



2014

# ANNUAL REPORT

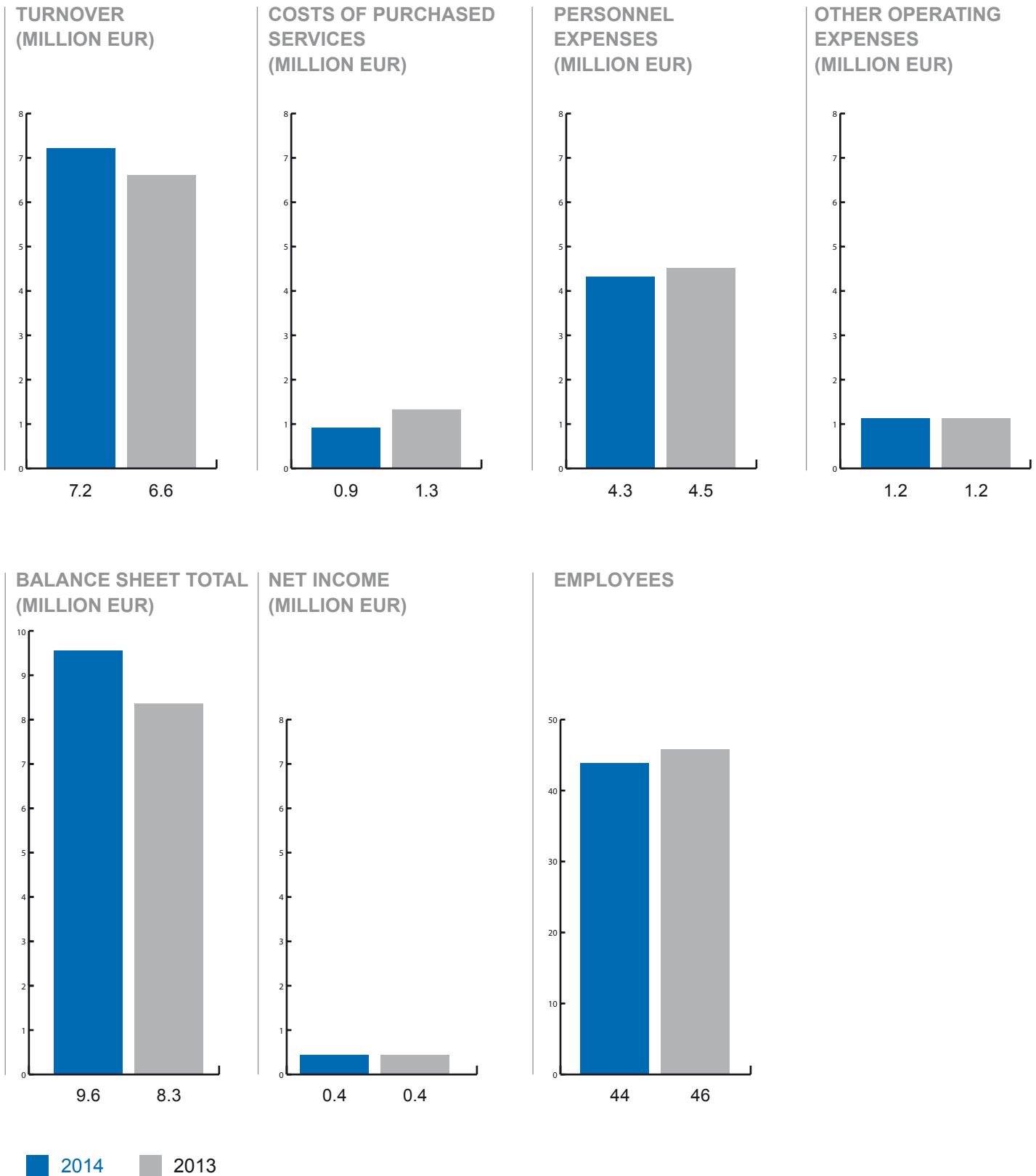
Verantwortung  
für Generationen

Responsibility  
for Generations

**DBE TEC**

DBE TECHNOLOGY GmbH

# IN FIGURES



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# MANAGEMENT TEAM

## MANAGEMENT

Managing Director:

Dr. Jürgen Krone,  
Peine



*Managing Director Dr. Jürgen Krone (m.) with Wilhelm Bollingerfehr (Authorised Officer, Head of Research & Development, left) and Dr. Thilo von Berlepsch (Head of International Projects, far left), Dr. Nina Müller-Hoeppe (Head of Repository Safety, right), and Hartmut Bothe (Head of Asse Projects, far right)*



Dear Reader,

This report provides an overview of the work of DBE TECHNOLOGY GmbH and of the results achieved in 2014, a year that, above all, was characterized by continuity for our company. This does not only concern the positive business results but also the intensification of national and international collaboration for solving scientific and technical key issues regarding the disposal of radioactive waste, the cooperation in major industrial projects, and the participation in the precautionary planning and implementation of emergency response measures for the Asse II mine.

In this connection, I would like to thank our numerous, mostly long-standing, business partners and clients for their constructive cooperation and our employees for their commitment and performance.

This assures us that we are well prepared to meet future challenges and to contribute considerably to the resolution of any associated task. Above all, this also includes important scientific and technical issues of the selection procedure for a site to host a repository for heat-generating radioactive waste.

With this in mind, we look forward to continuing our successful cooperation.

Dr. Jürgen Krone  
Managing Director

# 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 14 years ago,

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,



*Guests of a Japanese delegation from politics and economy visiting the Gorleben mine*

DBE TECHNOLOGY GmbH has rapidly become a nationally and internationally recognized engineering company in the area of radioactive waste disposal.

Its activities are based on over 35 years of experience gained by its parent company in German nuclear waste repository projects as well as on the know-how gained through over 30 years of collaborative efforts in national and international research projects. The company's main

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. The company was also involved in the development of safety cases for HLW repositories in salt and clay formations and crystalline rock.

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

On November 17, 2014, the Evening of Arts and Sciences took place in the entrance hall of the head office of DBE/DBE TECHNOLOGY GmbH. 140 members of the business and research communities, of government institutions, and of the media took the opportunity to exchange ideas in a relaxed and comfortable atmosphere. One highlight of the evening was the lecture by Manfred Müller, head of the research department on air traffic safety at LUFTHANSA and lecturer for risk management at the Bremen University, who talked about “Individual safety needs versus calculated risk – are men assessable as a risk factor?” He illustrated that people are more willing to take risks they choose to take of their own free will, e.g., during recreation. Risks beyond their control are overestimated, while everyday risks like road traffic or household tasks are underestimated. In aviation safety, small mistakes can have fatal consequences, and most of the mistakes are man-made. Manfred Müller’s excellent and interesting lecture led to lively discussions among the audience.



*From left to right:  
Dr. Thomas Lautsch (Managing Director DBE), Dr. Jürgen Krone  
(Managing Director DBE TECHNOLOGY GmbH), Michael Ripkens  
(Managing Director DBE), Manfred Müller (Lufthansa), and  
Borries Raapke (Managing Director DBE)*

Musical entertainment was provided by the “Spicy Trio”. To the delight of the guests, the sketcher and cartoonist Iouri Didenko drew their portraits.

# RESEARCH & DEVELOPMENT

## FUNCTIONALITY OF CRUSHED SALT BACKFILL IN A HLW REPOSITORY IN SALT FORMATIONS

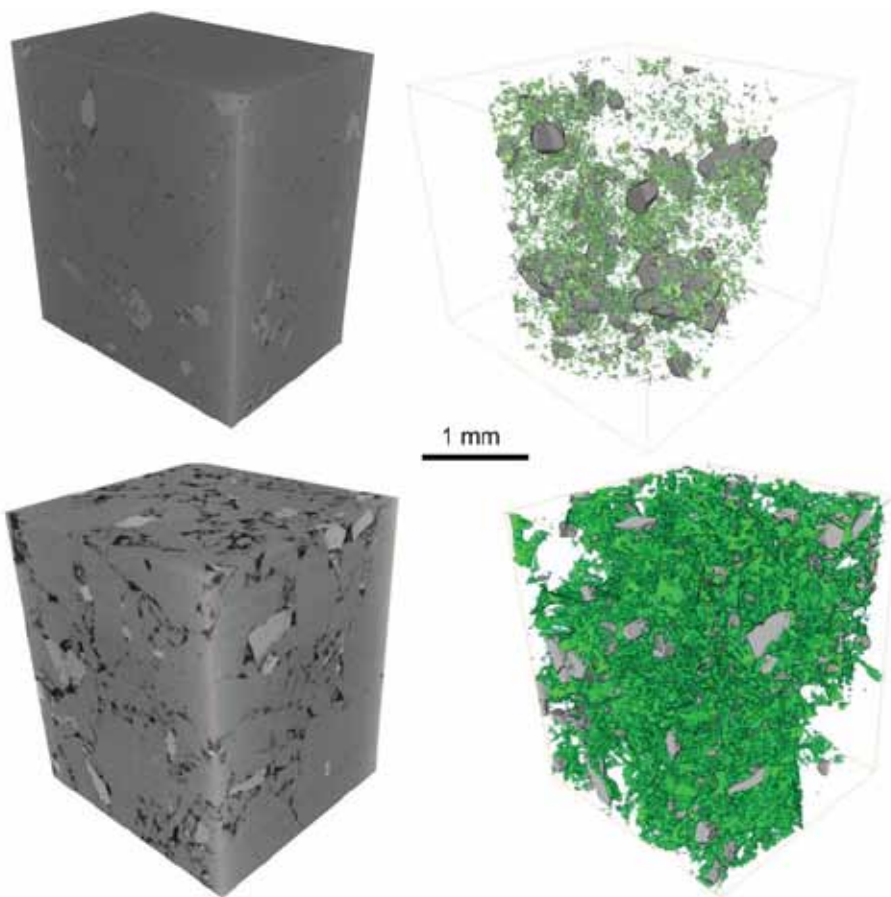
The long-term containment of radioactive waste in a repository in salt formations relies on the properties of the host rock as well as on the measures taken to seal and backfill the mine openings. As backfill material for the mine openings, crushed salt is considered as the reference material. An R&D project (REPOPERM), which was

Agency Karlsruhe, Water Technology and Waste Management (PTKA-WTE, KIT), was to investigate the long-term development of the backfill properties.

One advantage of crushed salt is its ability to consolidate into a dense material as a result of long-term compaction.

A final assessment of the material's suitability as backfill material requires an understanding of the compaction processes on a microscopic level, i.e., of porosity reduction and pore connectivity. In this context, changes in permeability due to porosity changes close to the threshold porosity are of special significance. The relationship between these microstructural properties and the increase in compaction is the basis for assessing the sealing properties of crushed salt.

The material was analysed by means of X-ray computer tomography (XCT) in order to obtain 3D reconstructions of the macro- and microporosity of samples with different degrees of compaction and different porosities. The analysis showed that – regarding connectivity – the pore space has to be considered to be isotropic. Numerically simulated pore structures can be used to determine the so-called “critical porosity” below which the pore connectivity is too low for the material to be permeable. The studies carried out so far show that at porosities above 5%, the pores are to be considered to be connected and, thus, permeable. At porosities of 1% or less, it can be assumed that the pore network is not interconnected and that the backfill material, thus, meets its sealing requirements.



3D models of samples with a higher porosity (bottom) and a lower porosity (top). Porosity shown in green. Top sample with low pore connectivity.

funded by BMWi (Federal Ministry for Economic Affairs and Energy) represented by the Project Management

assumed that the pore network is not interconnected and that the backfill material, thus, meets its sealing requirements.



## FINAL DISPOSAL OF CARBON-CONTAINING WASTE FROM GERMAN HIGH-TEMPERATURE AND RESEARCH REACTORS

In German research reactors as well as in the two high-temperature reactors (AVR, THTR 300) graphite or carbon brick was used as reflector and/or moderator material. So far, no suitable conditioning and packaging concepts

have been developed for these highly active wastes. Furthermore, it has not yet been fully clarified if these C-14-containing wastes will comply with the waste acceptance criteria for the Konrad repository. To solve this problem, PTKA acting on behalf of BMWi contracted DBE TECHNOLOGY GmbH to conduct an R&D project called CarbonForeSt (Acronym for: *Status quo of the storage of C-14-containing wastes from German high-temperature and research reactors and strategy for their future disposal*).

The purpose of the research project was to inventory the graphite and carbon bricks from the high-temperature and research reactors

in terms of activity and quantity and to develop strategies for their disposal. A suitable conditioning and packaging concept was to be developed that takes into account the legal framework for intermediate storage, transport, and disposal. The objective was to analyse the possibilities of

final disposal in the Konrad repository on the one hand and the final disposal in a HLW repository on the other hand. The study showed that the graphite from the THTR, the research reactors, and the graphite dust and reactor fuel



AVR reactor building Jülich, 2007 (Source EWN)

bound in light-weight porous concrete of the AVR can in principle be disposed of at the Konrad repository. At the current licensing situation, the graphite/carbon brick from the AVR has to be disposed of in a repository for heat-generating radioactive waste and spent fuel elements.

# RESEARCH & DEVELOPMENT

## TECHNICAL APPROACHES AND CONCEPTS

### TO IMPLEMENT RETRIEVABILITY REQUIREMENTS INTO THE DRIFT DISPOSAL CONCEPT FOR A HLW REPOSITORY IN SALT FORMATIONS

In 2010, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety issued the new “Safety Requirements Governing the Final Disposal of Heat-Generating Radioactive Waste” that stipulate retrievability of radioactive waste containers from a repository during the operational period. These requirements are, thus, part of the licensing conditions and have to be taken into account when designing a repository. Within the scope of an R&D

adaptations are necessary to existing repository concepts. The results of this analysis showed that the retrieval of POLLUX® casks is generally feasible. In addition to this, concepts for the retrieval of canisters were developed and open questions were identified.

For the disposal of heat-generating radioactive waste in salt formations, the current reference concept recom-

mends the emplacement of POLLUX® casks on the floor of parallel emplacement drifts. The voids between the POLLUX® casks and the drift walls will be back-filled with crushed rock salt. The technology for the transport and emplacement of POLLUX® casks as well as the backfilling technique were successfully tested by DBE in the 1990s.

Based on this, possible retrieval processes were analysed with the result that the so-called “re-mining” strategy is a suitable option to retrieve POLLUX® casks without affecting long-term safety. In order to retrieve the POLLUX® casks, new retrieval drifts have to be excavated parallel to the waste containers. These drifts will allow access as well as ventilation and cooling. The pillar between the new drifts and the emplacement drifts will then be removed, thus exposing the POLLUX® cask for

retrieval. For retrieval, modifications to the emplacement device and a railless transport system are necessary.



*Prototype of an emplacement device for POLLUX® casks*

project (ASTERIX), which was funded by BMWi represented by PTKA, DBE TECHNOLOGY GmbH analysed which

## SAFETY DEMONSTRATION AND VERIFICATION CONCEPT FOR A HLW REPOSITORY IN CLAYSTONE IN GERMANY

Within the framework of the R&D project “AnSichT”, DBE TECHNOLOGY GmbH, the Federal Institute for Geosciences and Natural Resources (BGR), and Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH are developing a methodology to demonstrate the safety of a

used to generate corresponding geological models and to project the geoscientific long-term evolution. Furthermore, a safety strategy for a HLW repository in claystone was developed. In a next step, suitable disposal and closure concepts were developed for both regions. These aspects



*Ammonite (Harpoceras falciferum) from Jurassic claystone (Lias), a potential host rock for a final repository, Dottenhausen (Southern Germany)*

repository for heat-generating radioactive waste and spent fuel elements in claystone in Germany.

This methods development is based on the existing safety demonstration and verification concept for repositories in rock salt and links legal and geologic boundary conditions, disposal and closure concept, demonstration of barrier integrity, and long-term analysis of probable and less probable repository evolutions.

The geological descriptions of two reference regions – one in Northern and one in Southern Germany – were

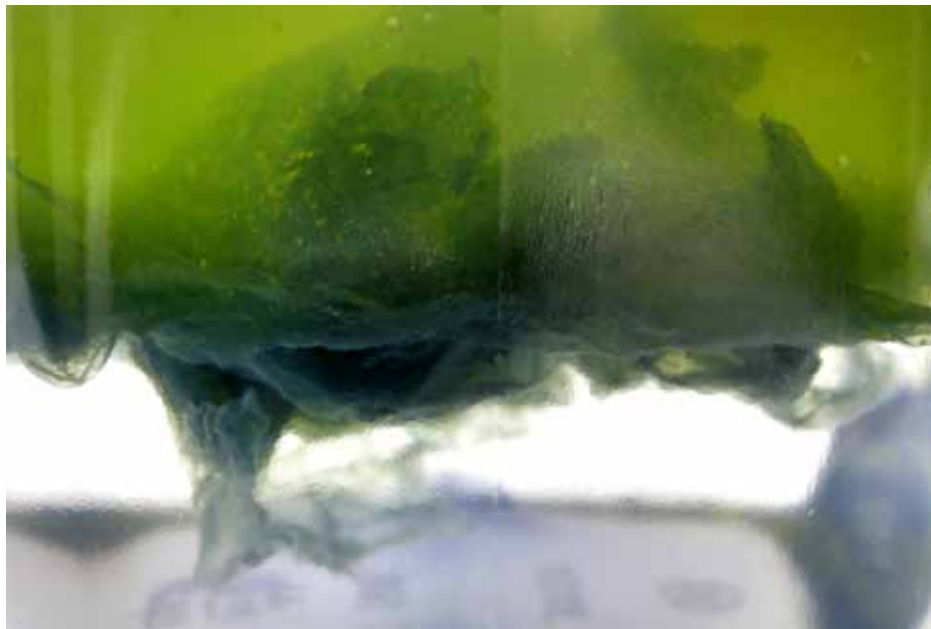
are essential for a system analysis and safety assessment. For the reference region North, a FEP catalogue (features, events, and processes) was compiled taking into account the requirements of the scenario development methodology. Following this approach, the scenarios can be derived directly from the FEP catalogue. A reference scenario (probable repository evolution) as well as several alternative scenarios (less probable evolutions) were then derived for the repository site model “North”. In addition to this, quantitative criteria for demonstrating the integrity of the geologic barrier have been prepared.

# RESEARCH & DEVELOPMENT

## EXPERIMENTS ON SEALING PATHWAYS IN ROCK SALT WITH SODIUM SILICATE SOLUTIONS

The long-term safety of deep geological repositories depends on the capacity of the host rock to isolate and retain radioactive substances. During construction and operation of the repository, damage to the host rock has, thus, to be kept to a minimum. In addition to existing geogenic dislocations and cracks in the host rock, an excavation damaged zone forms at the contour of the

was investigated within the scope of the R&D project VerA (*Improvement of the excavation damaged zone in saliferous formations*). In-situ experiments showed that sodium silicate injections decreased the permeability of damaged rock salt. The sealing effect is due to insoluble, amorphous silica gels and long-term stable minerals that are formed during chemical reactions with the soluble



*Precipitation of salt at the contact surface of solutions of heavy metal and sodium silicate*

cavities, which could be a potential pathway for fluids in the post-closure phase of the repository. If possible, these pathways are to be sealed. The applicability and efficiency of crack sealing using sodium silicate solutions

salts of the host rock and brines. In addition to sealing pathways, chemical precipitation of dissolved trace elements with sodium silicate is relevant for the migration of toxic and radioactive elements. This process was investigated in the laboratory using solutions that contained barium (Ba), cobalt (Co), iron (Fe), nickel (Ni), or strontium (Sr). The visual observations are comparable to the results gained in known crystal or chemical garden experiments. Chemical gardens are obtained from the precipitation reaction on adding crystals of a soluble heavy metal salt to aqueous solutions of sodium or potassium silicate. In particular, chemical analyses prove a removal of small divalent ions (Co, Ni) as well as a significant decrease of the  $UO_2$  concentration. The precipitates can comprise insoluble salts as well as hydroxides and silicate phases. Another well-known and in water treatment frequently used property of amorphous silicates is a high sorption capacity of the reaction products.



*Wilhelm Bollingerfehr, Authorised Officer, Head of Research & Development Department*

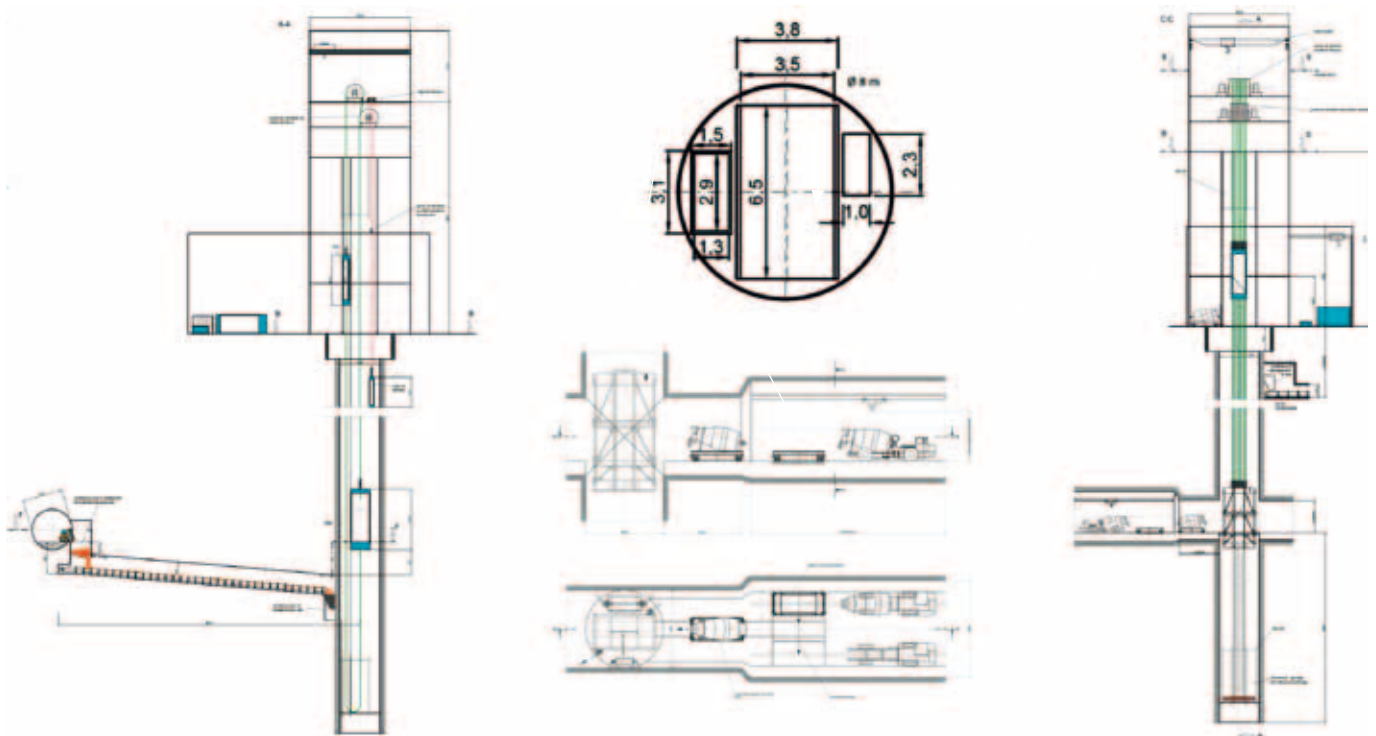
# INTERNATIONAL COOPERATION

## SUPPORT IN THE FURTHER DEVELOPMENT OF THE FRENCH REPOSITORY DESIGN

In 2006, the French Parliament decided that geological disposal is the only solution to ensure the long-term safe isolation of intermediate level long-lived (IL/LL) and high level (HL) radioactive waste. A respective Deep Geological Repository is currently being planned at a site (Meuse district/Haute-Marne district) in eastern France (project Cigéo). A first concept study was prepared in 2012 and subsequently discussed with the public. The outcome of this public debate then formed the basis for the current further development of this repository concept, which is eventually to be used for the preparation of licensing documents.

subcontracted for the development of a conceptual design of the shaft hoisting systems and the simulation of the logistics, which includes excavation work, emplacement, and the closure of the repository.

The aim of the logistics simulation is to confirm the feasibility of a parallel excavation of the disposal drifts and operation of the repository. The simulations include the transport of the excavation material, of the lining and backfilling material, the waste containers, the personnel and the equipment. What has to be taken into account is that the geometry of the repository changes constantly



*Design of a shaft hoisting system for a material shaft for the French repository project Cigéo*

At the end of 2013, the French National Radioactive Waste Management Agency ANDRA contracted a consortium led by Tractebel Engineering (GDF SUEZ) to design the underground facilities of the repository. Due to its experience in the planning, construction, and operation of geologic repositories, DBE TECHNOLOGY GmbH was

due to excavation and closure activities and that an ideal sequence of activities is impeded by malfunctions, breakdowns, and maintenance work. The data basis will be derived from the experience gained in German repository projects and will be adapted to the requirements specific to Cigéo.

The shaft hoisting systems for the material transport and for the personnel transport in the conventional mining section and in the monitoring area of the repository will be based on the logistics planning and on the project-specific

requirements. This also includes loading and unloading of the material transport shaft. Before the shaft fittings can be designed in more detail, the respective regulatory framework and the technical specifications have to be defined.

## **DEVELOPMENT OF A POLICY AND STRATEGY FOR THE MANAGEMENT OF RADIOACTIVE WASTE AND SPENT FUEL IN CHINA**

China is in the process of developing a comprehensive policy and a strategy for managing radioactive waste originating from uranium mining, the treatment of ores (uranium and other metals), uranium enrichment, the nuclear fuel cycle, the operation of nuclear power plants and research and experimental reactors as well as from medical and industrial activities. In October 2012, the national safety goals, i.e. the improvement of the safety of nuclear installations and radiation sources and the expansion of the capacity in the field of nuclear safety, were extended until 2020. The aim is to achieve levels of nuclear and radiation safety commensurate with best international practice by that time. Essential components of this strategy and of the safety goals are radioactive waste treatment, interim storage, and final disposal.

Within the scope of a project funded by the European Commission, a consortium consisting of the European waste management organisations ANDRA (France), COVRA (Netherlands), DBE TECHNOLOGY GmbH

(Germany), ENRESA (Spain), and SKB International AB (Sweden) was awarded a contract to assist the competent Chinese institutions to further develop the strategy for the



*Qinshan, China's first reactor started operation in 1991. (Source: Imago stock & people)*

management of spent nuclear fuel and radioactive waste. The kick-off meeting for this three-year project took place in Beijing at the end of November 2014.

In addition to the provision of information on the German situation for the compilation of international best practice, DBE TECHNOLOGY GmbH is tasked with a report on the Comparison of Spent Fuel Storage Alternatives. After development of the waste management strategy, the main task will be the development of a methodology for its implementation and the supervision of same.

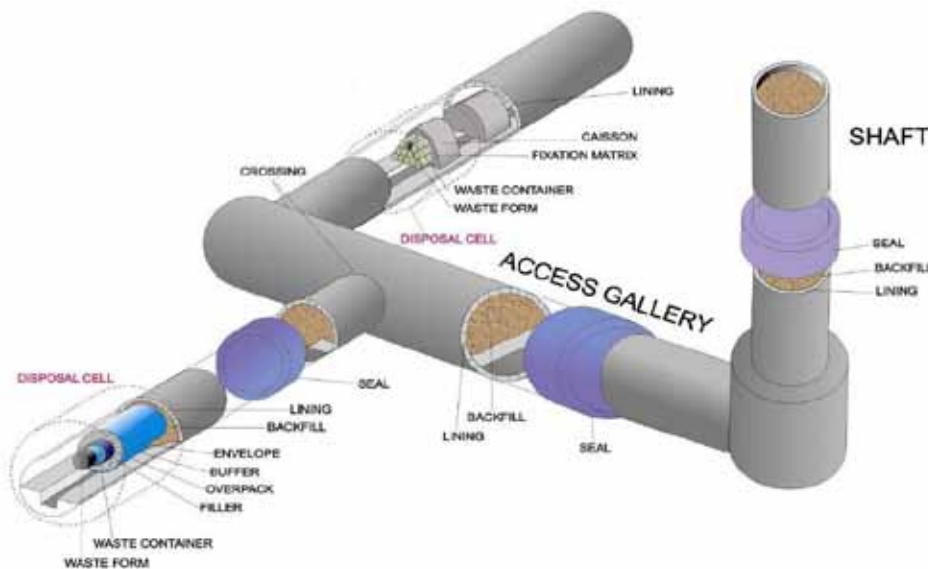
# INTERNATIONAL COOPERATION

## DEVELOPMENT OF A REFERENCE BACKFILL MATERIAL FOR THE DISPOSAL GALLERIES OF THE CURRENT BELGIAN REFERENCE REPOSITORY CONCEPT

ONDRAF/NIRAS, the Belgian Agency for Radioactive Waste and Enriched Fissile Material, plans to dispose of long-lived intermediate-level and high-level waste in a geological repository in claystone. In order to stabilize the galleries, they are to be backfilled after the waste has been emplaced. The backfill material is to be produced in

laboratory. The assessment of the hydrochemical environment and of the range of possible corrosion processes were based on chemical analyses of the pore solution. In addition to this, the thermal properties of the backfill material were determined and used for subsequent calculations of the heat

propagation. The flow behaviour of the backfill material was studied by means of a 2-m-long Plexiglas tube with interior structures that correspond to a section of a disposal gallery (mock-up test at a scale of 1:6). During the test, the pump pressure and the pressure in the backfill feed pipe were recorded as well in order to gain measurement data for the design of the pumping and conveying equipment.



Schematic representation of the Belgian reference concept for the disposal of long-lived intermediate level and high level radioactive waste (category B and C) (source: ONDRAF/NIRAS)

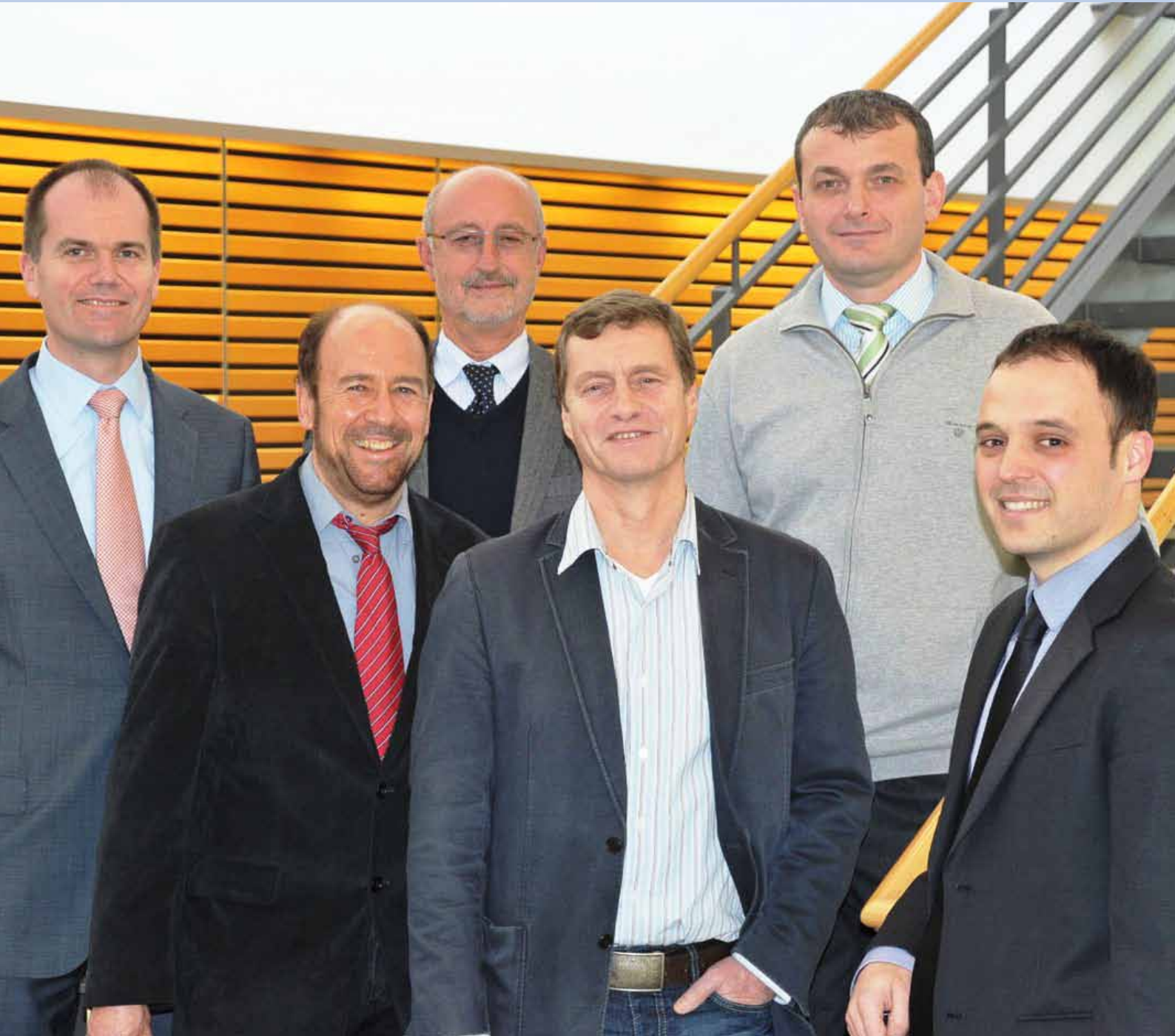
surface facilities and pumped into the disposal galleries via the shaft and access drifts. In order to avoid damage to the gallery lining, no excessive expansion or shrinkage of the backfill material must occur during hardening. After hardening, the backfill is to provide a chemical environment that limits corrosion processes and reduces the mobilization of radionuclides. Furthermore, the material is to facilitate the dissipation of decay heat. At the same time, the strength of the backfill material has to be low enough to enable retrieval of the waste packages.

DBE TECHNOLOGY GmbH was commissioned by ONDRAF/NIRAS to develop a backfill material that meets the requirements described above and to demonstrate its suitability by means of experiments and model calculations. The pumpability as well as the flow and spreading behav-



Mock-up test at a scale of 1:6 to demonstrate the feasibility of backfilling disposal galleries without residual voids





*Team "International Projects"*

# INTERNATIONAL COOPERATION

## DBE TECHNOLOGY GMBH AT THE IAEA GENERAL CONFERENCE 2014

At the invitation of the Federal Ministry for Economic Affairs and Energy (BMWi), DBE TECHNOLOGY GmbH joined the German delegation at the IAEA General Conference in Vienna. In addition to consulting experts, the delegation consisted of representatives of BMWi, of the Federal Foreign Office (AA), and of the Federal Ministry for the Environment, Nature Conservation, Building

management, which was met with great interest. The visitors' interests were manifold and went from general questions about radioactive waste disposal to questions about Germany's energy and disposal policy to requests for support in radioactive waste management by DBE TECHNOLOGY GmbH. At the exhibition, DBE TECHNOLOGY GmbH illustrated its expertise by presenting projects in the

areas of supporting governments and public authorities in the development and optimisation of waste management strategies as well as planning, licensing, and operation of disposal facilities for radioactive waste.

In addition to this, IAEA had invited DBE TECHNOLOGY GmbH to give a presentation at the Scientific Forum about its experience in and the challenges of radioactive waste management and the demonstration of technical feasibility of radioactive waste disposal. The Scientific Forum was organised in the margins of the General Conference.

All members of the German delegation, including the Heads of Delegation of BMWi and the AA, visited the Ger-



*German stand at the IAEA General Conference. Left to right: Dr. T. von Berlepsch (DBE TECHNOLOGY GmbH), T. Herdan (BMWi, Head of Delegation), K. M. Scharinger (German Ambassador at the United Nations in Vienna), Dr. H.-C. Pape (BMWi) und Dr. J. Krone (DBE TECHNOLOGY GmbH).*

and Nuclear Safety (BMUB). At the German stand, DBE TECHNOLOGY GmbH presented an exhibition about its know-how and its expertise in the field of radioactive waste

management during the Conference to inform themselves about the response to the exhibit. They were very pleased with the success of the German representation.



*Eric Kuate Simo, Department "Research & Development"*

# MANAGEMENT REPORT

## SPHERE OF ACTIVITIES

### GENERAL INFORMATION

The main business area of DBE TECHNOLOGY GmbH, a highly specialized engineering company operating on both national and international scale, continues to be engineering and consulting services for the disposal of radioactive waste.

In particular, this includes national and international research and development projects for the safe final disposal of such waste. Particular mention has to be made of international projects which deal with various aspects of radioactive waste disposal in near-surface repositories and in different host rock formations (claystone in Belgium and France, rock salt in Poland and the USA as well as magmatic host rock in Russia and the Ukraine). Furthermore, the Company is also involved in international consortia – in some as leader – 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. In China, it is involved in the preparation of a disposal strategy for radioactive waste and spent nuclear fuel, whilst in Bulgaria planning for the repository at the Kosloduj site is close to completion.

Of particular importance for developing know-how and for future tasks in Germany are 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 various deep rock formations, retrievability, sealing of excavation-damaged zones, as well as the compaction of crushed salt, and the visualization of model calculations for safety-related processes.

Furthermore, the Company provided services for Asse-GmbH with regard to several major tasks as part of the hazard prevention and emergency planning activities. In addition to various typical mining engineering services and the provision of highly qualified specialist personnel, 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 completion of the refurbishment of shaft 4.

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

After the Waste Management Services department had to be abandoned in 2013, the Company focused on the business sectors research and development, repository safety and Asse II and forced especially the expansion of its international activities.

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## RESEARCH & DEVELOPMENT

Research and development projects continue to be of major importance. In conjunction with its parent company DBE, DBE TECHNOLOGY GmbH thus ensures that the know-how for the exploration, planning, construction, operation, and closure of radioactive waste repositories

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 17 national and international research and development projects.

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## FINANCIAL REPORT

### BUSINESS DEVELOPMENT

The Company continued its successful development in the past financial year. Turnover amounted to € 7.2 million. The net profit for the year amounted to € 0.4 million.

As at December 31, 2014, the Company had orders on

hand amounting to approximately € 20.0 million. Because of the extremely specialist nature of the Company's activities, the macro-economic situation does not have any major impact on the development of business and the volume of incoming orders.

## RESULTS OF OPERATIONS, NET ASSETS AND FINANCIAL POSITION

### RESULTS OF OPERATIONS

Turnover rose by € 0.6 million to € 7.2 million compared with the previous year. The Company was able to compensate for the loss of turnover resulting from the cancellation of the order for waste documentation through other orders and the final billing of these services.

Other operating income amounted to € 0.1 million with the main item being the reimbursement of contributions to the *German Social Accident Insurance Institution for the raw materials and chemical industry "Berufsgenossenschaft Rohstoffe und chemische Industrie"* (BG RCI) for the previous year.

Personnel expenses decreased by € 0.2 million to € 4.3 million compared with the previous year. This was mainly due to the reduction in the number of employees.

The cost of purchased services mainly consists of assistance in major contracts and/or international contracts and amounted to € 0.9 million.

### NET ASSETS AND FINANCIAL POSITION

The balance sheet total increased by € 1.2 million compared with the previous year and amounts to € 9.6 million.

On the assets' side of the balance sheet, inventories rose by a total of € 0.2 million as a result of the increase in prepayments by € 0.4 million with a simultaneous decline in work in progress by € 0.2 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 € 0.1 million compared with the previous year and amount to € 2.3 million. Other assets mainly consist of a bonded loan to an amount of € 1.5 million as well as tax refund entitlements. Receivables include entitlements from DBE as part of intercompany performance accounting as well as other supplies and services.

The item "Cash on hand and bank balances" has risen by € 0.9 million to € 1.9 million compared with the closing date of the previous year. This is the result of advance payments made for two major orders from the European Union.

Other operating expenses remained virtually unchanged at € 1.2 million.

Net interest income includes interest income from a bonded loan and current bank balances as well as interest expenses mainly from the valuation of other provisions.

The result from ordinary activities rose by € 0.2 million as a result of the increase in turnover and now amounts to € 0.7 million.

As a consequence, the tax expense increased slightly and now amounts to € 0.2 million. As in the previous year, 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.

Compared with the previous year, net income has risen slightly and now amounts to € 0.4 million.

On the liabilities side of the balance sheet, shareholders' equity increased by € 0.1 million compared with the previous year and now amounts to € 1.7 million.

Provisions rose by € 0.1 million to € 0.9 million. They are made up of provisions for revenue risks from invoicing of services as well as the provisions for personnel expenses. Tax provisions relate to potential burdens from the tax audits for the years 2006 to 2009.

Compared with the previous year, liabilities have risen by € 1.2 million to € 7.0 million. The largest individual item at € 6.5 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 17.7 % (previous year: 19.4 %) has fallen due to the considerable increase in advance payments received. On the balance sheet date, equity financed not only fixed assets but also 31.3 % of inventories (previous year: 30.3 %).

# MANAGEMENT REPORT

The Company was solvent at all times during the past financial year and remained so thereafter.

The fundamental objective of company management is to ensure sustained economic stability which can be measured by the two indicators of the forward order book over

several years and positive net income. Positive proof of this can be seen in the net income for the year of € 0.4 million, the average forward order book range of approximately three years with an order volume of € 20.0 million as at December 31, 2014 (previous year: € 22.2 million), and the level of total output at € 7.0 million.

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## PERSONNEL AND SOCIAL REPORT

As of December 31, 2014, the Company's workforce consisted of 44 employees. Support for handling 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.

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## FORECAST, RISK AND OPPORTUNITY REPORT

Reporting and risk management are conducted in line with the systems that exist 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 which the Company can usually expect to encounter. This is primarily achieved through contractual integration into the insurance cover of DBE. There are no risks which pose a threat to the going concern assumption.

The order volume as at December 31, 2014, amounting to approx. € 20.0 million continues to be at a high level. Utilization of employee capacity is fully assured for 2015 and to more than half for 2016 and 2017. The Company's

activities continue to focus on using the unique know-how of the DBE/DBE TECHNOLOGY GmbH group so that it can offer appropriate high-quality services on a competitive basis. In 2015, it is intended to expand and intensify activities to further attractive and interesting markets.

Together with a sustained business development, the focus is on consolidating the Company's ability to continue as a going concern – also in view of the impending changes in the organizational framework conditions for final disposal in Germany. With a consistent level of orders on hand, the Company expects a constant, positive level of earnings both in 2015 and in the medium term.

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## 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 within the meaning 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 financial statements.

The accounting and valuation methods have fundamentally

remained unchanged compared with the previous year.

As a result of function standardization within the Group in 2014, the Company dispensed with netting out receivables from and liabilities to Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mit beschränkter Haftung (DBE) for the first time. The previous year's figures have been adjusted accordingly.

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

## ACCOUNTING AND VALUATION METHODS

The figures shown in the balance sheet for intangible assets and tangible assets are based on the cost of purchase. Intangible assets – consisting exclusively of software – are depreciated over a period of 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 € 150 but not more than € 1,000 are combined into an annual collective item and depreciated uniformly over a period of five years.

Orders which have been commenced (work in progress) are valued at the directly attributable production costs in accordance with the minimum valuation threshold under commercial law.

Advance payments are recognized at nominal value.

Receivables, other assets and cash and cash equivalents are reported at nominal value.

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

Prepaid expenses and deferred charges consist of payments made before the balance sheet date insofar as they relate to a specific period after that point in time.

Subscribed capital is reported in the balance sheet at nominal value.

Provisions are reported at the amount deemed necessary for the fulfilment thereof 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.

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 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 amounts to 4.58 %. The calculation of provisions for pensions was based on a salary 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 3.45 % as at December 31, 2014. 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 differences are reversed. 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 assets

The financial assets consist of a cooperative share acquired in 2012.  
Other than this, movements of fixed assets are shown in the Appendix to the Notes.

#### 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 bonded loan to an amount of € 1.5 million as well as tax refund entitlements.

#### 3. Deferred tax assets

Deferred tax assets, which are shown separately in the balance sheet without being netted, consist of the following balance sheet items:

	<b>12/31/2014 Difference between commercial and tax accounts</b>	<b>12/31/2014 Deferred tax assets</b>
Balance sheet item	<b>T€</b>	<b>T€</b>
Pension provisions	11	3
Other provisions	406	122
	<b>417</b>	<b>125</b>



## EQUITY AND LIABILITIES

### 4. Subscribed capital

Subscribed capital has 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

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

### 6. Revenue reserves

Revenue reserves amount to € 0.6 million and include € 0.5 million of retained earnings from previous financial years and € 0.1 million from a conversion in compliance with the German Accounting Law Modernization Act (Bilanzrechtsmodernisierungsgesetz/BilMoG) as of January 1, 2010. Of the net profit for the year 2013 amounting to € 0.4 million, a dividend of € 0.35 million was paid to the sole shareholder and € 0.05 million was transferred to the revenue reserves.

### 7. Provisions for pensions

Provisions for pensions relate to pension obligations to the management.

### 8. Tax provisions

The tax provisions are related to expected encumbrances from the tax audits for the financial years 2006 to 2009.

### 9. Other provisions

Other provisions amounted to € 0.8 million on the balance sheet date. They consist primarily of provisions for revenue risks attributable to billings for research and development contracts (€ 0.5 million).

### 10. Liabilities

All advance payments received consist of contractually agreed advance payments by customers.

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 value-added tax and wage tax obligations which still have to be paid (€ 0.2 million).

All liabilities are unsecured and have remaining terms of less than one year.

## CONTINGENCIES

There has been no change in contingencies compared with the previous year. They consist of a guarantee loan framework agreement for providing a contract fulfillment guarantee (T€ 32) and a prepayment guarantee (T€ 501). Based on past experience, there is only a slight probability of the contingencies being utilized.

# NOTES TO THE FINANCIAL STATEMENTS

## NOTES TO THE INCOME STATEMENT

### 11. Turnover

	2014 T€	2013 T€
Project assistance and engineering services for industrial companies	5,550	4,663
Revenues from billing domestic research and development contracts	1,299	1,386
Revenues from international contracts	310	501
	<b>7,159</b>	<b>6,550</b>

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

### 12. Other operating income

Other operating income mainly consists of a contribution refund of the German Social Accident Insurance Institution for the raw materials and chemical industry "Berufsgenossenschaft Rohstoffe und chemische Industrie" (BG RCI) for the financial year 2013 (T€ 44) and income from the reversal of provisions (T€ 33).

### 13. Cost of purchased services

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

#### 14. Personnel expenses

	<b>2014</b>	<b>2013</b>
	<b>T€</b>	<b>T€</b>
Wages and salaries	3,495	3,593
Social security and pension benefit costs (thereof for pensions)	809 (12)	906 (81)
	<b>4,304</b>	<b>4,499</b>

#### 15. Other operating expenses

This item mainly comprises costs of services in connection with the agency and service agreement with the parent company, rent, travel expenses, and general administration costs. As in previous years, they do not include any off-period expenses.

#### 16. Net interest income

Net interest income can be broken down as follows:

	<b>2014</b>	<b>2013</b>
	<b>T€</b>	<b>T€</b>
Other interest and similar income	26	3
Interest and similar expenses	24	11
	<b>2</b>	<b>-8</b>

Net interest income includes interest received in particular from the annual interest payments for the bonded loan as well as interest expenses from accrued interest on provisions (T€ 13).

#### 17. Taxes on income

Taxes on income consist of corporation tax (incl. solidarity surcharge) at T€ 107 (previous year: T€ 91) and trade tax for the current year at T€ 96 (previous year: T€ 81). Furthermore, additional income tax expenditure has been incurred to an amount of T€ 14 as a result of setting up tax provisions because of the tax audits for the financial years 2006 to 2009.

Income from deferred taxes (T€ 5) results from differences between figures shown in the commercial and tax accounts as at December 31, 2014.

# NOTES TO THE FINANCIAL STATEMENTS

## OTHER DISCLOSURES

### Annual average number of employees

On average, the Company had 44 employees over the year (previous year: 46 employees).

### Remuneration of corporate bodies

Details concerning the total remuneration of the management have been omitted with reference to 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€ 125
less deferred tax liabilities	T€ 0
	<u>T€ 125</u>

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## APPROPRIATION OF NET INCOME

Subject to the approval of the sole shareholder, the net income for the year to an amount of € 0.4 million is to be paid out as a dividend.

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## 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, 2014, with an unqualified auditor's report dated June 03, 2015.

# BALANCE SHEET

Assets	Notes	12/31/2014 (T€)	12/31/2013 (T€)
<b>A. Fixed assets</b>	(1)		
I. Intangible assets		34	20
II. Tangible assets		50	75
III. Financial assets		(€ 250)	(€ 250)
		<b>84</b>	<b>95</b>
<b>B. Current assets</b>			
I. Inventories			
1. Work in progress		4,263	4,433
2. Advance payments		904	516
		5,167	4,949
II. Receivables and other assets	(2)		
1. Trade receivables		234	498
2. Receivables from affiliated companies		404	129
3. Other assets		1,689	1,623
		2,327	2,250
III. Cash on hand, bank balances		1,856	925
		<b>9,350</b>	<b>8,124</b>
<b>C. Prepaid expenses and deferred charges</b>		<b>15</b>	<b>10</b>
<b>D. Deferred tax assets</b>	(3)	<b>125</b>	<b>120</b>
		<b>9,574</b>	<b>8,349</b>

<b>Equity and Liabilities</b>	<b>Notes</b>	<b>12/31/2014 (T€)</b>	<b>12/31/2013 (T€)</b>
<b>A. Equity</b>			
I. Subscribed capital	(4)	511	511
II. Capital reserves	(5)	179	179
III. Revenue reserves	(6)	569	519
IV. Net profit for the year		440	386
		<b>1,699</b>	<b>1,595</b>
<b>B. Provisions</b>			
1. Provisions for pensions	(7)	90	78
2. Tax provisions	(8)	18	0
3. Other provisions	(9)	775	722
		<b>883</b>	<b>800</b>
<b>C. Liabilities</b>			
	(10)		
1. Advance payments received		6,548	5,302
2. Trade payables		88	173
3. Payables to affiliated companies		135	189
4. Other liabilities		221	290
		<b>6,992</b>	<b>5,954</b>
		<b>9,574</b>	<b>8,349</b>

# INCOME STATEMENT

	Notes	01/01/ - 12 /31/ 2014 (T€)	01/01/ - 12 /31/ 2013 (T€)
1. Turnover	(11)	7,159	6,550
2. Changes in inventories		-170	893
3. Other operating income	(12)	103	138
		<b>7,092</b>	<b>7,581</b>
4. Costs of purchased services	(13)	938	1,344
5. Personnel expenses	(14)	4,304	4,499
6. Depreciation		43	44
7. Other operating expenses	(15)	1,155	1,194
		<b>6,440</b>	<b>7,081</b>
		652	500
8. Net interest income	(16)	2	-8
<b>9. Results from ordinary operations</b>		<b>654</b>	<b>492</b>
10. Extraordinary net income		0	70
11. Taxes on income	(17)	212	168
12. Other taxes		2	8
<b>13. Net income for the year</b>		<b>440</b>	<b>386</b>



# FIXED ASSETS

	At cost				Impairments				Net book values	
	As of 1/1/2014	Additions	Disposals	As of 12/31/2014	Cumula- tive amorti- zation/de- preciation 1/1/2014	Additions	Disposals	Cumula- tive amorti- zation/de- preciation 12/31/2014	As of 12/31/2014	As of 12/31/2013
	T€	T€	T€	T€	T€	T€	T€	T€	T€	T€
<b>Intangible assets</b> - Concessions, industrial property and similar rights and assets, and licenses in such rights and assets	146	30	20	156	126	16	20	122	34	20
<b>Tangible assets</b> - Other equipment, business and office equipment	253	2	10	245	178	27	10	195	50	75
<b>Subtotal</b>	<b>399</b>	<b>32</b>	<b>30</b>	<b>401</b>	<b>304</b>	<b>43</b>	<b>30</b>	<b>317</b>	<b>84</b>	<b>95</b>
<b>Financial assets</b> - Other loans	(250 €)	0	0	(250 €)	0	0	0	0	(250 €)	(250 €)
<b>Total fixed assets</b>	<b>399</b>	<b>32</b>	<b>30</b>	<b>401</b>	<b>304</b>	<b>43</b>	<b>30</b>	<b>317</b>	<b>84</b>	<b>95</b>



Head office of DBE TECHNOLOGY GmbH in the company building of DBE, Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mbH, Peine

**DBE  
TECHNOLOGY  
GmbH**



Verantwortung  
für Generationen  
Responsibility  
for Generations

**DBE TEC**  
DBE TECHNOLOGY GmbH



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