



SÚRAO

RADIOACTIVE
WASTE REPOSITORY
AUTHORITY

Richard repository



Richard Repository

Czech Radioactive Waste Repository Authority (SÚRAO)

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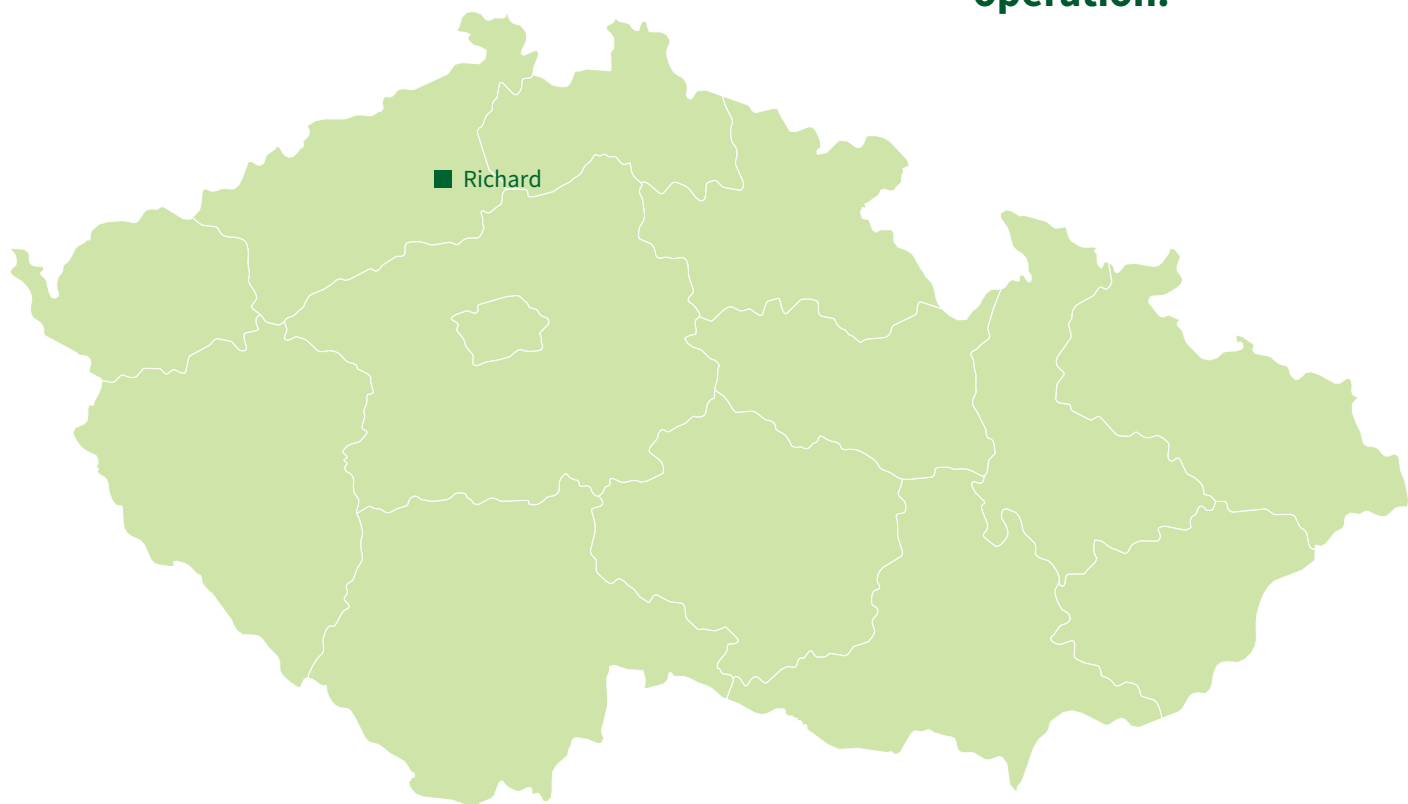
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Basic information

Mankind has lived with radioactivity for hundreds of thousands of years and, over the last two centuries, we have also learned to use it for our own benefit. In the fields of medicine, energy and others, radioactive elements form a key part of many unique and irreplaceable technologies. However, the application of radioactive elements leads to the generation of waste that must be safely isolated from the environment. Radioactive waste is classified according to the place of origin and the largest group of such waste in terms of volume and activity consists of so-called operational waste from the nuclear energy sector. The second largest group of radioactive waste consists of so-called institutional waste which is generated in the healthcare, industry, agriculture and research sectors.

The only safe way to permanently dispose of radioactive waste is via its treatment and subsequent disposal so as to ensure its isolation from the environment.

In 2019, the Richard Repository celebrated 55 years of safe operation.



Radioactive waste disposal

The main criterion governing radioactive waste disposal is the protection of humans and the environment

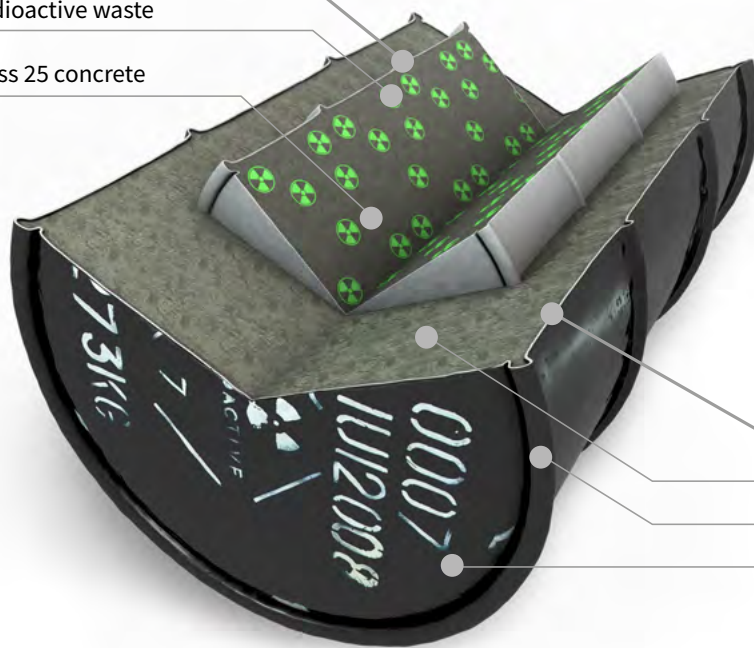
The disposal of radioactive waste constitutes the final stage in a sequence of carefully controlled operations. The process commences with the collection and classification of the waste followed by its processing and treatment which depend on the type and category of the waste. Following treatment, the waste is transported to the relevant repository. The sole purpose of this process is to ensure the protection of humans and the environment. Since radioactive substances that might pose a threat to living organisms if not treated properly cannot be destroyed, radioactive waste must be isolated from the environment for as long as the radioactive substances might be harmful to the environment due to the occurrence of spontaneous processes. Thus, repositories have been constructed so as to provide for the safe isolation of radioactive waste for the necessary period of time.



100-litre drum

Radioactive waste

Class 25 concrete



216-litre drum

Class 28 concrete

Protective coating

Labelling of the disposal package

The waste is emplaced in 100-litre drums which are then placed in 216-litre drums; the space between the two drums is filled with concrete, thus creating a 5 cm-thick protective layer around the smaller drum. The outer wall of the drum is galvanised on both sides and the outer wall further painted with an anticorrosive coating which serves to protect the drums from external influences. Each drum is carefully marked and the contents recorded in detailed documentation that contains information on the origin of the waste and the processing method, the radionuclide composition, weight, etc.

The total usable volume of the Richard II mine exceeds 19,000 m³. The capacity of the disposal chambers is 10 250 m³, of which approximately 80% has been filled to date. The repository is currently being reconstructed and the stabilisation of the surrounding areas will allow for increasing the disposal capacity of the facility.

The Richard Repository serves only for the disposal of low- and intermediate-level waste (LILW) generated via the use of ionising radiation sources in the industry, healthcare, agriculture and research sectors, i.e. so-called institutional waste, and not for the disposal of LILW generated via the operation of nuclear power plants.



The operation of the repository is financed from the nuclear account



In accordance with the Atomic Act, the costs associated with the operation of the Richard Repository are financed from the so-called nuclear account, to which the nuclear power plant operator is required to contribute. Other producers pay a fee for each m³ of waste disposed of, the amount of which is determined by government decree. The funds collected in the nuclear account are intended to cover the costs of safe disposal. The nuclear account is administered by the Ministry of Finance, and the funds used by SURAO for its various activities are set out in its budget and annual plan of activities as approved by the government.

The amount paid by the nuclear power plant operator for 2019 was set at 55 CZK for each MWh of electricity generated

Other producers pay CZK 33,189 per 216-litre drum for the disposal of their radioactive waste

As at 31 December 2018, the balance of the nuclear account was CZK 28.4 billion

Receiving, checking and disposal at the Richard Repository

Institutional low- and intermediate-level waste disposed of at the Richard Repository must meet the relevant acceptability criteria as set by the State Office for Nuclear Safety (which is also responsible for ensuring that the criteria are strictly observed). Only after thoroughly reviewing the documentation that accompanies each waste package and physically inspecting the contents are SURAO specialists able to accept the waste for disposal.



1 A waste producer transporter at the entrance to the Richard Repository complex.



2 The accompanying documentation and the contents are carefully checked.



3 After entering the complex, the waste can be unloaded.



4



5



6

In accordance with the Atomic Act, the costs associated with the operation of all repositories are paid from the nuclear account; waste producers pay for disposal according to the number of m³ of waste.

4 The drums are unloaded one-by-one from the transporter using a forklift truck.

5 The dose rate on the surface and the weight of each drum are recorded.

6 Provided the waste drums fulfil the acceptability criteria, they can be transferred to the subsurface disposal facility.

7 Finally, each drum is placed in a pre-determined location in a disposal chamber and its position recorded in the disposal documentation.



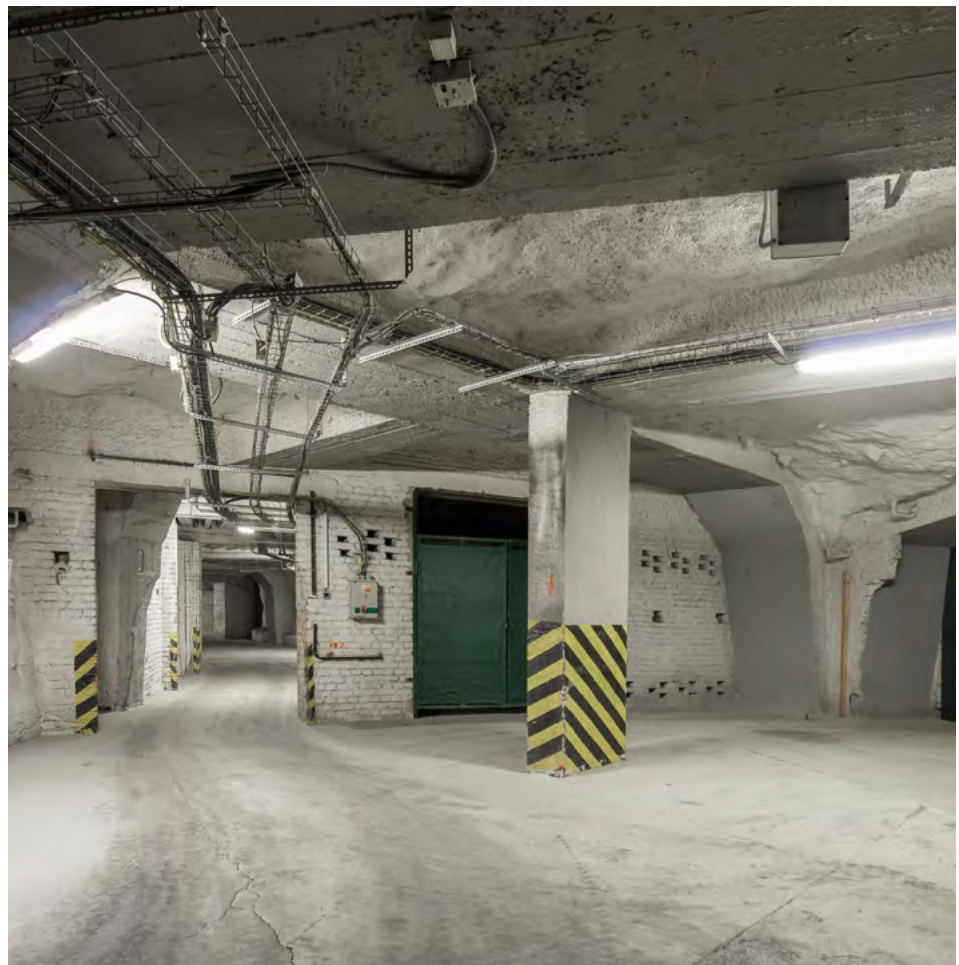
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The Richard Repository is located in a former limestone mine

Limestone was mined under the Bídnice Hill near Litoměřice from the first half of the 19th century. The 5-metre layer of limestone lies at a depth of 70-80 m below the surface. The repository constitutes only a small part of the former Richard I, II and III mining complex, which features more than 40 km of corridors and crosscuts. The repository was built in a sub-horizontal layer of clayey limestone with a thickness of approximately 5 m. The repository is located above the local groundwater level and is classified as a subsurface facility.

The repository was constructed in the Richard II mine, which was expanded to its present size through supplementary mining excavation work in the period 1960–1964. The disposal corridors are 6–8 m wide and have a height of 3–4 m. The corridors have been strengthened with reinforced concrete frameworks that exhibit the form of an angled inverted U-shape. The walls of the service corridors have been covered with sprayed concrete (shotcrete). The floor has been reinforced with concrete and features a drainage system with retention chambers that eventually drain into an external retention well. The disposal chambers, which have been stabilised by means of reinforced concrete entrance structures, were excavated along the 630-metre long service corridor. The disposal area is fully ventilated and has a constant all-year temperature of 10°C.

The drums containing conditioned radioactive waste that has been proved to fulfil all the strict conditions set by the State Office for Nuclear Safety (e.g. the conditioning method, the weight of the drum and the activity of the radionuclides) are transported to disposal chambers.



The Richard site has an interesting history

In the period 1943-1944 this location was chosen by the German Protectorate as the site for an underground factory for Auto Union A.G. Chemnitz (the production of components for Maybach HL 230 engines) and Osram. The underground production complex, known as Richard, was constructed

by miners, bricklayers, builders, electricians, plumbers and other craftsmen who had been imprisoned by the Nazis in local labour camps. Only a small number of production halls were fully completed for the Auto Union concern. The site was in various stages of construction at the end of the war,

i.e. from completed production halls to corridors based on which mining operations would subsequently be expanded. Following the removal of the industrial equipment at the end of 1945, the Čížkovice cement and lime works re-introduced limestone mining operations.



The environmental impacts of the repository are carefully monitored

The purpose of radioactive waste disposal is to protect the environment from the potential undesirable effects of radioactive radiation. In order to avoid any doubt as to the fulfilment of this objective, the site and its immediate vicinity must be monitored on a regular basis. Therefore, the repository also includes an underground and surface monitoring system. Requirements concerning radiation monitoring are set out in the Atomic

Act and in the relevant decrees issued by the State Office for Nuclear Safety (SUJB). The planning and conducting of all inspections and the taking of measurements is carried out in accordance with a monitoring programme approved by the SUJB. Radiation monitoring includes the monitoring of people, the working environment, water draining from the facility and the surroundings of the repository. Since the repository was

constructed in a former mine, geotechnical and hydrogeological monitoring is performed in addition to radiation monitoring aimed at confirming the stability of the mine workings. The results of monitoring to date indicate that the operation of the Richard radioactive waste repository complies with all the relevant safety criteria set out by the State Office for Nuclear Safety and that no set limits have been exceeded.



Waste package testing laboratory

The Richard Repository covers an area of 16 ha. The surface area of the facility includes an administrative building, an information centre, a laboratory and an accredited testing facility for waste packages and so-called radioactive materials of special form. Waste packages are used for the transport and disposal of radioactive substances and certain types of radioactive waste. One of the requirements that such packages

must comply with before the granting of approval for their use is that they maintain their integrity when dropped from a height of several metres. Hence the testing facility is equipped with a special testing crane. The Litoměřice testing laboratory also provides for the testing of IP-2, IP-3, A and B type transport containers and radioactive materials of special form as required by regulations governing the transport

of dangerous substances. The testing laboratory conducts tests as required by Decree No. 317/2002 Coll., e.g. the water spray test, the free fall test from 1.2 m and 9 m, the crush test, the puncture test, the drop test and spike drop test, the crush test with a 500 kg plate, the thermal test and the immersion test. The integrity of the confinement system is verified by the radiation and vacuum bubble test.



1

drop test

leakage test

2



3

thermal test

There are currently 3 repositories in operation in the Czech Republic

In addition to the Richard Repository, SURAO manages two other repositories in the Czech Republic - the Dukovany Repository located in the complex of the nuclear power plant of the same name and the Bratrství repository near the town of Jáchymov.

Dukovany Repository



The Dukovany Repository occupies an area of 1.3 hectares and consists of a system of reinforced concrete chambers built on the surface. It is intended exclusively for the disposal of low-level waste generated via the operation of the Czech Republic's two nuclear power plants. It is not used for the storage or disposal of spent nuclear fuel, nor will it be in the future. The repository was put into operation in 1995, making it the country's most recently-constructed repository.

Bratrství Repository – Jáchymov



The Bratrství subsurface repository is located in part of a former uranium mine of the same name near the town of Jáchymov. The repository, which has been in operation since 1974, is intended for waste originating from the healthcare, industry and research sectors that contains exclusively naturally-occurring radionuclides.

Czech Radioactive Waste Repository Authority (SÚRAO)

SURAO's task is to ensure the safe disposal of current and future radioactive waste in accordance with nuclear safety and human and environmental radiation protection requirements.

SURAO was established on 1 June 1997 by the Ministry of Industry and Trade as a state organisation. On 1 January 2001, SURAO was transformed into a state organisational unit in accordance with Section 51 of Act No. 219/2000 Coll. The activities conducted by SURAO are regulated by the Atomic Act.

The State is responsible for the safe dis-

posal of all radioactive waste in the Czech Republic. Pursuant to the original Atomic Act (Act No. 18/1997 Coll.), SURAO was entrusted with the safe operation of repositories and the disposal of all radioactive waste in the Czech Republic.

Up to the end of 1991, the management of radioactive waste and its final disposal were the responsibility of the Institute for

the Research, Production and Utilisation of Radioisotopes. From 1992, when the repositories were privatised, such activities were performed by NYCOM Ltd and, subsequently, ARAO Ltd. Based on the provisions of the original Atomic Act, the repositories were transferred back to state ownership and their safe operation and the disposal of radioactive waste were assumed by SURAO.





SURAO's most important activities include the operation of all the Czech Republic's low- and intermediate-level waste repositories:

- the Richard Repository near the town of Litoměřice for the disposal of institutional waste;
- the Dukovany Repository, intended for the disposal of operational waste from nuclear power plants;
- the Bratrství Repository, for the disposal of low- and intermediate waste containing only naturally-occurring radionuclides.

We also coordinate the research involved in the development and

eventual construction of the Czech Deep Geological Repository for high-level waste and spent nuclear fuel.

In addition, we monitor the impact of our repositories on the surrounding environment and maintain records of the radioactive waste received and its producers. Moreover, we coordinate research and development in the field of radioactive waste management, an integral part of which concerns close scientific research cooperation and the exchange of information at international level.

Information centres:

SÚRAO, Prague
Richard Repository, Litoměřice
Bratrství Repository, Jáchymov
Dukovany Repository, Rouchovany
Bystřice nad Pernštejnem



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