

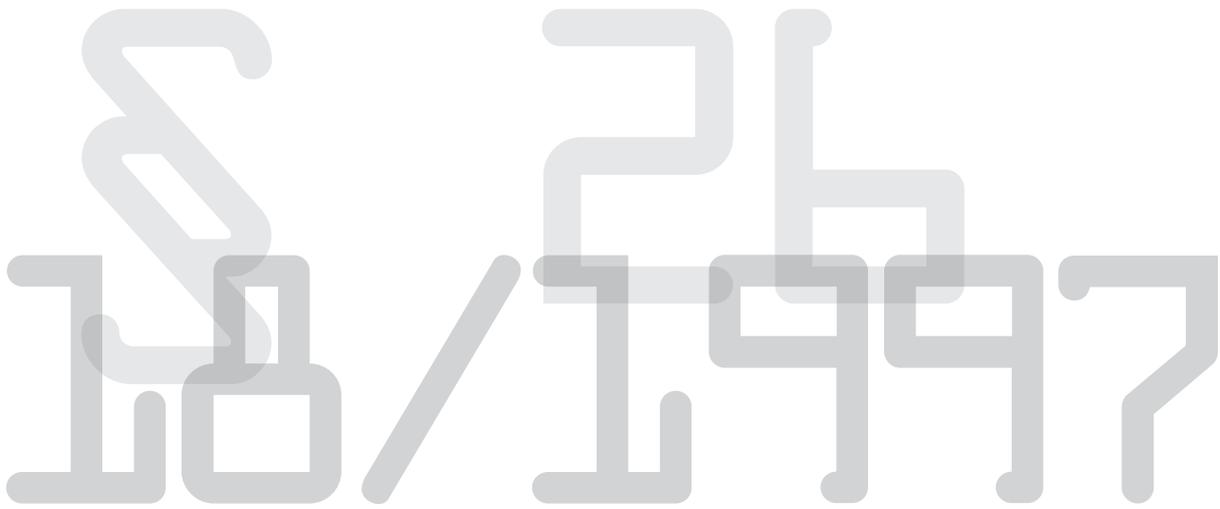
Bratrství

repository

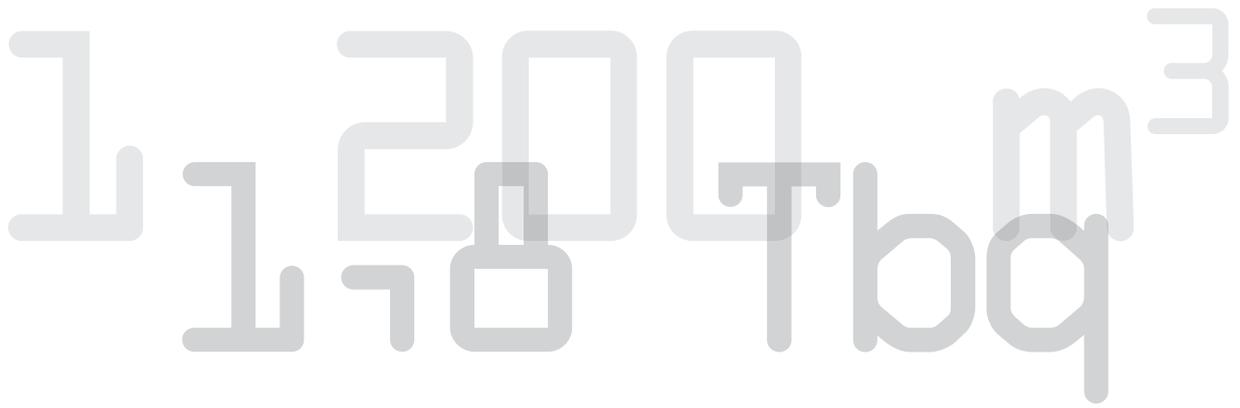


Radioactive Waste
Repository Authority





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.



RADIOACTIVE WASTE

Radioactive waste is generated as a consequence of the uses of radioactive materials. Radioactive waste can be classified as gaseous, liquid or solid waste. Solid radioactive waste can be broken down into three basic categories: transition radioactive waste, low-level and intermediate-level waste, and high-level waste.

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.

A further criterion for waste classification consists of the origin of the various radioactive elements monitored. This criterion is specifically applied for waste disposed of at the Bratrství repository. Only institutional radioactive waste containing exclusively natural radionuclides (though in lower concentrations than in the natural environment) is disposed of at this facility.

In terms of volume, this type of waste forms only a small fraction of the total radioactive waste produced. Radioactive waste falling into this category is primarily generated during the decommissioning of certain types of radioactive emitters used in the health care and research sectors.

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.

The Bratrství repository is located near the town of Jáchymov, in the abandoned Bratrství uranium mine. The repository was granted approval and subsequently commissioned in 1974. The total volume of the disposal capacity is approximately 1200 m³. More than 2100 waste packages with a current overall radioactivity content of 1.8 TBq have been emplaced there to date.

Radioactive waste management is the responsibility of the State

According to the Atomic Act effective from 1997, the State is responsible for the safe disposal of radioactive waste in the Czech Republic. Under the provisions of this Act, the Bratrství repository, previously owned by ARAO, was transferred into State ownership on 1 January 2000. The Radioactive Waste Repository Authority (RAWRA), a specialist state-owned organisation established by the same Act, thus became responsible for running the repository.

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.



Entrance area.

The Bratrství repository was built in an abandoned uranium mine of the same name. The repository was granted approval and commissioned in 1974. The total volume of the disposal capacity is approximately 1200 m³.



Transportation passage.



Radioactive waste disposed of in an emplacement chamber.



Secur

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.



ity

9,8 km²

PROTECTION OF THE ENVIRONMENT

Nuclear safety and human and environmental protection are 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. All these activities are aimed at providing the highest level of both human and environmental protection. 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. Radioactive materials, if not handled properly, might pose a threat to living organisms; however, they 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.

The repository was constructed in a former uranium mine

The Bratrství repository is situated in part of a disused uranium mine of the same name; only a small part of the mine site, which covers a total of 9.8 km² and comprises more than 80 km of galleries and crosscuts, is used for repository purposes. The repository was constructed close to one of the galleries through which waste material from the “Zdař Bůh” shank and surrounding stopes was transported in the 1950s. This gallery and adjoining chambers were adapted for radioactive waste disposal in 1974.

One of the galleries (the haulage shaft) and adjoining chambers have been adapted for radioactive waste disposal. The gallery, 385 metres long, is used as a haulageway. The walls and roofs of the emplacement chambers have also been adapted. Certain parts of some of the passages and roofs have been concreted and reinforced with steel girders. The floors, which incorporate a drainage system and a central retention reservoir, have also been concreted.

A forced ventilation system has been installed, with a fan at the mouth of the access passage. Forced ventilation is only employed when workers are present in the underground facility. Otherwise, natural draughts provide adequate air flow depending on the season of year – either out of the mine (in summer) or into the mine (in winter).

Individual chambers within the repository have gradually been filled with waste material whilst maintaining free access to other passages and facility equipment. Waste packages are disposed of in layers.

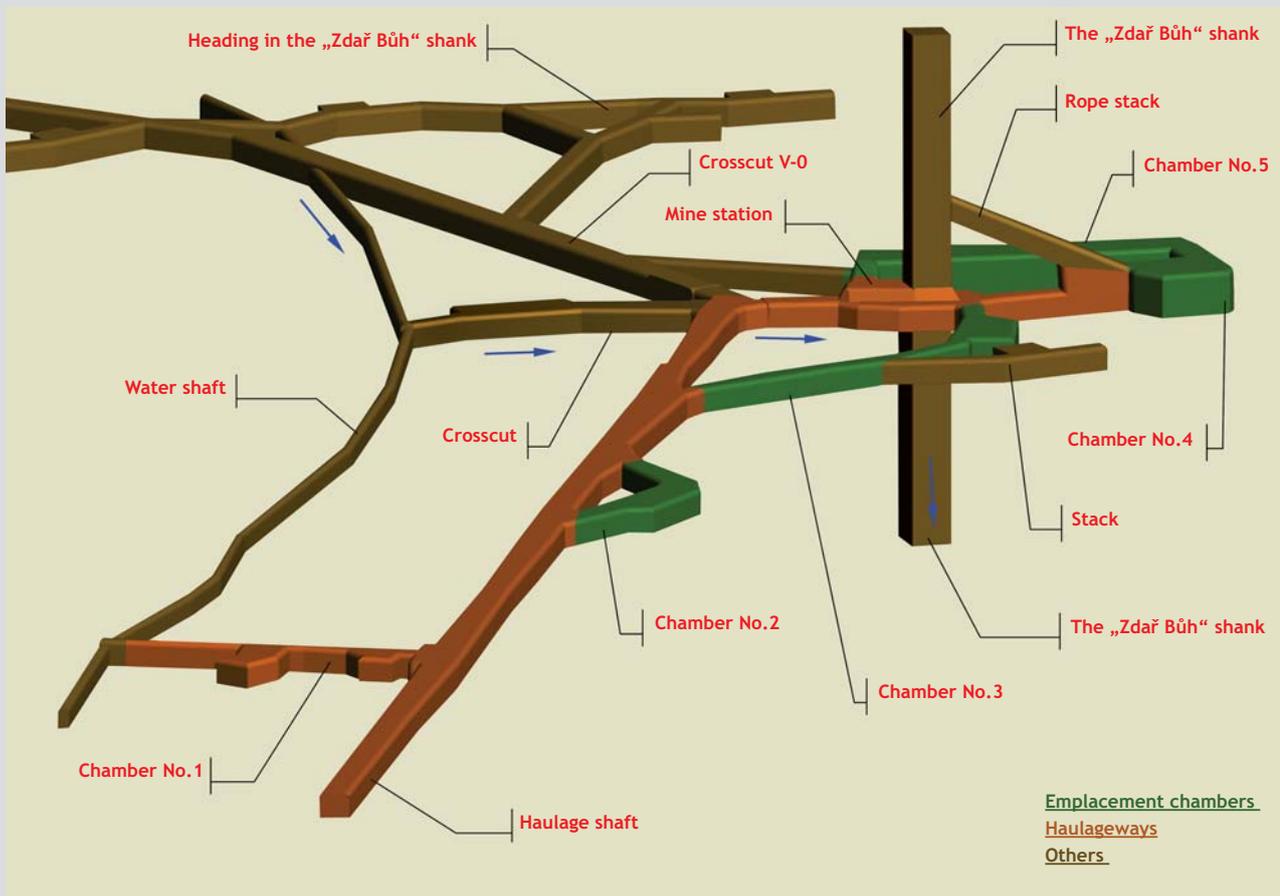


Diagram of the Bratrství repository.



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.





MONITORING

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

The aim of radioactive waste disposal is to protect both the general population and 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, as 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.

The repository's immediate vicinity, which consists of abandoned uranium ore mine workings and where remnants of this ore are still present, together with the fact that no sealing barriers have been built between the repository and the former non-ventilated mine workings, have resulted in an increased concentration of radon and radon progeny at the repository; consequently, repository operation, ventilation and, primarily, monitoring have had to be adapted to reflect these conditions.

Repository safety is regularly verified by the taking of dosimetric measurements in accordance with a monitoring programme approved by the State Office for Nuclear Safety (SÚJB). In addition, operational inspections are conducted following work at the repository or as a result of changes in the ventilation conditions at the underground facility. Tests involve the checking of the equivalent volume activity of radon and

the volume activity of a mixture of uranium-radium series long-lived radionuclides. Subsequently, based on the results of the tests and the time spent underground, the effective dose for each person entering the underground facility can be calculated. During recent years, the effective dose of radiation received by workers at the repository has been consistently well below the limits set by SÚJB Regulation 307/2002.

Samples are taken regularly of effluents issuing from mined cavities and surface water in the vicinity of the repository and subjected to an assessment of the volume activity of naturally occurring radionuclides and concentrations of uranium. Because of the high concentrations of naturally occurring radionuclides in the local environment, the values obtained are higher than usual natural background radiation levels detected in other regions of the Czech Republic. Notwithstanding, limits set out in SÚJB Regulation 307/2002 have not been exceeded.

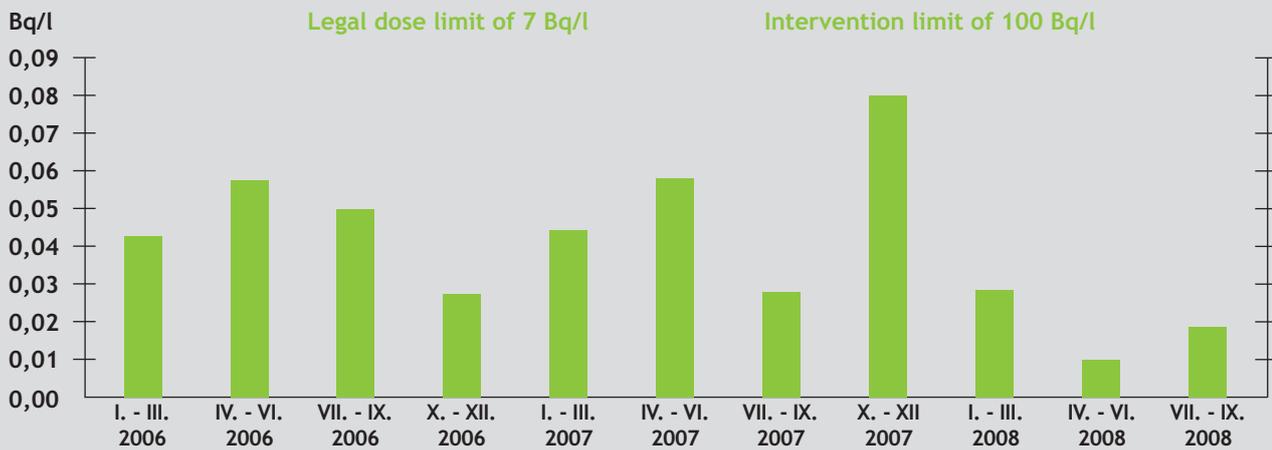
Since the repository is situated in a disused mine, radiation monitoring also includes detailed geotechnical and hydrogeological measurements, the results of which, along with geotechnical documentation concerning the condition of the stope walls have consistently demonstrated the stability of the underground mine working. The results of monitoring carried out to date show that the Bratrství repository meets all the security limits set by the State Office for Nuclear Safety (SÚJB) and that relevant limit values have not been exceeded.



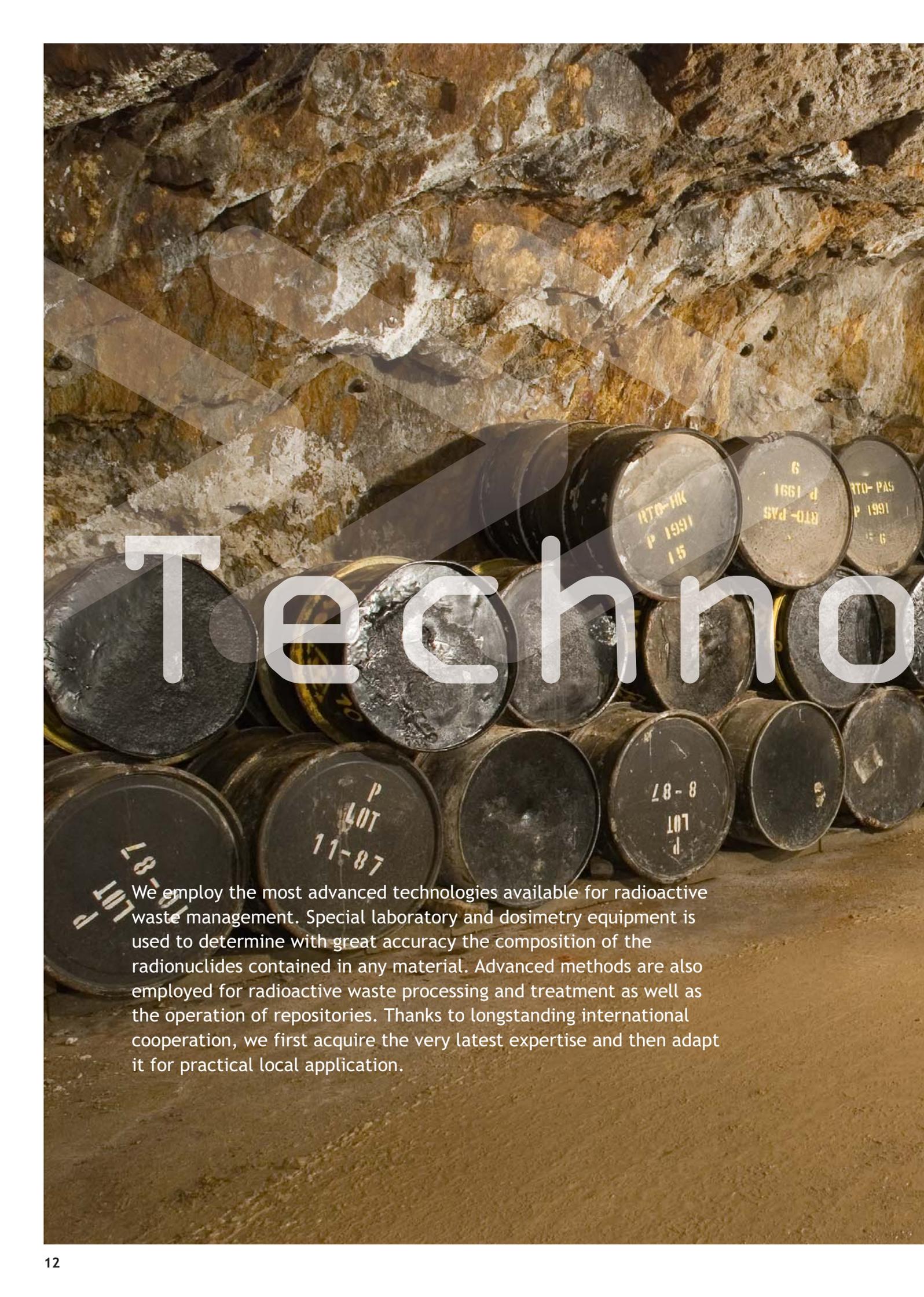
⇔ Sampling of water in the vicinity of the repository.

⇓ Legal dose limit
(exceeding the legal dose limit results in a thorough investigation of the causes and potential impacts).

⇓ Intervention limit
(exceeding the intervention limit results in the immediate implementation of appropriate protective measures).



Volume activity of radium (^{226}Ra) in the retention reservoir.



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 for radioactive waste processing and treatment as well as the operation of repositories. Thanks to longstanding international cooperation, we first acquire the very latest expertise and then adapt it for practical local application.



Loggies



The repository has sufficient capacity

More than 80% of the Bratrství repository storage capacity had been utilised by the end of 2008. The ultimate date and method of repository closure depend on the volume of radioactive waste to be disposed of at the facility in the future.

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 Bratrství repository have been met, since 1st January 2000, from the Nuclear Account and funding provided by the Ministry of Industry and Trade. 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 Bratrství and Richard repositories currently amount to approximately CZK 20 million per annum.

Three repositories are currently in operation in the Czech Republic

A further two repositories – the Dukovany repository situated at the Dukovany NPP in Moravia and the Richard repository near the town of Litoměřice, northern

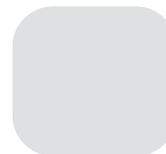
Bohemia – are in operation in the Czech Republic. The Dukovany repository is the largest of the repositories, comparable, in terms of its design and safety, with repositories in Western European countries. It was built specifically for the disposal of low-level and intermediate-level radioactive waste generated during the operation of the Dukovany and Temelín nuclear power plants. The 55,000 m³ storage volume provides enough space for the waste from both plants even if the design life of both were to be extended up to 40 years. The Dukovany repository consists of 112 reinforced concrete vaults arranged in four rows of 28 vaults each. The size of each vault is 5.3 by 5.4 by 17.3 metres; if the available capacity of such vaults is exploited to the optimal level, each vault can accommodate about 1600 individual 200-litre drums. Bituminised wasteforms obtained following multiple wastewater treatment are disposed of at this repository, as well as solid waste a certain part of which has been compacted.

Since 1964, institutional waste has been disposed of at the Richard repository situated within the Bídnice hill. More than 24,000 waste packages are presently stored there. The total volume of this underground facility exceeds 17,000 m³; the disposal capacity makes up approximately half that volume, the remainder being service corridors.



Monitoring of the Bratrství repository - overview

Data monitored	Frequency of measurement
<i>Monitoring at the repository</i>	
Gamma radiation equivalent dose rate	Whenever anyone is present in the underground facility
Equivalent volume activity of radon	Whenever anyone is present in the underground facility
Volume activity of a mixture of uranium-radium series long-lived radionuclides	Whenever anyone is present in the underground facility
Volume activity and concentration values in mine water samples - volume activity of ^{232}Th - concentration of uranium - volume activity of ^{226}Ra	Quarterly
<i>Monitoring in the immediate environment</i>	
Volume activity and concentration values in surface water samples - volume activity of ^{232}Th - concentration of uranium - volume activity of ^{226}Ra	Quarterly



INFORMATION CENTRES

Information on radioactive waste should be easily available to the public

RAWRA aims to provide easily accessible information on radioactive waste to the public. Information Centres in Prague and at the Richard repository offer such services.

Permanent exhibitions feature the whole radioactive waste cycle, beginning with its occurrence up to its final disposal in a repository, especially in terms of radiation safety and impact on the environment. Display posters, three-dimensional models, photos and film clips are used to make up a truly multimedia programme; visitors can view presentation CDs, DVDs, the RAWRA website, etc. The exhibitions can be used as a supplement to the curriculum for primary and secondary schools to enhance students' knowledge concerning general physics or environmental protection.

Opening hours of the Richard Information Centre:
Weekdays from 9:00 to 13:00.

Opening hours of the Prague Information Centre in
Dlážděná Street 6, Prague 1:

Monday: from 9:00 to 12:00 and from 13:00 to 15:00
Tuesday: from 9:00 to 12:00 and from 13:00 to 15:00
Wednesday: from 9:00 to 12:00 and from 13:00 to 17:00
Thursday: from 9:00 to 12:00 and from 13:00 to 15:00
Friday: from 9:00 to 12:00

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

Contacts:

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Richard and Bratrství Repositories
Joint Operation Department, Litoměřice
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Správa úložišť radioaktivních odpadů
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