECHNOLOGY GmbH to review their design for future heater experiments in the Waste Isolation Pilot Plant (WIPP) as soon as the design work has started.

## **INTERNATIONAL PROJECTS / LARGE PROJECTS**

### FEASIBILITY STUDY

FOR A HLW REPOSITORY IN BELGIAN CLAY FORMATIONS

ONDRAF/NIRAS, the Belgian Agency for Radioactive Waste and Enriched Fissile Materials, proposes geological disposal in poorly indurated clay as the reference solution for the long-term management of high-level and/or longlived radioactive waste in Belgium. ONDRAF/NIRAS is currently preparing a safety and feasibility case (SFC), which will describe, substantiate and, as far as possible, quantify the safety and feasibility of the proposed disposal system. DBE TECHNOLOGY GmbH was commissioned to support ONDRAF/NIRAS in the preparation of feasibility studies regarding the future operation of such a repository. The studies focused on essential parts of the conceptual repository design that need further development and confirmation of technical feasibility, on the demonstration of compliance with the safety requirements, and on a cost estimate. The feasibility studies for a hoisting system for payloads of up to 80 tons, for the underground transport and waste emplacement systems, and for the repository



ventilation have been completed. The studies not completed so far comprise the development of a suitable backfill material and the conceptual design of the sealing and closing systems.

All systems proposed for transport and ventilation are based on state-of-the-art equipment. The shaft transport system is based on components that were built within the scope of an R&D project that was funded by Bundesministerium für Bildung und Forschung (BMBF, *Federal Ministry of Education and Research*) and tested at full scale by DBE in connection with the German repository projects at Gorleben and Konrad.

As a result of the analyses conducted as part of the feasibility studies, several recommendations for optimisations of the original design basis were given. In all cases, however, systems with proven technical feasibility could be designed that also complied with the requirements for safety and cost effective technical implementation.

Connecting drift in the underground laboratory in Belgium (Source: ONDRAF/NIRAS)



### **REFURBISHMENT OF THE HOISTING SYSTEM**

SHAFT ASSE 4

On behalf of Bundesamt für Strahlenschutz (BfS, *Federal Office for Radiation Protection*), Asse-GmbH operates the mine Asse II. Between 1967 and 1978, low- and intermediate-level radioactive waste was disposed of in the former potash and rock salt mine. According to current information of BfS, long-term waste storage in accordance with the

protection goals stipulated in nuclear rules and regulations is not possible. Studies of BfS show that the protection goals can only be met if the waste is retrieved from the mine. In April 2013, retrieval was laid down in nuclear legislation as the preferred option for the closure of the Asse mine. Closure will take several decades. The time necessary to meet this statutory provision requires that all electrical and engineering equipment of the mine is kept operational over long periods of time.

For this reason, the major components of the hoisting system of shaft Asse 4 were to be replaced. Like shaft Asse 2, shaft Asse 4 serves as access adapted to the SELDA concept.

A special challenge was to ensure at least limited mine operations while meeting the requirement that refitting takes place within only 3 weeks. For this reason, a new electrotechnical control room was prepared, where – in a



New shaft hoisting system shaft Asse 4

shaft and is operated as intake ventilation shaft equipped with a cage for staff transport (3 persons per hoisting cycle). DBE TECHNOLOGY GmbH was retained to support the electrotechnical work of the contractor and to coordinate the overall task.

This comprised the installation of a new main man hoisting system, of a new brake assembly at both ends of the shaft consisting of Strain Energy Linear Ductile Arrestor (SELDA) systems, of new conveyor systems, and a new electrotechnical control system and the implementation of a new evacuation concept. The German regulations stipulate that man hoisting systems be equipped with sears as a safety measure. For the first time, such sears were pre-installation phase – the control unit and control cabinets were installed and a pre-commissioning was carried out. Furthermore, the cables for the new man hoisting system were installed in the shaft prior to the actual installation. The main installation and commissioning took place according to plan between December 14, 2013 and January 5, 2014. Every single step was carried out in compliance with the requirement that start of evacuation of the mining personnel had to be possible within two hours at the latest.

The new shaft hoisting system was approved by an expert of the mining authority at approximately 10:30 p.m. on January 5, 2014, so that the mining personnel could return to work underground on the next day as planned.

## **EVENTS**

### **IAEA WORKSHOP IN PEINE**

ENGINEERING FOR SAFE GEOLOGICAL REPOSITORY CONSTRUCTION AND OPERATION



Participants from 15 countries at the workshop

Following similar workshops in 2007, 2009, and 2011, DBE TECHNOLOGY GmbH – in cooperation with the International Atomic Energy Agency – again organised an international workshop, which took place from September 23 till 27, 2013, and focused on technical engineering for the construction and operation of a safe geological repository.

At the five-day workshop in Peine, 24 speakers, including 11 from DBE and DBE TECHNOLOGY GmbH, presented information on the state-of-the-art in research and technology in the field of final disposal of radioactive waste. The workshop covered all aspects of planning, construction, operation, and closure of a deep geological repository. Furthermore, the issues operational safety, long-term safety, and quality assurance were addressed. Participants from 15 countries, delegated from their national authorities for radioactive waste management, took the opportunity to obtain information and further training.

In addition to the presentations, the participants visited the future Konrad repository, which is currently under construction.

The training course was a component of the IAEA Network Programme with the objective to preserve the knowledge and technologies in radioactive waste management developed in countries with mature programmes and to transfer this expertise to countries just starting to develop their radioactive waste management programmes.





Drift excavation

## **EVENTS**

## PRESENTATION ON THE GERMAN REPOSITORY PROGRAMME

AT A WORKSHOP OF THE US NUCLEAR WASTE TECHNICAL REVIEW BOARD

Currently, most American nuclear power plant operators store their spent fuel elements in wet storage facilities. When the capacity has been exhausted to a large extent, the spent fuel elements are transferred into dry storage facilities. This frees storage capacities in the spent fuel handling operations and radiation protection measures. In addition to this, these operations require that new fuel pools or dry storage facilities are provided at already decommissioned sites. On the other hand, a direct disposal of these large and heavy storage containers with-

pools for fuel elements from the reactors. In order to minimise the economic and operational impairments caused by the transfer of the fuel elements into interim storage facilities, most power plant operators use external storage system suppliers to design and optimise their onsite dry storage capacities. especially by using large containers. This means that most of the storage containers currently used exceed the size, weight, and temperature limits stipulated by the existing repository concepts.



A reloading of the spent fuel elements into smaller transport containers would have significant impacts on the waste management concepts of the nuclear power plants. Reloading of the spent fuel elements requires complex out reloading would present significant challenges regarding transport and handling during final transfer to underground.

Hence, the US Nuclear Waste Technical Review Board (NWTRB) held a workshop on November 18 and 19, 2013, in order to identify major issues that can arise from the use of large storage containers at nuclear power plant sites regarding the future handling, storage, transport, and disposal of spent fuel elements. DBE **TECHNOLOGY GmbH was** invited by NWTRB to participate in the discussion as well as to present major aspects of the German waste management programme and impacts on the various disposal routes. The audience was especially interested in the different disposal concepts that have been devel-

oped and in the fact that the most important repositoryspecific equipment has already been developed and constructed and that its functionality has been demonstrated and qualified in large-scale tests.





## MANAGEMENT REPORT

### SPHERE OF ACTIVITIES

### **GENERAL INFORMATION**

The activities of DBE TECHNOLOGY GmbH continue to focus on providing services for domestic and foreign clients, consisting above all of national and international research and development projects for the final disposal of radioactive waste. Particular mention has to be made of international projects which deal with various aspects of final disposal of radioactive waste in near-surface and deep geologic repositories and in different host rock formations (clay in Belgium and France and magmatic host rock in Russia).

Among others, the Company is also the leading partner of international consortia that advise the competent ministries and organisations in Ukraine with regard to radioactive waste management and that develop repository concepts for all types of radioactive waste in Ukraine. The international projects also include the technical design for the national disposal facility for radioactive waste at Kozloduy (Bulgaria).

Of particular importance for developing know-how is the management of and/or cooperation in joint projects with other leading research institutes in the field of radioactive waste disposal, e.g., concerning safety and safety demonstration concepts for repositories in claystone and rock salt, concerning the compaction of crushed salt as well as the visualization of model calculations for safety-related processes.

The Company provided services for Asse GmbH with regard to several major tasks as part of the hazard prevention and emergency planning activities. Key activities were the planning and drilling of injection boreholes and the injections themselves, experiments to increase the strength of crushed salt backfill material, and the refurbishment of shaft 4.

The Waste Management Services department had to be abandoned at the end of the financial year due to economic constraints affecting the main customer.

The requirements of environmentally responsible action are taken into account by the Company's activities, which specifically focus on protecting the environment.

Until June 30, 2013, management of the company was the responsibility of the managing directors of the sole shareholder Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mbH (DBE); on July 1, 2013, this responsibility was transferred to Dr. Jürgen Krone.

### **RESEARCH AND DEVELOPMENT**

Research and development projects continue to be of major importance. In conjunction with DBE, DBE TECHNOLOGY GmbH thus ensures that the how-how for the planning, construction, operation, and closure of repositories for radioactive waste is preserved and further developed based on the state of the art in science and technology. In the reporting period, the Company was involved in a total of 16 national and international research and development projects.

## **FINANCIAL REPORT**

#### **BUSINESS DEVELOPMENT**

The Company continued its successful development in the current financial year. Turnover amounted to  $\in$  6.6 million. The net profit for the year amounted to  $\in$  0.4 million. As at December 31, 2013, the Company had orders on hand amounting to approximately  $\in$  22.2 million. Because

of the extremely specialist nature of the Company's activities, the macro-economic situation does not have a major impact on the development of business and the volume of incoming orders.



### **RESULTS OF OPERATIONS, NET ASSETS, AND FINANCIAL POSITION**

### **RESULTS OF OPERATIONS**

The total output comprising turnover and changes in inventories of DBE TECHNOLOGY GmbH has remained virtually unchanged at the same level as the previous year at  $\in$  7.5 million.

Other operating income amounted to  $\in$  0.1 million with the main item being the reimbursement of employer's liability insurance contributions of the previous year.

Personnel expenses increased by  $\in$  0.2 million to  $\in$  4.5 million compared with the previous year. This was mainly due to an increase in employee remuneration and the fact that contributions to pension provisions were made for the first time.

The cost of purchased services mainly consists of assistance in major contracts and/or international contracts and remained virtually unchanged at  $\in$  1.3 million.

Other operating expenses remained also virtually unchanged at  $\in$  1.2 million.

### NET ASSETS AND FINANCIAL POSITION

The balance sheet total increased by  $\in$  0.4 million compared with the previous year and amounts to  $\in$  8.2 million.

On the assets' side of the balance sheet, inventories rose in total by  $\in$  1.2 million as a result of the increase in work in progress by  $\in$  0.9 million and advance payments by  $\in$ 0.3 million. Work in progress has been valued at directly attributable cost of production in accordance with the lower valuation threshold under Commercial Law.

Receivables and other assets increased by  $\in$  1.5 million compared with the previous year and now amount to  $\in$  2.1 million. This is primarily the result of the purchase of a promissory note. They also include entitlements from part-billing of major orders and from other orders as well as value-added tax (VAT) refunds.

The item "Cash on hand and bank balances" has fallen by  $\in$  2.3 million to  $\in$  0.9 million compared with the closing date of the previous year and corresponds to the increase in other assets through the purchase of a promissory note and the rise in advance payments made.

On the liabilities side of the balance sheet, shareholders' equity fell by  $\in$  0.2 million compared with the previous year

On the balance sheet date, net interest income was down in comparison with the previous year and includes interest elements from the valuation of other provisions as well as other interest expenses.

The extraordinary net income resulted from the balance from extraordinary income on the grounds of litigation as well as the corresponding legal and court costs.

The result from ordinary operations decreased by  $\in$  0.3 million as a result of billing orders with lower returns and now amounts to  $\in$  0.5 million.

As a consequence, the tax expense decreased by  $\notin 0.1$  million to  $\notin 0.2$  million. This includes not only taxes on income but also income from deferred taxes resulting from the differences between the figures shown in the commercial and tax balance sheets for other provisions as at December 31, 2013.

At  $\in$  0.4 million, the net income for the year is lower by  $\in$  0.2 million compared with the previous year.

and now amounts to  $\in$  1.6 million. This reduction is due to the lower net income for the year.

Overall, provisions have remained unchanged at  $\in$  0.8 million and are made up of provisions for revenue risks from billing of services and provisions for pensions.

Compared with the previous year, liabilities have risen by  $\in$  0.6 million to  $\in$  5.8 million. The largest individual item at  $\in$  5.3 million relates to customer advances received in the form of financial advances for orders which have not yet been completed and for which a final invoice has not yet been issued.

The equity ratio of DBE TECHNOLOGY GmbH at 19.4 % (previous year: 22.9 %) has fallen compared with the previous year due to the low net income for the year. On the balance sheet date, equity financed not only fixed assets but also 30.3 % of inventories (previous year: 45.1 %).

The Company was solvent at all times during the past financial year and remained so thereafter. The basic objective of company management is to ensure sustained economic stability which can be measured by the two indicators forward order book over several years

## MANAGEMENT REPORT

and positive net income. Positive proof of this can be seen in the net income for the year of  $\in$  0.4 million, the average forward order book range over 3-4 years with an order

volume of  $\in$  22.2 million as at December 31, 2013, and the constant total output of  $\in$  7.5 million.

### PERSONNEL AND SOCIALREPORT

As at December 31, 2013, the Company's workforce consisted of 46 employees. Support for processing the tasks of the Company is provided by employees of DBE under the terms of an agency and service agreement that has been concluded with DBE. This primarily involves the provision of commercial services.

The Company is integrated into the industrial safety concept and compliance organization of DBE.

### FORECAST, RISK AND OPPORTUNITY REPORT

Reporting and risk management are conducted in line with the systems existing at DBE. Risks from order processing are controlled on a timely basis by way of checks carried out in the course of an order.

There is adequate insurance cover for risks that the Company can usually expect to encounter. This is primarily achieved through contractual integration into the insurance cover of DBE. There are no risks threatening the Company's status as a going concern.

The order volume as at December 31, 2013, was at approx.  $\in$  22.2 million and continues to be at a high level. Capacity utilization of the Company is assured for all of 2014 and to more than two thirds of 2015 and 2016.

The Company's activities continue to focus on expanding and enhancing the core competence of the DBE/DBE TECHNOLOGY GmbH group in order to be able to offer competent services to national and international clients. In 2014, it is intended to expand and intensify activities to further attractive and interesting markets. Together with contributing to a sustained business development, this shall also compensate in the medium term for the limited effects of abandoning the Waste Management Services business sector.

With a constant level of orders on hand, the Company expects a constant, positive level of earnings both in 2014 and in the medium term.

### SUPPLEMENTARY REPORT

There have been no events of any significance after the reporting date.

## NOTES TO THE FINANCIAL STATEMENTS



### **GENERAL INFORMATION**

The Company is a small corporation in terms of Section 267 (1) HGB. The annual financial statements of DBE TECHNOLOGY GmbH are prepared voluntarily in accordance with the regulations applicable for large corporations.

In order to improve the overall clarity of presentation, individual items in the balance sheet and income statement have been combined and are shown separately in the notes to the

### **ACCOUNTING AND VALUATION METHODS**

The figures shown in the balance sheet for intangible assets and tangible assets are based on the acquisition costs. Intangible assets – consisting exclusively of software – are depreciated over three to five years using the straight-line method, and tangible assets are depreciated in accordance with their expected useful life using the straight-line method. Minor value assets with acquisition or production costs of more than  $\in$  150 and up to  $\in$  1,000 are combined in an annual collective item and depreciated uniformly over a period of five years.

Orders that have been commenced (work in progress) have been valued at directly attributable cost of production in accordance with the lower valuation threshold under tax law.

Advance payments are recognized at nominal value.

Under receivables, identifiable individual risks are taken into account in the form of allowances. Other assets are reported at nominal value.

Provisions are reported at the figure equivalent to the settlement amount required according to sound business judgment.

Provisions with a term of more than one year are discounted at the average market interest rate prevailing over the past seven financial years, corresponding to their remaining term.

The provisions for pensions were calculated on the basis of actuarial calculations using the projected unit credit method taking into account the "Mortality Tables 2005 G" of Prof. Dr. Klaus Heubeck, Cologne. The reported pension obligations for individual commitments are governed exclusively by the benefit regulations and the contribution-based pension plan of Bochumer Verband ("*Bochum Association*"). Provisions for

financial statements.

The type of expenditure format was used for the preparation of the income statement.

The accounting and valuation methods have remained unchanged compared with the previous year.

pensions were discounted using the average market interest rate of the past seven years published by the Deutsche Bundesbank for an assumed residual term of 15 years (Section 253 (2) Clause 2 HGB). This interest rate is 4.89 %. The calculation of provisions for pensions was based on a qualifying trend of 2.5 % p.a. and a pension trend of 1.0 % p.a. for defined contribution commitments.

Provisions for revenue risks attributable to billings under other provisions have been discounted at the average market rate published by the Deutsche Bundesbank of 3.93 % as at December 31, 2013. The provisions were calculated based on average terms of five years.

Other provisions also take into account all identifiable risks and contingent liabilities.

Liabilities are reported at the settlement amount.

Deferred taxes are determined in relation to the differences between the amounts shown in the commercial accounts and the tax accounts if such differences will probably be reversed in subsequent years. Deferred tax assets and deferred tax liabilities are shown without being netted.

The Company has exercised the capitalization option of Section 274 (1) Clause 2 HGB, and reports deferred tax assets.

Deferred taxes are calculated on the basis of an effective tax rate of 30.0 % (15.82 % for corporation tax incl. solidarity surcharge and 14.18 % for trade tax), which will probably be applicable at the time at which the differences are reversed. The trade tax rate is based on the trade tax assessment rate of 405 %.

## NOTES TO THE FINANCIAL STATEMENTS

## NOTES TO THE BALANCE SHEET

#### ASSETS

#### 1. Fixed asset

The financial assets shown under III. consist of a cooperative share acquired in 2012. Other than this, movements of fixed assets are shown in the Fixed Asset Movement Schedule.

#### 2. Receivables and other assets

All receivables have a remaining term of less than one year.

Other assets mainly consist of entitlements from the purchase of a promissory note bond to an amount of € 1.5 million.

#### 3. Deferred tax assets

Deferred tax assets, which are shown separately in the balance sheet without being netted, are attributable to the following temporary differences.

	31.12.2013 Difference between commercial and tax balance sheets	31.12.2013 Deferred tax assets
Balance sheet item	T€	T€
Other provisions	400	120

On the balance sheet date, the deferred taxes stated on the balance sheet amounted to T€ 120.



#### **EQUITY AND LIABILITIES**

#### 4. Subscribed capital

The subscribed capital remained unchanged at € 0.5 million. It is fully paid up and is held to 100 % by Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mit beschränkter Haftung (DBE), Peine.

#### 5. Capital reserves

The capital reserves originate from other contributions made by the shareholder in previous years.

#### 6. Revenue reserves

Revenue reserves remained unchanged at  $\in$  0.5 million and include  $\in$  0.4 million from contributions made in previous years from net profits as well as  $\in$  0.1 million resulting from the BilMoG conversion as of January 1, 2010.

The net profit of the previous year of € 0.6 million was paid out as dividend to the sole shareholder.

#### 7. Provisions for pensions

Provisions for pensions are reported for the first time. They amount to  $\in 0.1$  million and relate to the new commitment for the management.

#### 8. Other provisions

Other provisions amounted to  $\in$  0.7 million on the balance sheet date. They include revenue risks attributable to billings for research and development contracts ( $\in$  0.4 million), vacation obligations ( $\in$  0.1 million), and other obligations ( $\in$  0.2 million).

#### 9. Liabilities

All advance payments received consist of contractually agreed advance payments from clients.

Payables to affiliated companies are due in full to the sole shareholder and are the result of current business operations.

Other liabilities consist primarily of tax payables to an amount of  $\in$  0.3 million.

All liabilities are unsecured and are due within one year.

### CONTINGENCIES

On the balance sheet date, contingencies existed to an amount of T€ 32 (previous year: T€ 32) from a guarantee loan framework agreement for providing a contract fulfillment guarantee, and to an amount of T€ 501 (previous year: T€ 501) for providing a prepayment guarantee. Based on past experience, there is only a low probability of the contingencies being utilized.

## NOTES TO THE FINANCIAL STATEMENTS

## NOTES TO THE INCOME STATEMENT

#### 10. Turnover

	2013 T€	2012 T€
Project assistance and engineering services for industrial companies	4,663	5,273
Revenues from billing domestic research and develop- ment contracts	1,386	995
Revenues from international contracts	501	492
	6,550	6,760

Revenues from project assistance and engineering services for industrial companies were generated exclusively in Germany.

#### 11. Other operating income

Other operating income mainly consists of income from a contribution refund of "Berufsgenossenschaft Rohstoffe und chemische Industrie" (BG RCI, *Employers' liability insurance association for raw materials and chemical industry*) to an amount of T $\in$  57 for the year 2012, income from costs charged on in the course of business operations to an amount of T $\in$  40, and a premium payment by BG RCI to an amount of T $\in$  10.

#### 12. Cost of purchased services

The cost of purchased services includes third party costs for project assistance activities.



#### 13. Personnel expenses

	2013 T€	2012 T€
Salaries	3,593	3,465
Social security and pension benefit costs (thereof for pensions)	906 (81)	831 (3)
	4,499	4,296

The rise in pension benefit costs results primarily from the fact that contributions to pension provisions were made for the first time because of a new pension commitment to the management.

#### 14. Other operating expenses

This item mainly comprises costs of services in connection with the agency and service agreement with the parent company, rents, travel expenses as well as general administrative expenses.

#### 15. Net interest income

Net interest income can be broken down as follows:

	2013 T€	2012 T€
Other interest and similar income	3	39
Income from discounting other provisions	0	11
Interest and similar expenses	11	9
	-8	41

#### 16. Extraordinary net income

The extraordinary net income results from the balance from extraordinary income on the grounds of litigation, as well as the corresponding legal and court costs.

#### 17. Taxes on income

Taxes on income consist of corporation tax (incl. solidarity surcharge) at T€ 91 (previous year: T€ 142) and trade tax for the current year at T€ 81 (previous year: T€ 128).

Income from deferred taxes (T€ 4) results from differences between figures shown in the commercial and tax balance sheets as at December 31, 2013.

## NOTES TO THE FINANCIAL STATEMENTS

### **OTHER DISCLOSURES**

#### Annual average number of employees

On average, the Company had 46 employees over the year (previous year: 47).

#### Remuneration of corporate bodies

The members of the Advisory Board, which was active until its disbandment with effect from June 30, 2013, did not receive any remuneration.

Details concerning the total remuneration of the management have been omitted on the grounds of Section 286 (4) HGB.

#### Auditor's fees

The total auditor's fees charged for the financial year are shown in the consolidated financial statements of DBE.

#### Amounts subject to a distribution restriction in accordance with Section 268 (8) Clause 2 HGB

The following were subject to a distribution restriction as at the closing date:

Deferred tax assets	T€ 120
Less other deferred tax liabilities	T€ 0
Total amount subject to distribution restriction	T€ 120

### **APPROPRIATION OF NET INCOME**

Subject to approval by the sole shareholder,  $\in$  0.35 million of the total net income of  $\in$  0.4 million for the year are to be paid out in the form of a dividend and  $\in$  0.05 million are to be transferred to revenue reserves.

## **GROUP AFFILIATION**

DBE TECHNOLOGY GmbH, Peine, is under the uniform management of DBE. In its capacity as parent company, the latter prepares consolidated financial statements for the smallest and largest group of companies in which the annual financial statements of the Company are included. The consolidated financial statements are submitted to the operator of the Electronic Federal Gazette and are published in the Electronic Federal Gazette.



## AUDITOR'S REPORT

The auditor, PricewaterhouseCoopers Aktiengesellschaft Wirtschaftsprüfungsgesellschaft, Hanover, provided the annual financial statements of the Company as at December 31, 2013, with an unqualified auditor's report dated May 28, 2014.

## **BALANCE SHEET**

Assets	Notes	31.12.2013 (T€)	31.12.2012 (T€)
A. Fixed Assets	(1)		
I. Intangible assets		20	19
II. Tangible assets		75	95
III. Financial assets		(€ 250.00)	(€ 250.00)
		95	114
B. Current assets			
I. Inventories			
1. Work in progress		4,433	3,540
2. Advance payments		516	186
		4,949	3,726
II. Receivables and other assets	(2)		
1. Trade receivables		498	595
2. Other assets		1,623	35
		2,121	630
III. Cash on hand, bank balances		925	3,221
		7,995	7,577
C. Prepaid expenses and deferred charges		10	19
D. Deferred tax assets	(3)	120	116
		8,220	7,826



Equity an Liabilities	Notes	31.12.2013 (T€)	31.12.2012 (T€)
A. Equity			
I. Subscribed capital	(4)	511	511
II. Capital reserves	(5)	179	179
III. Revenue reserves	(6)	519	519
IV. Net income for the year		386	584
		1,595	1,793
B. Provisions			
1. Provisions for pensions	(7)	78	0
2. Tax provisions		0	55
3. Other provisions	(8)	722	754
		800	809
C. Liabilities	(9)		
1. Advance payments received		5,302	4,497
2. Trade accounts payable		173	232
3. Payables to affiliated companies		60	125
4. Other liabilities		290	370
		5,825	5,224
		8,220	7,826

## **INCOME STATEMENT**

	Notes	2013 (T€)	2012 (T€)
1. Turnover	(10)	6,550	6,760
2. Changes in inventories		893	717
3. Other operating income	(11)	138	153
		7,581	7,630
4. Cost of purchased services	(12)	1,344	1,297
5. Personnel expenses	(13)	4,499	4,296
6. Depreciation		44	62
7. Other operating expenses	(14)	1,194	1,169
		7,081	6,824
		500	806
8. Net interest income	(15)	-8	41
9. Results from ordinary operations		492	847
10. Extraordinary net income	(16)	70	0
11. Taxes on income	(17)	168	253
12. Other taxes		8	10
13. Net income for the year		386	584



## FIXED ASSETS

		At cost			Impairments				Net boo	k values
	As of 1.1.2013 <b>T€</b>	Additions <b>T€</b>	Disposals <b>T€</b>	As at 31.12.2013 <b>T€</b>	Accumu- lated De- preciation 1.1.2013 <b>T€</b>	Additions <b>T€</b>	Disposals <b>T€</b>	Accumu- lated De- preciation 31.12.2013 <b>T€</b>	As at 31.12.2013 <b>T€</b>	As at 31.12.2012 <b>T€</b>
Intangible assets - Concessions, industrial property and similar rights and assets, and licenses in such rights and assets	143	11	8	146	124	10	8	126	20	19
Tangible assets - Other equipment, business and office equipment	270	14	31	253	175	34	31	178	75	95
Subtotal	413	25	39	399	299	44	39	304	95	114
Financial assets - other loans	(250 €)	0	0	(250 €)	0	0	0	0	(250 €)	(250 €)
Total fixed assests	413	25	39	399	299	44	39	304	95	114

Verantwortung für Generationen Responsibility for Generations



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