Richard

repository

Radioactive Waste
Repository Authority

SÚRAO

The Radioactive Waste Repository Authority (RAWRA) is a state organisation established under the provisions of Article 26 of Act 18/1997 on the peaceful uses of nuclear energy and ionising radiation (the Atomic Act) and on amendments to certain other Acts. RAWRA's mission is to ensure the safe disposal of existing and future radioactive waste, in compliance with the requirements of nuclear safety and human and environmental protection.

The Richard site has an interesting past

Limestone extraction, from a limestone seam approximately 5 m thick and 70 to 80 metres beneath the Bídnice hill, commenced as early as in the mid-19th century.

In 1943 – 1944, the site was chosen by the Germans for the construction of both an underground plant for Auto Union A.G. Chemnitz, a German automobile company (producing components and parts for the HL230 Maybach engine) and a factory for Osram. The project was code-named Richard. The workforce, made up of prisoners – miners, builders, electricians, plumbers and various other workers, were transported to the site from a local labour camp and some of them from nearby Terezín. Only a small number of the factory halls planned were eventually completed; these were used by Auto Union. By the end of the war, construction work was still not finished, with individual parts of the project being at different stages of completion, from fully completed factory halls to underground galleries which had merely been widened out prior to further development. After the removal of all the plant and equipment at the end of 1945, the Čížkovice Cement and Lime Company took over the site to resume limestone extraction. A vast new system of galleries was created during the next 15 years. For economic reasons, deep mine excavation being so much more expensive than open-cast mining, the mine was eventually closed. In 1964 a specially adapted part of the mine commenced use as a radioactive waste disposal facility.

Richard II

1964

RADIOACTIVE WASTE

Radioactive waste is generated as a consequence of the various uses of radioactive materials. When classified according to producer, radioactive waste from nuclear power plants forms the largest group both in terms of volume and activity level. The second-largest group comprises institutional waste generated in the health sector, industry, research and agriculture. Examples of such waste include disused meters and radionuclide emitters, contaminated clothing, cloth, paper and syringes.

There are currently approximately one hundred radioactive waste producers in the Czech Republic. The only safe option available for the permanent management of radioactive waste consists of subjecting the waste to the appropriate methods of treatment followed by final disposal in such a way that the waste is safely isolated from the environment.

Institutional waste has been disposed of at the Richard repository since 1964. The repository is located near the town of Litoměřice, Northern Bohemia, in the abandoned Richard II limestone mine (beneath the Bídnice hill).

Radioactive waste management is the responsibility of the State

According to the Atomic Act effective since 1997, the State is responsible for the safe disposal of radioactive waste in the Czech Republic. The Radioactive Waste Repository Authority (RAWRA), a specialist state-owned organisation established by the same Act, thus became responsible for running the Richard repository. Under the provisions of the Act, the repository, previously owned by ARAO, was transferred into State ownership on 1 January 2000. The Prague-based Research Institute for Radioactive Isotope Production, Research and Use was previously responsible, before its privatisation, for radioactive waste management.

Besides operating existing disposal facilities, RAWRA is involved in the general management of all types of radioactive waste as well as in research and development relating to radioactive waste disposal. The efficient use of RAWRA's funds is overseen by a special Supervisory Board consisting of eleven members, three of whom are representatives of communities in whose vicinities operational radioactive waste facilities are situated (Jáchymov, Litoměřice and Dukovany); a Member of Parliament represents the general public.

Nuclear safety and human and environmental protection make up the major criteria in radioactive waste management

Radioactive waste disposal is the final step in a long sequence of carefully supervised activities which include waste collection, sorting, conditioning and processing. Following the completion of the required procedures, which depend on the type and category of the waste, radioactive waste is transported to the appropriate repository. All these activities are aimed at providing the highest level of both human and environmental protection. Radioactive materials, if not handled properly, might pose a threat to living organisms and therefore cannot simply be destroyed. Consequently, they need to be isolated from the environment for a certain period of time during which, as a result of natural decay, they change into other, stable elements. For this reason – i.e. radioactive waste isolation for the required period of time – repositories are constructed.

Office building – information centre.

Transportation passage.

Emplacement chamber at the Richard repository.

The safe management of radioactive waste and spent nuclear fuel is both our main priority and an obligation set out by the Peaceful Uses of Nuclear Energy and Ionising Radiation Act. We use methods aimed at providing maximum protection for the public, our staff and the environment from radiation exposure and the release of radioactive substances into the surrounding environment.


Phare 2002 NUS
tivních odpadů
LÁDACÍ KOMORY
ÚLOŽIŠTĚ RICHARD
vba, spol.s r.o.
odpadů
s r.o., AGE a.s.
SURAO
SPRÁVA ÚLOŽIŠŤ
RADIOAKTIVNÍCH ODPADŮ
6

40 km

RICHARD REPOSITORY

The Richard repository was constructed in an abandoned limestone mine

The repository covers just a small part of the abandoned Richard I, II & III mine complex (see map on page 4) which comprises over 40 km of galleries and crosscuts. The repository was built in a 5 m thick subhorizontal clay limestone bed. The overburden as well as the footwall consist of impermeable marlstone with a thickness of over 50 m. Beneath the impermeable marlstone lies fine-grained marly sandstone. The repository is situated above the local groundwater table and is classified as a subsurface repository.

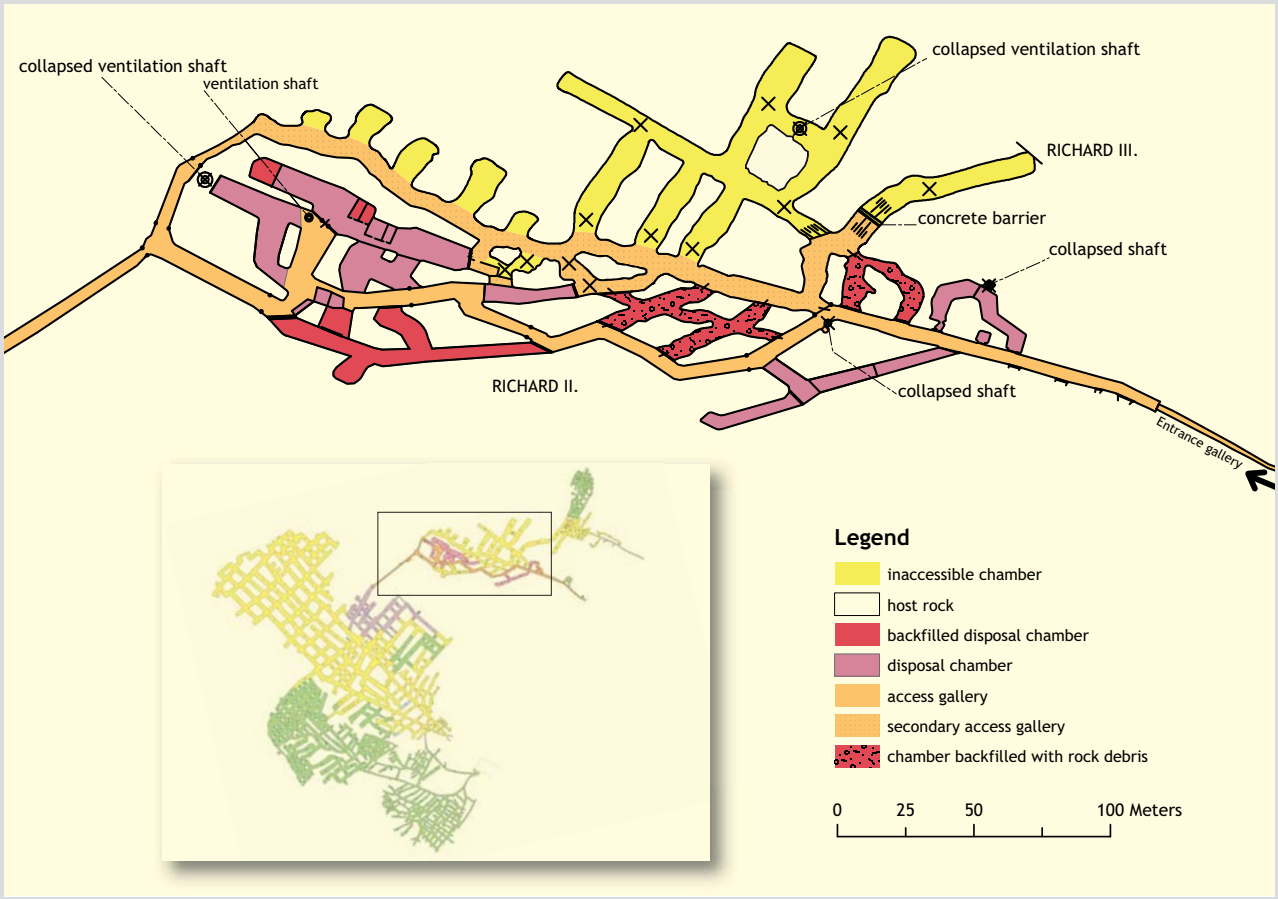
Between 1960 and 1964 the original mined caverns in the Richard II limestone mine were substantially enlarged for its use as a repository the haulageways of which are 6 to 8 metres wide and 3 to 4 metres high. The stability of the haulageways is ensured by reinforced concrete frames in the shape of an almost square inverted 'U'. Certain parts of the original reinforced concrete frames, installed in 1944 – 1945, were manufactured directly in the haulageways using concrete die casting techniques. The walls of the haulageways were subsequently stabilized using the shotcreting method. A drainage system comprising a number of retention reservoirs was installed in the floor, the floor itself being concreted. Water from the system as a whole is eventually collected in an external central retention reservoir.

Individual emplacement chambers were constructed along the 630-metre-long haulageways. The entrance to each chamber is secured by a reinforced concrete portal and additional supports; the walls and roof have been stabilized by means of shotcreting and strengthened using 1 to 5 metres long bolts. A fan has been installed to ensure proper ventilation. The temperature within the repository is stable (around 10°C).

Waste to be disposed of in the repository is usually packed into 200-litre drums. Initially, waste is packed into 100-litre drums which are subsequently loaded into the 200-litre drums (overpacks). The space between the two drums is then filled with concrete thus forming a 5 cm thick concrete protective lining for each drum. Both the inner and outer surfaces of the overpack are galvanised; in addition, the outer surface is coated with protective paint to prevent corrosion.

The repository is subjected to regular safety analysis in order to ensure compliance with the latest international methodology. Analysis to date has consistently shown a high standard of safety at the repository. In addition to the engineered barriers described above, natural barriers also form an important part of the repository's protection system.

Repository operation and monitoring, radioactive waste disposal and other related activities are provided by the Radioactive Waste Repository Authority whose powers and responsibilities are set out in the aforementioned Atomic Act and relevant mining regulations; RAWRA itself is subject to regular inspections by government supervisory bodies (SÚJB – the State Office for Nuclear Safety; ČBÚ – the Czech Mining Authority; and OBÚs – Regional Mining Authorities).



Map of the Richard repository.

Respons

We are well aware of our responsibility for the results achieved and for RAWRA's efficient financial management. Our performance is subject to regular quality control audits. Reports on repository operation and any impacts on the environment are submitted both to the relevant inspection authorities and the general public.


ibility

ENVIRONMENTAL ISSUES

The repository's impact on the environment is constantly and carefully monitored

The aim of radioactive waste disposal is to protect the environment from the detrimental effects of ionising radiation. To remove any doubts that this requirement is being met, radiation monitoring of both the repository site and the surrounding area is carried out regularly. Underground and surface monitoring systems have been introduced to this effect. Radiation monitoring is required by the Atomic Act and relevant regulations of the State Office for Nuclear Safety (SÚJB). Inspections and measurements are planned and conducted in accordance with a strict Monitoring Programme approved by the SÚJB.

Radiation monitoring includes the monitoring of the repository site, its workers, any discharges from the repository as well as of the surrounding area. This involves primarily the periodic monitoring of the gamma radiation dose rate and surface contamination at the repository, measurement of airborne concentrations of radon (^{222}Rn) and tritium (^{3}H) as well as water analysis (both of water samples taken at the repository and water effluents from the drainage system). The gamma radiation dose equivalent is also monitored by means of thermo luminescent dosimeters installed in the area surrounding the repository.

Sampling of mine water, effluents issuing from the mined cavities, water from boreholes and other places in the surrounding environment (principally from monitored wells in the vicinity of the repository, water discharged from a sewage plant at Litoměřice, water from wells at a water treatment plant at Píšťany and water from the Elbe River near Litoměřice) is carried out in intervals specified in the Monitoring Programme. These samples are subjected to an assessment of total volume alpha activity, total volume beta activity, the volume activity of tritium (^{3}H), carbon (^{14}C) and of individual radionuclides (^{60}Co, ^{134}Cs, ^{137}Cs and ^{241}Am). No activity exceeding the limits specified by the SÚJB in the repository licensing documentation has been detected in any sample; the values of most of the parameters monitored to date have been below the detection limit.

The effective dose of external radiation received by workers at the repository is measured using electronic and film dosimeters. The whole-body dose of radiation exposure for selected workers at the repository is measured annually. Exposure limits for persons working with radiation sources, determined by SÚJB regulation 307/2002, have not been exceeded.

Since the repository is situated in a mined cavity, monitoring also includes geotechnical and hydrogeological measurements to verify the stability of the underground cavern.

Monitoring results obtained to date show that the Richard repository meets all the security limits set by the State Office for Nuclear Safety and that relevant limit values have not been exceeded.

Crane for waste container drop testing.

Hall in the operations building.

Radiochemical analysis laboratory.

Techno

We employ the most advanced technologies available for radioactive waste management. Special laboratory and dosimetry equipment is used to determine with great accuracy the composition of the radionuclides contained in any material. Advanced methods are also employed in radioactive waste processing and treatment as well as in the operation of repositories. Thanks to longstanding international cooperation, we first acquire the very latest expertise and then adapt it for practical local application in the deep geological disposal of high-level radioactive waste.


logies

17 000 m^3

Richard repository site

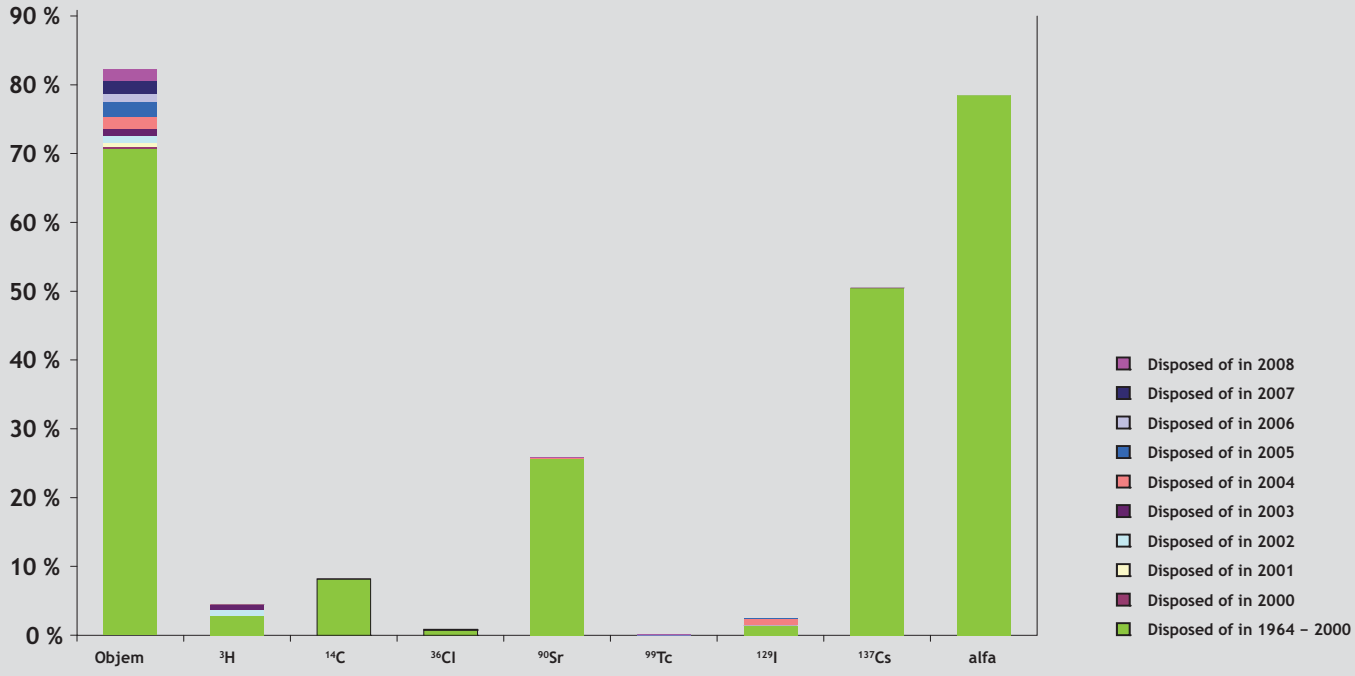
The repository site covers a total area of 16 hectares. It includes the operations building, the information centre, the radiochemical laboratory and an accredited laboratory for testing waste containers and radioactive substances of special form. The containers used for the transportation and disposal of radioactive substances and certain types of radioactive waste have to satisfy a number of strict requirements. One such requirement is that they must maintain their structural integrity after being dropped from a height of several meters. A test crane has therefore been installed at the site to perform the testing of waste containers (photo on page 11). Tests of containers for the transportation of radioactive packages of type IP-2, IP-3, A and B, and tests of radioactive substances of special form as required by regulations concerning the transportation of hazardous substances are performed at the Litoměřice testing laboratory. The laboratory performs tests specified in Regulation 317/2002, e.g. water spraying tests, free-fall tests, pressure tests, impact perforation tests, drop tests, crushing tests, heat tests and water immersing tests.

Repository operating costs are met from the Nuclear Account and funding from the Ministry of Industry and Trade

In accordance with the Atomic Act, all the costs associated with the operation of the Richard repository have been met, since 1st January 2000, from the Nuclear Account. Funds deposited in this Account are designed to be used for covering the costs of radioactive waste management. All radioactive waste producers are required to make payments to the Nuclear Account to cover radioactive waste management costs. State involvement in terms of funding is necessary since a large volume of radioactive waste had to be disposed of at a time when no funds existed to meet the costs of the long-term management of such waste and ultimate repository closure. The combined operating costs of the Richard and Bratrství repositories currently amount to approximately CZK 20 million per annum.

Final disposal of radioactive waste

A Phare project was carried out during 2005 – 2007 at the Richard repository with the aim of verifying the methodology of the final closure of emplacement chambers filled with radioactive waste. Waste disposed of at the repository from 1965 to 1985 was transferred to specially refurbished chambers. 15,000 waste packages of so-called historical waste were conditioned, transferred to the refurbished chambers and subsequently backfilled. Individual drums were removed from their original location, checked, emplaced in new containers if necessary, transferred to the refurbished chambers and sealed in concrete backfill thus ensuring the safe isolation of the waste from the environment. A total of approximately EUR 1 million was provided from EU funds for the project while the Czech Republic provided approximately EUR 450,000. The closure of emplacement chambers using this method and associated technologies serve to demonstrate and verify the various safe repository closure methods available.



Using the repository to its full capacity.

The repository has the capacity to provide waste disposal for the next several decades

More than 25,000 waste packages with a limited radionuclide activity level of 2.10^{14}Bq are presently disposed of at the repository. The total volume of this underground facility exceeds 17,000 m^3; the disposal capacity makes up approximately half that volume, the remainder being haulageways.

If the remaining volume continues to be filled at the current pace of 100 to 200 drums per year, the repository's operational life will continue up to 2070. Naturally, the eventual date of closure depends on whether changes occur in the rate at which the repository is filled.

CZECH REPOSITORIES

Three repositories are currently in operation in the Czech Republic

RAWRA manages a further two repositories in the Czech Republic – the Dukovany repository situated at the Dukovany NPP in Moravia and the Bratrství repository near the town of Jáchymov, Western Bohemia.

Dukovany repository

The Dukovany repository was built at the site of the Dukovany nuclear power plant for the disposal of radioactive waste generated in the nuclear power sector. It is the Czech Republic's largest disposal facility, comparable, in terms of its design and safety, with repositories in Western European countries. A long-life barrier system is in place to prevent the possible release of radionuclides into the surrounding environment. The repository has been in continuous operation since 1995. The 55,000 m^3 storage volume (which can accommodate more than 180,000 drums) provides enough space for all the waste generated at the Dukovany and Temelín nuclear power plants provided that the waste meets the relevant acceptance criteria.

Bratrství repository

The Bratrství repository is designed for the disposal of waste containing naturally occurring radionuclides, that is radionuclides that occur (in low concentrations) in nature. Waste of this type is generated principally by emitters used in the health and research sectors. The repository was constructed in one of the mined cavities of a former uranium mine and contains 5 chambers with an overall capacity of approximately 1200 m^3. The facility was put into operation in 1974.

Information on radioactive waste should be easily accessible to all

RAWRA aims to provide easily accessible information on radioactive waste especially to people in those regions where operating repositories are located. A local Information Centre was opened in April 2002 at the Richard repository.

A permanent exhibition at the Information Centre features the whole radioactive waste cycle, beginning with its occurrence up to its final disposal in a repository. The exhibition attempts to focus on issues which are of the greatest interest to the general public, i.e. radiation safety and the impact of radioactive waste on the environment. Display posters, three-dimensional models (of the Richard repository, interim storage facilities and a drum containing compacted waste), photos and film clips are used to make up a truly multimedia programme. Visitors can view presentation CDs, DVDs, the RAWRA website, etc. It is envisaged that the exhibition might be used as a supplement to the curriculum for primary and secondary schools to enhance students' knowledge concerning general physics or environmental protection. A special display poster prepared in co-operation with the Terezín Memorial is devoted to the history of the Richard repository; this, and descriptions of the nature of nuclear waste and the monitoring of its impact on the environment, make up the topics of greatest interest to the general public.

Guided visits for groups (including a film presentation) can be arranged in advance (Tel. No.: +420 221 421 539, +420 416 724 456; E-mail: richard@rawra.cz).
We look forward to meeting you!

Other addresses

A similar Information Centre is open to the public at RAWRA's head office building in Dlážděná Street 6, Prague 1.

Opening hours:
Monday: 9:00 – 12:00 and 13:00 – 15:00
Tuesday: 9:00 – 12:00 and 13:00 – 15:00
Wednesday: 9:00 – 12:00 and 13:00 – 17:00
Thursday: 9:00 – 12:00 and 13:00 – 15:00
Friday: 9:00 – 12:00

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More information can be found on RAWRA's website: www.surao.cz.

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