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Morsleben Repository for Radioactive Waste (ERAM) Submitting the documents for the public involvement procedure concerning the decommissioning of the ERAM

The procedure for the decommissioning of the Morsleben Repository for Radioactive Waste (ERAM) has reached a decisive stage. On September 13, 2005, the Federal Office for Radiation Protection submitted the documents relating to the involvement of the public with regard to the decommissioning of the ERAM to the Ministry of Agriculture and Environment Saxony-Anhalt (MLU) as the competent licensing authority. The plan shows in detail the geological, mining, systems engineering and radiological initial situation, the planned work associated with the conversion and dismantling of the facilities as well as the possible radiological impacts on the environment.

Between 1971 and 1998, altogether about 37,000 m³ of low and medium-level radioactive waste with a total activity of less than 6 x 10¹⁴ Bq (activity relating to the reference date: June 30, 2005) were disposed of in the ERAM.

Within the scope of the decommissioning procedure, apart from decommissioning the ERAM, it is intended to dispose of the radioactive waste stored intermediately at this time in the ERAM and of the radioactive operational waste produced in this period. Since 2003, selected mine openings in the central part have been backfilled with salt concrete as a measure of averting a danger due to mining. The decommissioning of the ERAM makes special demands on the competent authorities, since the cavity volume of the repository for radioactive waste established in a former winning mine by far exceeds the volume of the waste emplaced therein. The decommissioning concept developed for the ERAM after having checked technical alternatives therefore provides for a wide backfilling of selected mine openings.

In the process of the decommissioning measures, one intends to pump about 4 million m³ salt concrete via pipelines into mine cavities of the ERAM. With this stowing material a supporting effect for the mine opening can be achieved.

At the same time, the salt concrete in the mine openings and galleries constrains in the long term the movement of solutions and the transport of potentially contaminated solutions in the mine. The decommissioning concept also includes comprehensive measures for the sealing of the shafts Bartensleben and Marie. These have, on the one hand, a supporting effect and, on the other hand, constrain the influx of solutions into the mine and the discharge of potentially contaminated solutions from the mine in the long term.

On the basis of comprehensive scientific and technical investigations BfS has proved that, taking into account site-specific conditions, the effects on man and the environment remain minor and protection goals are complied with, even under long-term safety aspects. According to the guidelines laid down in the Law concerning Environmental Impact Assessments (UVPG), the impacts of decommissioning on man, animals and plants, soil, water, air, climate and landscape (including interactions as well as cultural and other real assets) were determined, described and evaluated within the scope of an environmental impact assessment.

After the plan-approval decision has been made, the decommissioning work will start with the infrastructure measures underground and above ground and will continue for about 15 years. After the completion of the decommissioning measures, the surface will be made reusable according to the regulations of the Federal Mining Act (Bundesberggesetz, BBergG). Apart from the "Plan for the decommissioning of the Morsleben Repository for Radioactive Waste", the "Brief description", the "Environmental impact study relating to the licensing procedure", the "Accompanying landscape conservation plan to the licensing procedure" and the "Survey of examined technical alternative procedures to the decommissioning of the Morsleben Repository for Radioactive Waste (ERAM)" were submitted to the Ministry for the Environment. The submitted documents give a survey of the investigations carried out during the planning phase of the decommissioning of the ERAM and their results. Within the scope of the public involvement procedure they are to inform the general public comprehensively, to represent the basics of the project and place the population in a position to judge to what extent they are affected. The nuclear law licensing authority, the Ministry of Agriculture and Environment Saxony-Anhalt, will now examine and evaluate the documents submitted by BfS, in order to determine if they are suitable for being displayed in the public involvement procedure. Following the announcement and display of the documents by the licensing authority there is the possibility to make objections which will be discussed in the public hearing.

World-wide, the ERAM is the first repository for radioactive waste in deep geological formations which will be decommissioned according to schedule after a nuclear law licensing procedure with public involvement.

Wilhelm Hund

Department Safety of Waste Management

International measurement comparison of in-situ gamma spectrometry to determine radioactivity in the soil

After a nuclear accident or in case radioactive contamination of a larger area is suspected, it is important to rapidly gain a survey of the possibly existing radioactivity distribution in the environment. Radioactivity in the soil can be determined in various ways. A very exact but also very time- and cost-consuming procedure requires soil samples to be taken and analysed in a laboratory. Much more rapid and simple are measuring methods carried out directly on the soil surfaces in situ to determine the content of natural and artificial radioactive substances. In Germany and many other countries, measurements by means of in-situ gamma spectrometry are inherent part of measuring programmes which help, e. g. after a nuclear accident, to make decisions about appropriate protection measures for the population.

As a measure of quality assurance of in-situ gamma spectrometry, the Federal Office for Radiation Protection together with the Wismut GmbH performed an international measurement comparison from May 9th to May 12th 2005 in Gera and its vicinity to determine radioactivity in the soil. 70 measuring teams from 13 countries participated in this pan-European exchange of experiences in the field of in-situ gamma spectrometry.

At the beginning of the event, all 70 teams received a detailed measuring programme with various tasks. More than 170 participants had to carry out measurements with their own measuring methods and instruments at given points in the vicinity of Gera (at Seelingstädt, Reust, Dänkritz and Ronneburg). The following issues were required:

- Determination of the mass-related activities of natural radionuclides at several measuring points with different soil composition.
- Determination of the surface-related activities of the radionuclide Cs-137 at one of the measuring points.
- Determination of the detector calibration by measuring punctiform activity normals.
- Determination of buried radioactive sources.
- Determination of the mapping of the local dose rate on a surface sized about 1 ha.

Currently, the results gained by the measuring teams are compiled and evaluated at BfS. The evaluation of results gained by this large number of measuring teams makes it possible to compile the internationally achieved quality standard on a wide basis. A detailed report about the results of the measurement campaign will be available by the end of this year. Apart from the compilation of the internationally achieved quality standard, these days shared with each other offered many national and international experts the opportunity to exchange experiences. During and after the measurement campaign numerous participants expressed their very positive attitude towards the type and execution of the event and encouraged that such measurement campaigns and expert meetings be carried out more frequently. It is to be hoped that there will be organisers of such events in the years to come too.

Stefan Mundigl, Christopher Strobl

Department Radiation Protection and the Environment

International emergency response exercises - Report about the INEX-3 and CONVEX-3 exercises

In the past half year, two international emergency response exercises took place with participation of BfS.

On May 11 and May 12 the IAEA (International Atomic Energy Agency) and the IACRNA (Inter-Agency Committee for Response to Nuclear Accidents) organised the international nuclear emergency response exercise "CONVEX -3". The objective of the exercise was in particular to test the international exchange of experiences and the IAEA Emergency Response Centre. In addition to this, the alarm procedure or the elaboration of press releases were to be tested. More than 50 countries and 8 international organisations participated in the exercise. The exercise was based on a fictitious accident in the Cernavoda NPP in the south-east of Romania, which is located at a distance of about 1000 km from the German border. In the exercise real weather data were used, so that the fictitiously affected areas could not be predicted. The exercise started in the morning of May 11 and lasted without interruption until the evening of May 12. German participants in the exercise were the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), German Meteorological Services (DWD), the (Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) and the Federal Office for Radiation Protection (BfS).

Weather conditions on May 11 and May 12 had the effect that initially the northern neighbouring countries of Romania, Moldova and the Ukraine, were affected by the fictitious radioactive cloud, later on also the southern neighbouring countries Bulgaria, Greece and Turkey. Since in Germany no contamination had to be expected due to weather conditions, the main focus of the German participants in the exercise was – apart from the periodic determination of the current radiological situation – on travel recommendations for Germans to Romania and its neighbouring countries, on issues of import restrictions for food originating from the affected countries to Germany and possible supporting measures for Germans in the affected areas. From the German point of view the following conclusions can be drawn from this exercise: The flow of information between the IAEA, the EU, Rumania and Germany was good. Compared with the past exercises an improvement in the alarm procedure of the German authorities could be recognised. Internet inquiry and web-based systems for the exchange of information between the national teams will gain more importance in future. The simulations of media involvement and press information should play a larger role in the next exercises (to a limited extent queries by media and citizens were simulated in the exercise).

On September 13 and 14, the emergency exercise "INEX-3", jointly executed by German and Austria, took place within the framework of an international series of exercises co-ordinated and prepared by the OECD/NEA (The Nuclear Energy Agency (NEA) is a special authority within the Organisation for Economic Co-operation and Development (OECD)). The main focus of the INEX-3 exercise was on decision-making following environmental contamination due to a release of radioactivity

into the environment. In the first instance, late countermeasures were examined such as restriction of production or consumption of food, measures relating to trade, travelling and tourism, recovery and waste management as well as information of the public. On the German side, representatives of 8 authorities and institutions, headed by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) participated in the exercise. In contrast e. g. to the CONVEX-3 exercise, this INEX-3 exercise was executed as "tabletop" exercise, i. e. as map exercise, where on both sides, the German and Austrian, all participants had gathered in a room and represented their respective organisations. The benefit of such a tabletop exercise showed in the intensive discussions between different authorities which are not possible in reality due to the spacial separation.

The exercise scenario was elaborated by BMU, BfS, the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (Lebensministerium, BMLFUW) and the state of Vorarlberg. The scenario was based on a fire (magnesium combustion) in connection with an abandoned Cs-137 source in Lustenau in the state of Vorarlberg. Weather conditions at the exercise date July 1, 2005, led to contamination in Germany. Particularly affected were the Bodenseekreis around Friedrichshafen in the Federal State of Baden-Württemberg and its neighbouring districts. On the first day of the exercise, the evaluation of the radiological situation and first immediate measures were discussed, having only incomplete information about the consequences of the accident. On the second day of the exercise, having assumed a leap in time of 3 weeks, the measures of the late phase (e. g. measures relating to food production) were the focus of the INEX-3 exercise.

New about the exercise was the transboundary scenario requiring close co-operation between Austria and Germany. The scenario which is rather exceptional for radiological emergency response exercises, required some flexibility by the participants, but permitted nevertheless dealing with nearly all the precautionary radiation protection issues. Some of the actors could still fall back on their practical experience gained after Chernobyl. The evaluation of the exercise will also be taken into account in the international exchange of experiences within the scope of an OECD/NEA workshop to be held in spring 2006 in Paris.

Florian Gering

Department Radiation Protection and the Environment

Radiation exposure of flight attendants

In the EU Directive 96/29 EURATOM, the European Commission laid down the protection of occupationally exposed persons against a significantly enhanced exposure due to natural radiation sources. This protection also applies to flight attendants who, due to cosmic radiation, can receive an annual dose of more than 1 mSv. In Germany, this requirement was implemented in national law with the amendment to the Radiation Protection Ordinance 2001. Since August 2003, 45 airline companies from different areas of aviation (scheduled flights, charter flights, air cargo, military,

etc.) have calculated dose values of their flight attendants with computer programs. They transfer the accumulated monthly doses via the Luftfahrt-Bundesamt to the Radiation Protection Register of the Federal Office for Radiation Protection. The recently introduced first report of the BfS Radiation Protection Register includes the evaluation of the exposure data of the flight attendants over one year since the beginning of their radiation protection monitoring in August 2003. The radiation protection monitored person subgroup of flight attendants comprises 30,204 persons. With a collective dose of 44.2 Pers.-Sv, these persons contribute to more than half of the collective dose of all occupationally radiation exposed persons. Compared with other radiation exposed occupational groups, flight attendants are among the most exposed occupational groups with an average effective annual dose of 1.8 mSv, following the categories "radiography", "nuclear power engineering, maintenance" and "nuclear power engineering, cleaning". All annual doses were below 6 mSv.

Compared with other European countries, Germany has also the largest number of radiation protection monitored persons in the case of flight attendants. Compared with the mean annual dose values of those European countries executing an official dose determination of flight attendants, the annual doses to German flight attendants are in the mean range.

Lothar Kammerer

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Radiation protection of the personnel in radioimmunotherapy with Y-90

The chance of survival of patients with Non-Hodgkin's-lymphoma can clearly be improved by a new method, the radioimmunotherapy using yttrium-90 labelled antibodies (registered trade name Zevalin®). Zevalin® has been licensed all over Europe since 2004. The high effectiveness of this radiopharmaceutical is based on the fact that nearly all the energy of beta radiation of Y-90 is absorbed in the tumour tissue where it gets with the help of the antibody. Thereby the tumour cells can be killed and the healthy tissue can be spared. When handling beta-emitters, however, the exposure risk to the medical personnel can be very high. Therefore BfS accompanied the launch of the Zevalin®-therapy with investigations on extremity exposure of medical personnel. In several hospitals, measurements to determine the maximum local skin dose at the hands of radiochemists, assistants and doctors were carried out. For these measurements, small thin-layer thermoluminescence dosimeters were attached to the finger tips with adhesive tape.

Due to the relatively high labelling activity of 1.5 GBq and the numerous worksteps, the exposure risk is very high, in particular during the labelling of the antibodies with Y-90.

When working carefully and using all radiation protection means recommended and provided by the manufacturer of the radiopharmaceutical, the maximum exposure at the finger tips was 6 mSv on average per preparation. When injecting Zevalin®, a maximum local skin dose of 3 mSv per treatment was measured on average at the doctors' finger tips. Although the manufacturer of the pharmaceutical

provides for suitable shielding for the syringes, activity vials and reaction vessels, these radiation protection means are not always used. In one case no shielding was used when the therapeutic syringe was drawn up, which led to a high skin dose of 80 mSv at the right hand.

Cause for such a malpractice is often a deficiency of information of the medical personnel regarding the radiation hazard and the necessary radiation protection measures when handling beta-emitters. It is thus partially not known that e. g. the skin dose when handling an unshielded 5-ml-plastic syringe filled with Y-90 is higher by a factor of 12, compared with Tc-99m with the same activity and contact time. The dose rate factors in the case of a droplet skin contamination even vary by a factor of 150 for these two radionuclides.

Through better information about the potential hazard at beta-workplaces, the affected personnel can be motivated to apply all available radiation protection means and measures and to regularly carry out contamination controls.

To control that the skin dose limit is complied with, official beta/photon ring dosimeters are available at the individual dosimetry services. These are suited for determining the local skin dose if the recommended instructions for wearing are fulfilled. The maximum skin dose, however, is usually underestimated in those cases too, since it is not possible to wear the ring dosimeter at the place of maximum dose, mostly at the finger tip. This could be compensated in future by application-specific correction factors, which would require further investigations.

Arndt Rimpler

Department Radiation Protection and Health

New and updated BfS information material

In the current year, BfS has newly published and updated numerous brochures, flyers of the series "Radiation Topics" and handouts. These include the brochures "Disposal of radioactive waste as a national task" and "Decentralised interim storage facilities – modules for the disposal of radioactive waste", the radiation topics "Integrated Measuring and Information System for the Surveillance of Environmental Radioactivity – IMIS", "X-ray diagnostics – harmful or beneficial?", "Electric and magnetic fields in power supply" and "Mobile telecommunication and transmitter stations" as well as the handouts titled "Mushrooms – unconsidered consumption?", "Natural radionuclides in building materials", "Radon – main cause of natural radiation exposure", "Radon in buildings", "Measures for the protection from enhanced radon concentrations in buildings", "Modern communication technologies – Bluetooth and WLAN", "Use of wireless fixed-network phones/DECT phones", and "Solaria put health at risk". Further information material is currently elaborated. Citizens have a great demand for information provided by BfS, which is a great success. This shows in the daily subscriptions and in fairs and other road shows. They can be downloaded in the Internet (www.bfs.de) or can be ordered free of charge at Bundesamt für Strahlenschutz, Postfach 10 01 49, D-38226 Salzgitter, e-mail: info@bfs.de, fax: 0049 1888 333 1150.

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Press and Public Relations