Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

Eighth National Report of Austria

On the implementation of the obligations of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

Vienna, August 2024

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Media owner, publisher, editor:
Federal Ministry Republic of Austria Climate Action, Environment, Energy, Mobility, Innovation and Technology, Radetzkystraße 2, 1030 Vienna, Austria
Editorial: Department V/8 – Radiation Protection
Photo credits: Nuclear Engineering Seibersdorf, 2024
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Executive Summary

There is neither a nuclear power plant (NPP) nor any other fuel cycle facility in operation in Austria. In 1978, the Austrian electorate decided in a referendum not to start the operation of the already constructed nuclear power plant (BWR) in Zwentendorf. One TRIGA Mark II research reactor is currently in operation in Vienna. Spent nuclear fuel from the operation of the research reactor is stored on site in dry or wet storage facilities if necessary and, based on a memorandum of understanding, will be returned to the United States after the shutdown of the research reactor. Two other research reactors were operated until 1999 and 2004, respectively, and have been fully decommissioned.

In Austria, there is a single organisation responsible for the management and interim storage of radioactive waste: Nuclear Engineering Seibersdorf GmbH (NES). NES operates facilities for predisposal management including treatment, conditioning and interim storage of all low and intermediate level radioactive waste (LILW) produced in Austria. High level radioactive waste (HLW) does not arise. LILW originates primarily from applications of ionising radiation in medicine, research, industry and ongoing decommissioning projects. There is no disposal facility for radioactive waste in operation in Austria.

Notable developments since the previous report

- Based on the provisions of the National Programme for the Management of Radioactive Waste approved in 2018, the Austrian Government established the Austrian Board for Radioactive Waste Management in 2021. The Board is to provide recommendations and bases for decisions regarding the disposal of Austrian radioactive waste to the Government. The Board is set up and working towards the accomplishment of its tasks.
- Austria conducted its first ARTEMIS mission in 2022. The recommendations and suggestions of the ARTEMIS Review Team provide a valuable basis for a future update of the national legislation and the National Programme for the Management of Radioactive Waste.
- The modernisation of the radioactive waste management and interim storage facilities at NES is essentially completed. On-site decommissioning projects as well as the

project regarding additional conditioning and reconditioning of radioactive waste packages are progressing as planned.

- The repatriation of spent fuel from the TRIGA Mark II Research Reactor in Vienna, based on a memorandum of understanding between Austrian and US authorities, was postponed until 2040 (instead of 2025) at the latest to enable the continued operation of the research reactor. Correspondingly, activities regarding the decommissioning of the research reactor will only commence after repatriation of the fuel elements.

A Introduction

The Eighth National Report of Austria contains updated information on the Austrian policy and the practices concerning the management of spent fuel of the TRIGA research reactor in Vienna and the management of radioactive waste arising in Austria. Furthermore, it contains information on the Austrian national framework concerning the management of radioactive waste, applicable national laws, regulations and practices. The general structure of this report follows the "Guidelines regarding the Form and Structure of National Reports" (INFCIRC/604/Rev.4). This report includes developments since the submission of the Seventh National Report in October 2020.

This report also includes additional information related to questions raised during the Seventh Review Cycle and takes into account the progress in implementing the Austrian National Programme for the Management of Radioactive Waste. For more details regarding waste management facilities and practices at NES, see Annex L.1. For a list of applicable international law and of relevant national laws and ordinances, refer to Annexes L.2 and L.3. Relevant reports on international review missions are found in Annex L.4.

A.1 Basic country information

The Republic of Austria is a Member State of the European Union and is situated in central Europe. The country has a total area of 83.879 km² and a population of about nine million. The Republic of Austria is a federal state consisting of nine federal provinces ("Länder"). The federal state ("Bund", i.e. "the federation") is in charge of key tasks such as federal legislation, external and defence policies as well as general jurisdiction. In addition to federal constitutional laws and federal laws, each of the nine Austrian federal provinces have their own regional constitutional laws and regional laws. The provinces are represented by their respective Governor.

The respective competences of the federal state and the federal provinces are laid out in the competence articles of the Federal Constitutional Law. The general protection of the health and life of people against damage caused by ionising radiation is a matter in which legislation and execution is the responsibility of the federal state. Execution in that context means the implementation of laws and law enforcement.

Since 1995, Austria is a Member State of the European Union. The relevant EU and Euratom legislation in the fields of radiation protection, nuclear safety and safety of spent fuel and radioactive waste management as well as safeguards is either transposed into national law or directly applicable. The Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) is the leading national authority concerning the implementation of the obligations of this Convention.

A.2 Brief outline of radioactive waste management in Austria

The use of radioactive substances has a long tradition in Austria. Before artificially produced radionuclides were utilised, naturally occurring long-lived radionuclides were used for several applications, for example, as radiopharmaceuticals. Residues from these applications were typically stored on-site.

The Seibersdorf research centre, the purpose of which was to carry out research activities regarding the nuclear fuel cycle and prepare the development of a nuclear power programme in Austria, was established in the years 1958 to 1960. The 10 MW ASTRA Research Reactor located in Seibersdorf was commissioned in 1959. In Vienna and in Graz, a TRIGA Mark II Research Reactor and a Siemens Argonaut Reactor went into operation in 1962 and 1965, respectively.

The Radiation Protection Act from 1969 and the General Radiation Protection Ordinance from 1972 first regulated treatment of radioactive waste. This became necessary due to the increasing use of radionuclides in medicine, industry and research. In these days, the research centre in Seibersdorf started to take over and store radioactive waste on its premises on a voluntary basis. The research centre developed a concept for the management of radioactive waste that would be generated in Austria from institutional waste producers and from energy production from NPPs, which were planned at that time. This concept included the construction of the necessary conditioning facilities. In 1976, a contract was closed between the research centre and the Austrian government to formally lay down the criteria for the management of radioactive waste produced in Austria.

In 1978, the Austrian electorate decided in a referendum not to start the operation of the already constructed nuclear power plant (BWR) in Zwentendorf. The nuclear fuel elements remained unused (no burn-up) and were removed in the late 1980s.

In 1999, the Austrian parliament unanimously passed the Federal Constitutional Act for a Nonnuclear Austria. This act stipulates, inter alia, that installations that serve for energy generation by nuclear power must not be constructed, nor, if they already exist, come on line. Furthermore, the law prohibits the transport of fissile materials for purposes of nuclear power generation or disposal unless this were to conflict with international obligations.

After the abandonment of any nuclear power development activities and therefore any plans to dispose institutional radioactive waste together with radioactive waste produced by nuclear power plants, the Seibersdorf research centre developed plans for the disposal of Austrian low and intermediate level waste in geological formations. Those plans were met with great scepticism by the Austrian population and were dropped subsequently. Another attempt to construct a near-surface repository was also unsuccessful and cancelled in 2001.

In 2003, the latest contract with the Austrian Research Centers Seibersdorf (now: NES) for predisposal management and interim storage of Austrian radioactive waste ("Joint Agreement" or "Disposal Agreement") was concluded, ensuring storage of radioactive waste in Seibersdorf until 2030. This contract was amended twice: in 2008 to include a comprehensive modernisation effort of the interim storage and waste treatment facilities, which has been reported on during previous national reports, and in 2013 to extend the storage period until the end of 2045.

In 2003, another contract was concluded between the Federal Government and NES that covers the decommissioning and decontamination of facilities, installations and substances from 45 years of research and development activities in Seibersdorf ("Decommissioning Agreement"). This contract was amended twice, in 2008 and 2017, and runs until 2033.

With the establishment of the National Programme for the Management of Radioactive Waste pursuant to the requirements of Council Directive 2011/70/Euratom, which was approved in 2018, the Austrian Government initiated a new attempt to find a disposal solution for the Austrian radioactive waste. Based on the provisions of this programme, the Government established the Austrian Board for Radioactive Waste Management, which advises the Government in questions related to the disposal of radioactive waste.

A.3 Facilities related to spent fuel and radioactive waste management

The TRIGA Center Atominstitut, belonging to the Vienna University of Technology ("TU Wien"), operates a 250 kW TRIGA Mark II Research Reactor, located in the Vienna Prater, since 1962. This is the only existing facility in Austria which falls under the definition of a nuclear installation. The research reactor ever since served research purposes for university professors and students as well as training for (research) reactor personnel and inspectors likewise. The reactor core and corresponding safety systems were refurbished in 2012, including the delivery of fresh low-enriched uranium (LEU) fuel elements.

Nuclear Engineering Seibersdorf GmbH (NES) is the only organisation for the management of radioactive waste in Austria. NES is a 100% subsidiary of the Austrian Institute of Technology (AIT), the largest extramural research organisation in Austria, in which the Federal State (represented by the BMK) owns a controlling stake. NES is located in Seibersdorf, approximately 40 km south of Vienna, and operates an interim storage facility for all Austrian radioactive waste as well as waste treatment facilities, such as an incineration plant, a supercompactor and a drum drying system. For more information, see Section B.4 and Annex L.1.

Besides the TRIGA reactor, two further research reactors were in operation in Austria. They have been fully decommissioned to date:

- A 10 MW ASTRA Research Reactor, located in Seibersdorf, was shut down in 1999. Decommissioning of the reactor was carried out by NES and completed in 2006. The spent fuel elements were repatriated under the fuel return programme of the US Department of Energy (DoE).
- A 1 kW Siemens Argonaut Research Reactor, operated by the Technical University of Graz, was shut down in 2004 and decommissioned in 2007. The fuel plates were repatriated under the fuel return programme of the US DoE.

A.4 Overview matrix

Type of Liability	Long-term management policy	Funding of Liabilities	Current Practice/Facilities	Planned Facilities
Spent Fuel	Return to country of origin	State liability	Interim dry or wet storage on site	N/A
Nuclear Fuel cycle wastes	N/A	N/A	N/A	N/A
Application Wastes	Disposal; Bilateral/Multilateral approach for small amounts of LILW-LL	Polluter pays principle	Conditioning and interim storage at NES	Disposal facility or facilities for LILW
Decommissioning Liabilities	Facilities no longer used must be decommissioned	Polluter pays principle	Decommissioning of research facilities and laboratories in Seibersdorf	Disposal facility or facilities for LILW
Disused Sealed Sources	Recycling/return to supplier if possible, otherwise management as radioactive waste	Polluter pays principle	Registration, collection and storage (at NES) or return to supplier	Disposal facility or facilities for LILW

A.5 Summary of results from previous review

In the previous Seventh Review Meeting of the Contracting Parties, the following challenge was identified for Austria:

Challenge	Reference(s) in present report
Implementation of the national programme, including the decision on the plan for disposal	Sections B.3, K

Austria is reporting on the progress of the implementation of the National Programme for the Management of Radioactive Waste throughout this current report. During the reporting period, several milestones have been achieved. Specific information related to the progress is given in the sections mentioned in the table above.

The Contracting Parties agreed that National Reports for the Eighth Review Meeting should address, as appropriate, the actual measures for certain overarching issues identified during the Review Meeting. These overarching issues are addressed in the present report in the following sections:

Overarching issue	Reference(s) in present report
Competence and staffing linked to timetable for spent fuel and radioactive waste management programmes	Sections E.3, F.2
Inclusive public engagement on radioactive waste management and on spent fuel management programmes	Sections B.3, K
Ageing management of packages and facilities for radioactive waste and spent fuel, considering extended storage periods	Section B.4, Annex L.1
Long term management of disused sealed sources, including sustainable options for regional as well as multinational solutions.	Sections E.2, J.1, J.2

B Policies and Practices – Article 32 Para 1

B.1 Spent fuel management policy – Article 32 Para 1 (i)

Austria does not operate, has not operated, and does not plan to operate a nuclear power plant. Spent fuel from research reactors will be repatriated. The Federal Constitutional Act for a Nonnuclear Austria legally prohibits the use of nuclear power for energy production.

The Radiation Protection Act 2020 stipulates that operators of research reactors have to ensure that no spent fuel arises for disposal in Austria. Furthermore, in order to obtain an operating licence, the operator of the research reactor has to ensure that only fuel elements are used whose manufacturer or supplier have committed to taking back the spent fuel or have undertaken a contractual obligation to accept used fuel elements.

B.2 Spent fuel management practices – Article 32 Para 1 (ii)

The TRIGA Center Atominstitut operates a pool type TRIGA Mark II research reactor. It has a maximum steady state thermal output of 250 kW and pulsing capabilities up to 250 MW. Being in operation since March 1962, the usage of this research reactor is only for basic and applied academic research and teaching purposes. As it is the closest research reactor to the IAEA headquarters in Vienna, it is also frequently used by IAEA staff for training and the development and calibration of safeguards instruments.

In 2012, irradiated fuel elements from the core and the spent fuel storage were shipped to the Idaho National Lab and replaced by 77 standard TRIGA fuel elements with an enrichment of 19.9%, based on a lending agreement between the TU Wien and the US Department of Energy. With this new core, the TRIGA research reactor went critical on 27 November 2012.

At present, 90 fuel elements are at the TRIGA Center Atominstitut. The total activity of these fuel elements after one year of cooling time is 7.27 x 10^{13} Bq and after ten years approx. 1.5 x 10^{13} Bq. The research reactor has a total spent fuel storage capacity (dry interim storage) of 168 fuel elements.

Initially, the parties agreed upon a return of the spent fuel elements by 2025. In 2023, a decision to continue the operation of the research reactor was made, in the course of which another 15 fuel elements necessary for the continued operation will be acquired. A memorandum of understanding was signed between the Federal Ministry of Education, Science and Research and the US DoE, agreeing to repatriate all spent fuel elements by 2040.

Storage of spent fuel is performed according to the relevant radiation protection and safeguards legislation. An appropriate licence is needed for the storage and annual inspections are performed by the licensing authority. Future repatriation is to be performed according to the relevant transport and safeguards legislation.

B.3 Radioactive waste management policy – Article 32 Para 1 (iii)

Austria has enshrined its policy regarding radioactive waste management in the Radiation Protection Act 2020. The policy is based on the following internationally recognised principles:

- The generation of radioactive waste shall be kept to the minimum which is reasonably practicable, both in terms of activity and volume, by means of appropriate design measures and of operating and decommissioning practices, including the recycling and reuse of materials;
- The interdependencies between all steps in radioactive waste generation and management shall be taken into account;
- Radioactive waste shall be safely managed, including in the long term with passive safety features;
- Implementation of measures shall follow a graded approach;
- The costs for the management of radioactive waste shall be borne by those who generated those materials;
- An evidence-based and documented decision-making process shall be applied with regard to all stages of the management of radioactive waste.

Furthermore, the Republic of Austria shall bear the ultimate responsibility for the safe management of radioactive waste arising in its territory. This basic principle underlines the national responsibility regarding radioactive waste management.

The Austrian national inventory, maintained by NES, consists only of low and intermediate level waste to dispose of. This waste is mainly institutional waste and waste from the decommissioning of old facilities. Any radioactive waste has to be transferred to NES, the only licensed waste management facility in Austria, where it is accepted, collected, sorted, treated, conditioned and kept in interim storage until future final disposal. High-level waste does not arise in Austria.

The large majority (more than 95 percent) of the Austrian radioactive waste is short-lived. At the same time, the inventory contains also a small amount of long-lived waste (cf. Section D.4), which might warrant for a separate disposal route. In the long term, pending a decision by the Federal Government, Austria plans to construct its own final repository or repositories for its low and intermediate level waste. A bilateral or multilateral approach, especially regarding the small amount of long-lived waste, is considered a feasible option.

The management policy for disused sealed sources is to return them to the supplier. If sources are declared as waste, they are sent to NES. In the case of high-activity sealed sources, a return agreement between the licence holder and the supplier is mandatory.

The national policy and the national strategy for the management of radioactive waste are set out in the National Programme for the Management of Radioactive Waste, adopted by the Federal Government in 2018. This programme also provides a preliminary overview of the possible disposal options as well as the target date for taking a decision on a disposal option (2030). To enable the Government to take a decision, the programme provides the basis for the establishment of a working group with the task to advise the Federal Government in finding a solution for disposal.

This Austrian Board for Radioactive Waste Management (in short “Advisory Board”), was established in 2021. The Advisory Board consists of 20 members, whereby scientists and representatives from the federal and state governments, nongovernmental organisations (NGOs) as well as from civil society are represented. In its first period, the Advisory Board was mandated by the Federal Government to develop recommendations for the following four key issues:

- Compilation of a more detailed inventory of the current and future radioactive waste than is currently available;
- Evaluation of possible options for the disposal of Austrian radioactive waste, including the necessary requirements, strengths, weaknesses, opportunities and risks as well as associated costs;
- Preparation of a participation concept with recommendations on how the population may be informed, involved and included in any decisions;
- Outline of a timetable and milestones for the disposal of the Austrian radioactive waste.

Key information regarding its membership, working methods as well as on reports and results produced by the Advisory Board are published on its website entsorgungsbeirat.gv.at (German/English). The Board will compile a report with all the recommendations and considerations regarding the future pathway for disposal and submit it to the Federal Government for perusal and subsequent decision-making. Recommendations made by this Board are not binding.

B.4 Radioactive waste management practices – Article 32 Para 1 (iv)

NES is the only operator of facilities for radioactive waste management in Austria. All conditioned low and intermediate level radioactive waste (LILW) is currently stored in the interim storage facilities at NES. HLW does not arise in Austria.

Austria follows the principle of minimisation of radioactive waste. For this reason, radioactive waste with radionuclides with short half-lives (less than 100 days) is allowed to be stored at the producers' sites until its activity has decayed below the applicable clearance levels. Subsequently, this material can be cleared (with an appropriate clearance procedure) and disposed of as conventional waste. Another possibility is the controlled release or discharge of very small amounts of gaseous or liquid radioactive material in line with the requirements of an appropriate licence. Radioactive material, which is not subject to clearance or discharge, has to be transferred to NES as radioactive waste for treatment and conditioning and subsequent storage.

The aim of treatment and conditioning is to transform the radioactive waste into a physically and chemically stable form and to isolate it safely from the environment. The reduction of the volume of the waste is also necessary to lower the cost of interim storage. Procedures are established to effectively minimise and monitor the releases of radioactivity in accordance with applicable environmental regulations (i.e. multi-step filtration of gas effluents from the incinerator). A comprehensive programme of environmental monitoring is in place to ensure that any unintended releases of radioactivity are detected and that necessary measures can be taken in a timely manner.

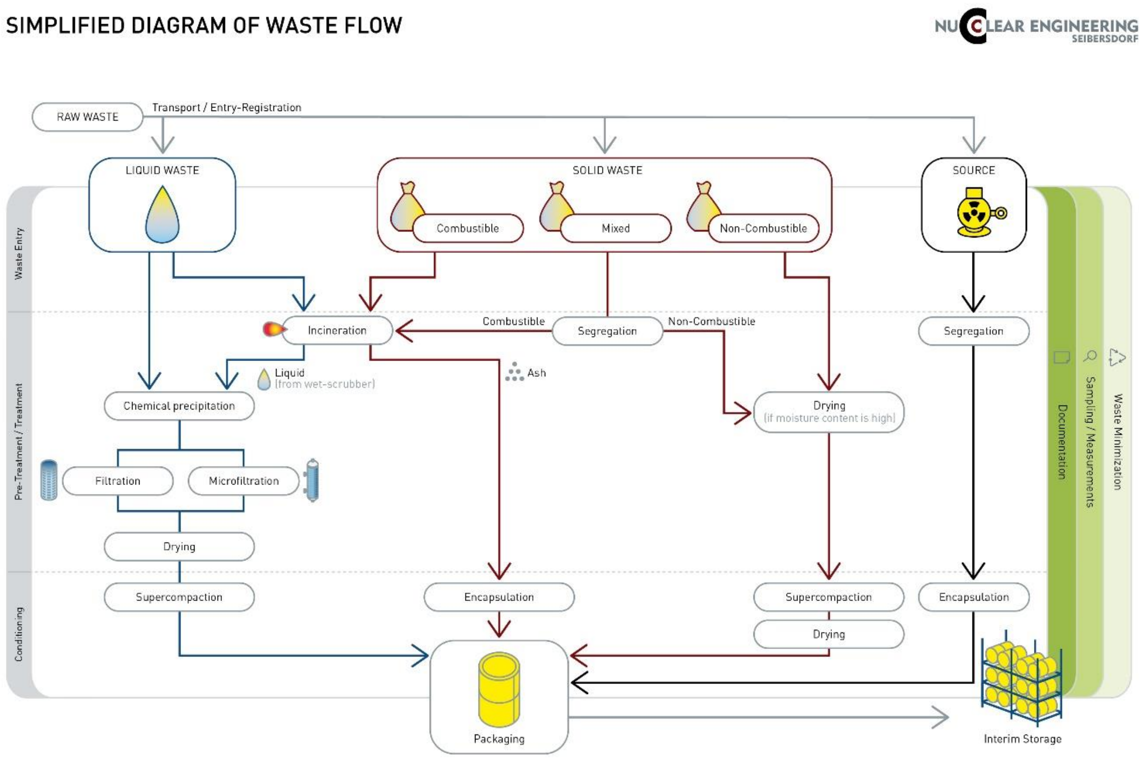
A number of conditioning systems are operated by NES (see also Annex L.1). A schematic diagram of the streams of radioactive waste at NES in Seibersdorf is shown in figure 1.

Depending on the type of waste, several treatment techniques are applied:

- Combustible waste is incinerated, with a volume reduction of > 40:1. In the past, the resulting incinerator ash has been homogeneously cemented. Nowadays, ash is deposited directly into custom-made stainless-steel cartridges which are placed into 200-litre-drums. The older drums with cemented ash are part of the reconditioning project (52 drums with homogeneously cemented ash have been reconditioned so far until March 2024);
- Non-combustible compactable waste is supercompacted; the resulting pellets are loaded into 200-litre-drums made of steel for interim storage; volume reduction: around 3:1.
- Liquids are either injected into the incinerator or dried in a vacuum cone dryer (usually after mixing with sludge from the waste water treatment plant). The resulting powder is supercompacted; volume reduction: > 30:1.
- Filters are supercompacted; pellets are loaded into 200-litre-drums for interim storage.
- Conditioned 200-litre-drums are dried in the 32-drum dryer to minimise the risk of corrosion effects and chemical reactions inside.
- Sealed sources are segregated according to their half-lives (e.g. short-lived β, ^{60}Co, ^{137}Cs, ^{241}Am, ^{226}Ra). They are enclosed in stainless steel cartridges and/or lead shielding and cemented into 200-litre-drums.
- Radium sources are encapsulated by welding them into stainless steel capsules; they are stored in lead shielding and cemented into 200-litre-drums. Other sources are collected in small steel containers and stored in shielded drums.
- High-activity sealed sources can be handled in the hot cell facility and are stored in the storage tubes of the underground storage below the hot cell. So far, only Co-sources have been stored there.

- Before the conditioned drums are transferred to the interim storage facility, they are characterised regarding radionuclide content with the waste assay system. This information is put together in a single document with all the data on the waste gathered throughout the waste management processes (the life cycle of the waste) as well as the customer information on the raw radioactive waste. This document gives proof that the waste acceptance criteria for interim storage are upheld. The data is stored in an in-house developed waste management database called "DOKURAD" (see chapter on documentation in Annex L.1). The checking of the combined results is done considering the four-eyes principle.

Figure 1: Schematic diagram of the streams of radioactive waste at NES, © NES



All radioactive waste management facilities and activities at NES are duly licensed and regularly supervised by the competent authority in accordance with the relevant radiation protection legislation (see section E .2).

B.5 Categorisation of Radioactive Waste – Article 32 Para 1 (v)

Radioactive waste is defined in the Austrian legislation as radioactive material for which no further use is foreseen and that is subject to regulatory control as radioactive waste. Radioactive material means any material containing radioactive substances, i.e. substances that contain one or more radionuclides the activity or activity concentration of which cannot be disregarded from a radiation protection point of view. Exemption and clearance levels are laid down in the General Radiation Protection Ordinance 2020 and are based on values provided in Annex VII of Council Directive 2013/59/Euratom.

Effective from 1 January 2004, NES adopted the Commission Recommendation 1999/669/EC of 15 September 1999 on a classification system for solid radioactive waste, which in turn is based on the IAEA classification scheme from 1994 (IAEA Safety Series No 111-G-1.1). The following, slightly modified classification system is used:

- **Clearable waste:** Waste that meets the clearance criteria. This category corresponds to the “Exempt Waste” category according to IAEA GSG-1.
- **Transition radioactive waste**: Type of radioactive waste (mainly from medical origin) which will decay within the period of temporary storage (e.g. radionuclides with half-lives less than 100 days) and may then be suitable for clearance. Waste in the transition phase, e.g. short-lived decay waste from medical applications containing ^{125}I, is left to decay at the producers' sites, i.e., hospitals, or is brought to NES for temporary decay storage.
- **Low and intermediate level waste (LILW):** In LILW, the concentration of radionuclides is such that generation of thermal power during its disposal is sufficiently low. These acceptable thermal power values are site-specific following safety assessments.
  - Short-lived waste (LILW-SL): This category includes radioactive waste with nuclides with a half-life less than or equal to those of 137Cs and 90Sr (around 30 years) with a restricted alpha long-lived radionuclide concentration (limitation of long-lived alpha-emitting radionuclides to 400 Bq/g in individual waste packages).1
  - Long-lived waste (LILW-LL): Long-lived radionuclides and alpha emitters whose concentration exceeds the limits for short-lived waste.

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[1] In the Commission Recommendation, the limitation of long-lived alpha emitting radionuclides is set to 4.000 Bq/g in individual waste packages and to an overall average of 400 Bq/g in the total waste volume.

- **High level waste (HLW)**: Waste with levels of activity concentration high enough to generate significant quantities of heat by the radioactive decay process or waste with large amounts of long-lived radionuclides that need to be considered in the design of a disposal facility. HLW does not arise in Austria.

C Scope of Application – Article 3

C.1 Reprocessing – Article 3 Para 1

There are no reprocessing facilities in Austria, nor is there any spent fuel held at reprocessing facilities abroad.

C.2 Waste containing only NORM – Article 3 Para 2

The Austrian legislation defines the conditions under which practices with naturally occurring radioactive materials (NORM) fall under the provisions of the radiation protection legislation. According to the provisions of the Radiation Protection Act 2020, a licence is required for practices involving NORM that produce residues above the value for restricted clearance. In such a case, the residues would have to be declared as radioactive waste, being subject to the same requirements as other radioactive waste.

The competent authority would not issue a licence if the residues would have to be managed as radioactive waste. However, in the interest of economics, licensees are allowed to file an application to the competent authority to declare up to 15 kg of residues, which exceed the limits for restricted clearance, as radioactive waste per calendar year. Only small amounts of radioactive waste resulting from NORM arise in Austria.

C.3 Radioactive waste from defence programs – Article 3 Para 3

The Austrian legislation applicable for radioactive waste management makes no difference for the regulation of radioactive waste originating from civilian or military applications. Only a small amount of radioactive waste (from time to time some disused sealed sources) originates from military applications. Such waste is sent to NES for treatment, conditioning and interim storage. Radioactive waste from military applications comprises small disused sealed sources used for training purposes or, for example, ^{3}H sources from targeting devices.

D Inventories and Lists – Article 32 Para 2

D.1 Spent fuel management facilities – Article 32 Para 2 (i)

There are no dedicated spent fuel management facilities in Austria. The TRIGA Center Atominstitut has a total spent fuel storage capacity of 168 fuel elements.

As stated in chapters B.1 and B.2, spent fuel elements from the TRIGA reactor will be returned to the USA according to a contract between the United States Department of Energy, the TU Wien and EURATOM.

D.2 Inventory of spent fuel – Article 32 Para 2 (ii)

During the reporting period, no spent fuel elements were held in interim storage at the TRIGA Center Atominstitut.

D.3 Radioactive waste management facilities – Article 32 Para 2 (iii)

NES is the only operator of radioactive waste management facilities in Austria and located at the Seibersdorf site 40 km south of Vienna. NES is responsible for the collection, treatment, conditioning and interim storage of all radioactive waste generated in Austria. The following treatment, conditioning and waste handling facilities are in operation:

- Incinerator for LILW (capacity: about 40 kg/h solid burnable waste)
- Supercompactor (1.500 t)
- Waste water treatment facility (precipitation, filtration) including ultrafiltration facility
- Sludge dryer
- Cementation equipment
- Drum drying facilities (1- and 32-drum dryer)
- Waste assay system
- Hot cell facility

- Buffer storage facilities for raw radioactive waste
- Interim storage facilities for conditioned radioactive waste.

The comprehensive modernisation project of the different facilities at NES, which was started in 2008, is essentially completed. All facilities are either licensed or at least in active trial operation. For more details regarding the different waste management facilities at NES and the modernisation project, see Annex L.1.

D.4 Inventory of radioactive waste – Article 32 Para 2 (iv)

The main sources of LILW are the use of radioactive substances in medicine, industry and research (approximately 15 tons/year for interim storage), but the inventory at NES includes as well waste from past practices, such as from the ongoing decommissioning and dismantling activities of former nuclear research facilities (10 to 110 tons/year for interim storage).

The annual quantity of incoming/raw waste is largely depending on the ongoing decommissioning projects. Usually, a large part of this waste can be decontaminated and cleared, while only a small part has to be transferred to the interim storage as conditioned radioactive waste. Therefore, the resulting amount of conditioned waste is at maximum approximately 250 drums (200 litre) per year.

The activity inventory and waste volume present at the interim storage facilities of NES at 31 December 2023 are as follows (changes compared to the previous report are given in brackets):

Table 1: Inventory (volumes and activity) of radioactive waste in the interim storage facilities of NES (as of 31 December 2023)

Type of waste	Volume [m³]	Total activity[2] [Bq]	Total activity (decay-corrected as of 31 Dec 2023) [Bq]
LILW-SL	2523 (+163)	9.97×10^{15} (+0 %)	3.59×10^{15}
LILW-LL	52 (-8)	5.73×10^{12} (+25 %)	5.73×10^{12}

At the end of 2023, 12.579 (+763 since the previous report) mainly 200-litre-drums containing conditioned radioactive waste were held in interim storage, as well as five "*Mosaik*©" containers and five "*Konrad Type II*" containers with radioactive waste from the decommissioning project of the former ASTRA reactor.

At present, there are no disposal facilities for radioactive waste in operation in Austria. None of the Austrian radioactive waste has been disposed of in other countries nor was it dumped in the sea in the past.

Origin of the waste

The major amount of solid waste is material from decommissioning or dismantling activities and combustible waste from the use of radioactive material in medicine. Liquid waste mainly originates from the operation of waste treatment facilities (e.g. NES incinerator's wet scrubber) and radionuclide laboratories on the Seibersdorf site. A small fraction of liquid waste originates from medical facilities and universities.

Sealed sources such as ^{60}Co, ^{137}Cs, ^{241}Am and others are widely used for industrial purposes. Sources containing ^{60}Co and ^{137}Cs were used for medical applications as radiation sources for high dose treatment (few in number, but with high activities). Special categories are radium sources used from around 1900 to about 1960 for medical treatment. They were produced in different qualities and some showed a tendency for leakage. Due to the high radiotoxicity of radium, their usage was discontinued and they

[2] Activities as per reference date. Reference date for these activities is the entry date of the respective raw waste.

were replaced by safer sources as soon as available. Approximately 14 g of radium were conditioned and are stored in the interim storage facility at NES.

NORM originating from different industrial processes has been treated and conditioned at NES until 2006. Since 2008, the treatment of residues originating from practices with NORM is regulated by the General Radiation Protection Ordinance 2020. Only NORM waste which is declared as radioactive waste is treated by NES (see section C).

D.5 Nuclear facilities in the process of being decommissioned – Article 32 Para 2 (v)

Decommissioning of the old Hot Cell Laboratory, which was located on the premises of NES, was completed in 2023. The request for approval of restricted clearance for the demolition of the building is currently under review.

E Legislative and Regulatory System

E.1 Implementing Measures – Article 18

As described below in Sections E.2 and E.3, Austria has taken the legislative, regulatory and administrative measures for implementing its obligations under the Joint Convention.

E.2 Legislative and Regulatory Framework – Article 19

Overview – Article 19 Para 1

The safety of spent fuel management and the safety of radioactive waste management are mainly governed by the federal legislation on radiation protection, consisting of the following laws and ordinances:

- Radiation Protection Act 2020, in force since 1 August 2020,
- General Radiation Protection Ordinance 2020, in force since 1 August 2020,
- Ordinance on Interventions in Case of Radiological Emergencies 2020, in force since 1 August 2020,
- Ordinance on the Shipment of Radioactive Waste 2009, amended version in force since 1 August 2020.

Regarding radioactive waste management, the Radiation Protection Act 2020 covers, among others:

- General principles of the national policy (including the requirement of the prime responsibility of the licence holder for the safety of a waste management facility),
- Provisions for a national programme for the management of radioactive waste,
- Provisions for regular self-assessment and peer reviews at least every 10 years and
- Requirements for public participation in the decision-making process.

The responsible and safe management of spent fuel and radioactive waste is one of the target provisions of the Act.

The General Radiation Protection Ordinance 2020 addresses the following requirements:

- Provisions for the construction, operation and decommissioning of radioactive waste management facilities,
- Provisions for the organisation and for the safety of radioactive waste management facilities (supplemented by measures to promote and improve the safety culture),
- Provisions for record keeping and obligations for notifications to the competent authority,
- Requirements for radiation protection officers,
- Provisions for the information of the public regarding radioactive waste management.

Specific requirements for the construction, operation and decommissioning of radioactive waste management facilities are prescribed in detail in the individual licences. National and international norms and standards (for construction and operation of the radioactive waste management facilities, requirements for radiation protection and radioactive waste management) are prescribed in the licences of the licence holders.

Radiation Safety – Article 19 Para 2 (i)

Requirements for radiation safety are determined in the Radiation Protection Act 2020, the General Radiation Protection Ordinance 2020 and the Ordinance on Interventions in Case of Radiological Emergencies 2020 with the aim to protect lives and health of individuals and their descendants as well as the environment from the hazards of ionising radiation. They implement the principles of justification of a practice, optimisation of radiation exposure and dose limitation. Detailed and specific radiation protection measures for the predisposal management of radioactive waste are additionally laid down in the construction and operation licences of the respective facilities.

Beyond these specific regulations, the General Administrative Procedures Act from 1991 and related legal instruments subsequently apply to the licensing procedures.

These requirements are in line with the standards on radiation protection agreed on international level. More detailed criteria concerning radiation protection and radiation safety are defined in the individual licences.

Licensing System – Article 19 Para 2 (ii)

§§ 15 to 22 Radiation Protection Act 2020 and §§ 7 to 10 General Radiation Protection Ordinance 2020 establish fundamental rules regarding licensing. If a practice requires constructional radiation protection measures, a two-stage licensing procedure shall be performed, firstly a construction licence and secondly a licence to perform the practice. In general, a licence may only be granted where

- the intended practice is justified,
- there are no reservations about the reliability of the licence applicant or, in the case of a legal entity, about the reliability of the persons authorised to represent it,
- sufficient protection is provided for the workers concerned and
- in the case of practices that, in normal operating conditions, may cause such exposure of members of the public as cannot be disregarded, sufficient protection is provided for these individuals.

Following the graded approach, for specific areas such as research reactors or waste management facilities, the Radiation Protection Act 2020 contains tailored rules that also need to be fulfilled in order to obtain a licence. § 53 Radiation Protection Act 2020 stipulates requirements for waste management facilities that include provisions regarding construction, operation and decommissioning of such facilities. Pursuant to the Radiation Protection Act 2020, a waste management facility is a dedicated facility for any practice that relates to treatment or disposal of radioactive waste, excluding off-site transportation.

In order to obtain a construction licence for a waste management facility, siting must comply with internationally recognised safety standards, the waste management facility needs to be designed in accordance with the state of the art and internationally recognised safety standards and a preliminary safety report, a preliminary on-site emergence response plan and a decommissioning concept must be available.

Specific requirements for granting a licence to operate a waste management facility include

- the availability of appropriate technical, human and financial resources for safe operation,
- the availability of a safety report and an on-site emergency response plan,
- the setting up of an integrated management system and

- the availability of a decommissioning concept including appropriate financial provisions for decommissioning.

In practice, the first step of the licensing process is the submission of the licence application. The licence application must include the documentation specified in the General Radiation Protection Ordinance 2020, such as an exact description of the intended practice, technical and other information on the radiation source for which radiation protection is to be ensured and training certificates of the designated radiation protection officers. For the granting of a licence to operate a waste management facility, proof of compliance with the specific requirements pursuant to § 53 Radiation Protection Act 2020 mentioned above has to be submitted.

If a licence application does not contain all necessary documents, the competent authority shall without delay notify the applicant and request to transmit the missing documents within an adequate period of time. If the applicant fails to submit them, a licence will not be granted.

A licence to operate a waste management facility shall be granted if the above-mentioned general requirements and specific requirements for waste management facilities as well as the conditions and requirements of the construction licence are fulfilled. Additionally, a radiation protection officer needs to be notified to the competent authority.

Radiation protection officers must have successfully completed scientific or technical studies at a regular university or university of applied sciences as well as the radiation protection training stipulated by the General Radiation Protection Ordinance 2020. Further, they shall present proof to the competent authority of having been employed for a period of no less than two years in a position where they were able to gain sufficient practical experience for the intended practice. The General Radiation Protection Ordinance 2020 contains detailed provisions on the training of radiation protection officers for waste management facilities, which must cover training of at least 40 hours particularly dedicated to management of radioactive waste, such as conditioning practices and facilities, interim storage, emission monitoring, etc., general training in the fields of nuclear physics, ionising radiation and legal provisions as well as hands-on training with sealed radioactive sources and unsealed radioactive substances. Training schools, which provide education and training for radiation protection officers according to the requirements of the ordinance, require an approval by the competent authority. Training schools issue certificates for those radiation protection officers who have successfully completed their training and education programme.

Prohibition of operation without a license – Article 19 Para 2 (iii)

The Radiation Protection Act 2020 requires a licence for the construction, operation or decommissioning of a radioactive waste management facility and explicitly prohibits to carry out a practice without an appropriate licence. There are no exceptions to this requirement. Violations will be prosecuted according to the list of penalties set out in the Radiation Protection Act 2020.

Control, regulatory inspection, documentation and reporting – Art 19 Para 2 (iv)

§ 61 Radiation Protection Act 2020 requires that the licence to perform a practice pursuant to § 17 Radiation Protection Act 2020 shall be reviewed by the licensing authority. In case of waste management facilities, the inspection must be conducted at least once a year. The BMK as the competent authority can perform inspections more frequently at any given time. It is the discretionary decision of the regulatory authority whether those are necessary. For instance, in case of events that may significantly affect the safety or in case of significant deficiencies in the operation of waste management facilities, additional announced or unannounced inspections may be deemed necessary. This assessment may change depending on discovering significant deficiencies or planned changes that potentially affect safety significantly during regular supervisory procedures.

An inspection programme is established prior to the inspection. The methods used range from questioning, perusal and examination of the operator's documents/information/test plans to on-site inspections. Prior to the inspection, the licensee is obliged to submit a set of documentation, particularly including annual reports on operation, on radiation protection and on environmental monitoring, a safety analysis report, report on training, test results and information on any safety-related change in the operation of the waste management facilities.

The authority and its experts review and assess the submitted documents. During the inspection, the reports of the licence holder are assessed and any measures to be taken are recorded. The competent authority writes a report of the inspection according to the General Administrative Procedure Act 1991 that concludes the results of the inspection.

The report is communicated to the licence holder at the end of the inspection and has to be signed by the competent authority and the licence holder. The licence holder has to communicate and demonstrate the improvements resulted from the inspection to the competent authority within a certain timeframe, which is defined in the report. The outcome of an inspection is discussed between the inspector (technical expert) and the legal experts of the regulatory body as the basis for the improvement of processes and the planning of future inspections.

Enforcement – Article 19 Para 2 (v)

Where the competent authority determines a breach of a radiation protection provision, the licensee shall be requested to establish compliance with the radiation protection framework within a reasonable period. Where the request is not complied with within the established or extended time limit, the competent authority shall file a complaint with the competent administrative penal authority. In case of a significant breach, the competent authority shall file a complaint without previous request.

In the event of imminent danger, where necessary, the competent authority shall prohibit or restrict the relevant practice. It can only be continued once the authority has determined that the cause of the danger has been eliminated. The competent authority shall set a reasonable time limit for the elimination of the cause. It shall revoke a licence where such practice is no longer justified or the licensee or the persons authorised to represent it no longer prove reliable.

From a procedural point of view, any complaints filed against such measures taken by the competent authority in case of imminent danger shall have no suspensive effect. This means they will become obsolete only in case of a court ruling that deems those measures ineffective or incorrect. Additionally, to achieve minimal response times, the competent authority has the right to issue an administrative decision without any prior investigation procedure pursuant to § 57 General Administrative Procedure Act 1991.

Where necessary, the competent authority shall implement measures itself directly on site, even prior to issuance of a decision. The members of the public police services shall provide the competent authority with assistance to protect the performance of an official act, if so requested. A written administrative decision on such measures must be issued within two weeks, or else the measures taken shall be lifted.

Furthermore, anyone who commits an administrative offence pursuant to § 152 Radiation Protection Act 2020, can be punished, depending on the severity of the act, by an administrative fine up to EUR 75.000, provided the act does not constitute an offence within the jurisdiction of the courts or is not subject to more severe penalties according to other administrative provisions.

During the reporting period, no events of imminent danger have occurred at the TRIGA Center Atominstitut or at the facilities of NES. The authority is in close communication with the licensee(s) in order to be informed about potential challenges at an early stage.

Allocation of Responsibilities – Article 19 Para 2 (vi)

The Republic of Austria has the ultimate responsibility for radioactive waste arising in Austria. For this purpose, the Federal Minister for Climate Action, Environment, Energy, Mobility, Innovation and Technology has been authorised in the past to conclude contracts with an appropriate institution (which is NES). Based on this authorisation, the Republic of Austria (represented by the BMK), the Municipality of Seibersdorf and NES concluded the Joint Agreement on the management of Austrian radioactive waste ("Disposal Agreement"), which obliges the contractor, inter alia,

- to take over, collect, sort, treat, condition and store until disposal radioactive waste produced in Austria, and
- to take all necessary measures to ensure the safe interim storage of the conditioned radioactive waste in the long term.

In turn, the Republic of Austria guarantees NES the necessary funds for fulfilling its contractual obligations, such as for the maintenance and modernisation of the facilities, reconditioning and transfer of the radioactive waste to a final repository. The financial resources provided for NES are approved by the Federal Minister of Finance.

The Radiation Protection Act 2020 clearly defines the responsible authorities for issuing licences and performing inspections (see below). Regarding information of the public, the Federal Minister for Climate Action, Environment, Energy, Mobility, Innovation and Technology shall in an appropriate manner, provide the public with information about the regulatory tasks in radiation protection, specifically about the justification of practices as well as the licensing and review procedures. Additionally, the competent authority shall inform the public about the nuclear safety of research reactors and about the management of radioactive waste in Austria.

The General Radiation Protection Ordinance 2020 stipulates that when applying for a licence, an applicant has to submit relevant information on radioactive waste management concerning the type and expected amount arising per year, the intended management route, as well as a possible temporary storage. All radioactive waste produced by licensees in Austria shall be either collected by or transferred to NES. The licensees are obliged to collect and label radioactive waste in accordance with the acceptance criteria of NES.

Regulating Radioactive Materials as Radioactive Waste – Article 19 Para 3

Radioactive waste is defined in the Austrian legislation as radioactive material for which no further use is foreseen and that is subject to regulatory control as radioactive waste. This is in line with the internationally agreed definition of radioactive waste.

Exemption and clearance levels are laid down in the General Radiation Protection Ordinance 2020 as nuclide specific values derived from the internationally accepted 10 µSv/year dose concept. Clearances have to be authorised by the competent authority.

E.3 Regulatory Body – Article 20

Establishment and Designation – Article 20 Para 1

Responsibility for enforcing the radiation protection regulations is defined in §§ 153 to 155 Radiation Protection Act 2020. The Federal Minister for Climate Action, Environment, Energy, Mobility, Innovation and Technology is the competent regulatory authority for research reactors, waste management facilities, the transport of radioactive material that is not exempt from the obligation to obtain a licence, particle accelerators at universities and research institutes of the Austrian Academy of Sciences (ÖAW) and practices in university organisational units in which research reactors or particle accelerators are operated. Federal Ministers are supported by their respective Federal Ministry (in this case, the BMK) functioning as an auxiliary body in the fulfilment of their functions.

The Federal Minister of Social Affairs, Health, Care and Consumer Protection is responsible for radiation matters in the medical field and with regard to foodstuff. The Federal Minister of Justice is responsible for all legal matters relating to the Nuclear Liability Act. The Governors of the Federal Provinces are responsible for licensing and supervision for any other practices if not specified otherwise by the Radiation Protection Act 2020 (e.g. hospitals, existing exposure situations due to radioactive legacy waste and orphan sources). They are also responsible for licensing according to the Environmental Impact Assessment Act 2000.

To ensure cooperation between federal and regional authorities in Austria, periodical conferences are held, bilateral exchange of opinions is conducted and administrative guidance is issued.

The supervision of the research reactor and the waste management facilities is organised within a department of the BMK, the head of which signs on behalf of the Federal Minister. The respective department of the BMK consists of 20 staff in total. The department consists of legal staff and technical experts, which are in constant exchange with consultants and external experts for the evaluation of technical questions related to radiation protection. The department receives a budget reserved for regulatory activities, which is deemed sufficient for the tasks at hand. The staff must undergo regular training to maintain competence.

Independence – Article 20 Para 2

In 2018, during the IRRS peer review it was recommended to *"review the regulatory framework at the federal level to avoid any potential conflict of interest and to ensure the appropriate independence in the discharge of safety related functions".* On 1 January 2021, Austria enhanced the independence of the regulatory body and consolidated the competences in the field of nuclear safety and radiation protection with the assignment of the competence for oversight of the research reactor from the Federal Minister for Education, Science and Research to the Federal Minister for Climate Action, Environment, Energy, Mobility, Innovation and Technology. Prior to the change, the Federal Minister for Education, Science and Research was the regulatory body for the research reactor, while at the same time executing competences related to research agendas and funding.

The Federal Minister for Climate Action, Environment, Energy, Mobility, Innovation and Technology is the licensing and regulatory authority for the construction and operation of radioactive waste management facilities. NES is contracted to the Federal State (represented by the BMK) via the Joint Agreement on the management of Austrian radioactive waste, which obliges the Federal State, inter alia, to provide financial contributions to the maintenance and modernisation of the waste treatment facilities of NES. These financial resources are administered by the BMK and supervised by the Federal Minister of Finance.

The Radiation Protection Act 2020 requires the Federal Minister for Climate Action, Environment, Energy, Mobility, Innovation and Technology to ensure that the actual independence of the competent authority (BMK) in performing its regulatory functions is maintained, in accordance with the provisions of Directive 2011/70/Euratom. The BMK has administrative arrangements in place that ensure a clear separation between execution of regulatory functions pertaining to safety and administration of the funds as well as any other activities in relation to the management of radioactive waste.

Notably, in 2022, the ARTEMIS review team recommended that the Federal Government, as the National Programme for the Management of Radioactive Waste develops, review the regulatory oversight system to avoid potential conflicts of interest. The consolidation of regulatory powers and the independence of the regulatory authority on the federal level has been and still is on the agenda in regular discussions with political stakeholders.

F Other General Safety Provisions

F.1 Responsibility of the license holder – Article 21

License Holder – Article 21 Para 1

The Radiation Protection Act 2020 stipulates that the licensees of research reactors and waste management facilities are responsible for the (nuclear) safety of the facilities and their operation. That responsibility cannot be delegated and includes responsibility for the activities of contractors that might affect nuclear safety. The specific obligations of the licensees resulting from that fundamental responsibility are provided in the Radiation Protection Act 2020 and further elaborated in the General Radiation Protection Ordinance 2020. They are supported by relevant standards and guidelines on radiation protection and radioactive waste management.

The compliance with the legal framework in regard to nuclear safety and radiation protection and the compliance with the requirements deriving from the licence is ensured by regular inspections and reviews performed by the regulatory authority.

The licence holder has to inform the employed staff as well as the public in a suitable form about the normal operating conditions of the research reactor or the waste management facility and immediately in case of events that are relevant from a radiation protection or nuclear safety point of view. Further reporting obligations may arise from the Hazardous Incident Information Ordinance. Notification plans are in place for emergencies, which are included in the safety analysis, incident analysis and the institute´s emergency plan (see Section F.5).

Communication to the public is maintained using various channels, such as webpages, social media and press releases, both at the national and at facility level. The operator of the TRIGA reactor keeps close contact with the adjoining owners of properties next to the premises of the research reactor and informs them about current developments and activities. People can also take up on the offer of guided tours at the research reactor building. NES maintains close contact with the host municipality of Seibersdorf and holds an annual meeting with the municipal council, where questions of mutual interest are discussed. NES facilities are frequently visited by a professional audience.

Unlicensed Facilities, Activities and Materials – Article 21 Para 2

The Radiation Protection Act 2020 stipulates that the ultimate responsibility for radioactive waste generated on its territory rests with the Republic of Austria. This is also true if no licence holder or other responsible party for the radioactive waste exists.

The Radiation Protection Act 2020 contains provisions on how discoveries of orphan sources or radioactively contaminated material have to be handled by the authorities. The competent authorities have to confiscate orphan sources and have to investigate whether a responsible person can be identified. If no responsible person can be identified, the confiscating authority has to take care for the safe management of the radioactive source, which in general means transfer to NES.

F.2 Human and financial resources – Article 22

Qualified Staff – Article 22 (i)

The General Radiation Protection Ordinance 2020 requires that persons who are directly entrusted with tasks in the field of radioactive waste management have relevant knowledge and training before starting their work. The qualified staff has to provide evidence of advanced training on radioactive waste management at intervals of five years.

The competent authority verifies these requirements for qualified staff in the frame of the annual inspections. Furthermore, the licence holder has to promote the ability at all levels of staff and management

- to question whether the relevant safety principles and practices are effectively performing their function,
- to report safety and security issues, and
- to take precautions for the registration, evaluation and documentation of internal and external safety-relevant operating experience.

The designation of a radiation protection officer is required for to perform a practice according to the Radiation Protection Act 2020. A radiation protection officer is a qualified person who has been designated by the licence holder to take over duties and responsibilities regarding radiation protection matters and who is notified to the competent authority. The duties of the radiation protection officer are laid down in the

Radiation Protection Act 2020. Depending on the practice, the licence holder must provide for a sufficient number of radiation protection officers or other safety-related staff and proof of their qualifications.

Adequate Financial Resources – Article 22 (ii)

The Radiation Protection Act 2020 stipulates that a prerequisite for obtaining an operating licence for research reactors and waste management facilities is the provision of adequate financial resources for operating the facilities. Furthermore, operators of such facilities have to make adequate financial provisions for the future decommissioning of those facilities.

Based on the provisions of the Radiation Protection Act 2020, the BMK, in the name of the Republic of Austria, is authorised to update the existing service contracts with NES. Two service contracts exist: the "Disposal Agreement" and the "Decommissioning Agreement". The first contract stipulates the duties of NES regarding the collection, sorting, conditioning and interim storage of Austrian radioactive waste and regulates the subsidies provided by the Republic of Austria for carrying out these activities as well as for the maintenance of the infrastructure and the equipment in the facilities. The latter agreement specifies the decommissioning projects of former research facilities at the Seibersdorf site.

Pursuant to the Radiation Protection Act 2020, the costs of radioactive waste management shall be borne by those who generated it (polluter pays principle). Waste generators have to pay a fee to NES for taking over and treating their waste, the amount of which is depending on the type of waste. This fee is divided into a treatment fee, which covers the cost of the treatment at NES, and a precautionary fee, which is set aside and paid into a fund earmarked for financing any disposal activities (also called "disposal fee"). In specific, the precautionary fee covers expenses regarding the planning, construction and operation of a disposal facility, the final conditioning of the waste packages (cementation into containers) for transport to the (future) disposal facility as well as the transport itself.

The precautionary fee is calculated based on the costs of existing foreign disposal facilities. The tariffs are annually revised and adopted by the BMK. If the funds accumulated via this precautionary fee prove insufficient, the Republic of Austria will cover the outstanding costs. There are no additional fees for the producer after delivery of the waste to NES and payment of the fees for processing/interim storage and disposal.

The operator of the research reactor has made the necessary financial provisions for the storage and the future return of the spent fuel elements.

Financial Provision for Institutional Controls – Article 22 (iii)

Since the national programme for the disposal of Austrian radioactive waste is in an early stage, as of now, there are no specific requirements for financial provision that will enable appropriate institutional controls and monitoring. The legislative bodies will define the necessary requirements for the post-closure period of a disposal facility in due time as the national programme advances.

F.3 Quality assurance – Article 23

The General Radiation Protection Ordinance 2020 requires licensees to implement an integrated management system, which shall specifically address radiation protection, quality assurance, occupational health and safety, environmental protection, security and hazard prevention. These systems have to be developed according to an internationally agreed standard and must be reviewed periodically.

Pursuant to the provisions in the Ordinance, the licensee shall implement measures to promote and to improve the safety culture, further to promote the ability to question delivery of relevant safety principles and practices at all staff and management levels and to report safety issues in a timely manner. Furthermore, the licensee has to implement arrangements for registration, evaluation and documentation of internal and external safety-related operating experience. Quality assurance is also part of the training of radiation protection officers.

NES has implemented an integrated management system (IMS), which comprises:

- Quality Management System (ISO 9001:2015)
- Environmental Management System (ISO 14001:2015)
- Occupational Safety and Health Management System (ISO 45001:2018)

This IMS facilitates a comprehensive perspective of operational processes. It incorporates aspects of occupational safety and environmental protection into the procedures which require regular external and internal audits.

F.4 Operational radiation protection – Article 24

The Radiation Protection Act 2020 and the General Radiation Protection Ordinance 2020 form the legal basis for operational radiation protection for all kinds of applications of ionising radiation in Austria. The legislation aims at protecting human life and health and the environment against the danger of ionising radiation. It is based on the requirements of the European Basic Safety Standards, IAEA (Basic) Safety Standards and on recommendations of the International Commission on Radiological Protection (ICRP). The internationally agreed-upon principles of justification of a practice, optimisation of radiation exposure and dose limitation are implemented in the legislation. Further radiation protection requirements are defined in non-binding national standards (Austrian Standards International). Requirements of certain standards can be made obligatory by the licences. Specific obligations for the licence holders are stated in the construction and operation licences granted to each operator of a nuclear facility. All activities must be performed in accordance with radiation protection regulations and the obligations in the licences.

Radiation Exposure – Article 24 Para 1(i)

The Austrian radiation protection legislation requires optimisation in line with the ALARA principle as a fundamental principle for limiting the radiation exposure of the workers and the public. It is the responsibility of the licence holder to optimise the radiation doses for a licensed practice and to implement a system of control. Typical measures taken by the operator to minimise the exposure of the workers are regular dose rate measurements at work places and low warning levels at the automatic radiation monitoring system. In addition, swipe tests at critical points are performed regularly.

Regulatory inspections cover the checking of the doses of the exposed workers. The authority has experience regarding the typical occurring dose for a certain kind of practice. In case of deviations of typical doses, the authority scrutinises the radiation protection measures of the licence holder. The authority can ask the licence holder to improve its radiation protection measures for optimising its practice. As a consequence, the authority can prescribe optimisation measures.

Radiation Doses – Article 24 Para 1 (ii)

According to the General Radiation Protection Ordinance 2020, the dose limit for individuals of the population is set to 1 mSv per year and the dose limit for occupational exposure to 20 mSv per year. These dose limits are in line with international standards. The exposure of occupationally exposed persons shall be monitored systematically on the basis of individual measurements. The external exposure resulting from the handling of sources shall be assessed using personal dosimeters. In case an occupationally exposed person handles unsealed radioactive substances in the course of his or her activity, routine intake monitoring shall be implemented if the committed effective dose resulting from intake on account of such handling may exceed the limit for members of the public.

The analysis of this individual dose monitoring and of incorporation monitoring may only be conducted by authorised services. The doses are then reported to the Central Dose Registry and evaluated by the competent authority. If a dose limit is exceeded, the authority starts an investigation and takes any further steps deemed necessary.

Exposed workers are categorised based on expected effective doses. The maximum dose for exposed workers of category B is 6 mSv per year and of category A is 20 mSv per year. Exposed workers have to undergo a training on the handling of radioactive materials prior to the commencement of their practices and they are equipped with personal protective devices and dosimeters. Exposed workers of category A have to undergo a preventive medical examination before they commence work. Afterwards they have to repeat the preventive medical examination on an annual basis.

The dose limits and working conditions for underage persons and pregnant women are laid down in the Radiation Protection Act 2020 and the General Radiation Protection Ordinance 2020. Persons under the age of 18 years may not be assigned to any work which would make them exposed workers (except for underage persons between 16 and 18 years whose training or studies require working with radiation sources). Working conditions for a pregnant worker must be organised in a way to ensure that the protection of the unborn child is comparable with the protection of members of the public. Breastfeeding workers may not be assigned to any work involving a risk of intake of radionuclides leading to an exposure of the infant. It is at the discretion of the competent authority to stipulate further dose constraints in the individual licences.

The average effective dose – including external background radiation – for all personnel involved in radioactive waste management at NES is reported in the table below (Note: The maximum dose in the years 2020-2022 is higher than average due to effects of a notional dose of 1.67 mSv/y that has been substituted).

Table 2: The average effective dose – including external background radiation – for all personnel involved in radioactive waste management

Year	max. Dose [mSv/y]	ex. Background [mSv/y]
2020	2.49	0.76
2021	2.46	0.79
2022	2.65	0.78
2023	1.43	0.74

Preventive measures taken – Article 24 Para 1 (iii)

The radiation protection legislation requires the licence holder to take appropriate measures to prevent unplanned and uncontrolled releases of radioactive materials into the environment. The General Radiation Protection Ordinance 2020 and prescriptions in the individual licences set out the necessary administrative and technical requirements to be considered during construction, operation and the decommissioning of such facilities. If the regulatory authority deems that the safe operation of a facility is not ensured, the authority can take steps to immediately stop the operation of the facility.

The General Radiation Protection Ordinance 2020 requires that rooms, building or areas be declared as controlled or supervised zones if the potential effective dose per calendar year received by workers performing practices in these areas may exceed certain limits specified in the Ordinance. The limits of the controlled and supervised areas are defined in the course of the licensing procedure.

Both the probability of and the hazard potential from releases due to abnormal conditions from the facilities at NES or from the research reactor are very low (transboundary emergencies cannot occur).

Radiation Exposure and Radiation Doses Due to Discharges – Article 24 Para 2

For limitation of the public exposure, a dose constraint of 0.3 mSv per year for the controlled discharge of gaseous or liquid radioactive material is applied. In the licence application for construction and operation of a facility, the technical measures which are taken to reduce exposure from radioactive discharges (i.e. barriers and air filters), must comply with the ALARA principle. These measures are explicitly stated as obligations when granting the licence. The release of radionuclides into the atmosphere and body of water is monitored by the licence holder. The results of the monitoring (air, rain deposit, water and biological material) are reported to and supervised by the licensing authority. The inspection of installations by the authorities concerning emission and immission consists of two parts: inspection of the quality of the internal control by the operator and independent surveillance by examination of samples taken by the authority.

The highest effective doses for the members of the public within a radius of 1 km due to discharges to the atmosphere and the water body from radioactive waste management facilities at NES are summarised in the table below.

Table 3: Effective dose due to discharges to the atmosphere and the water body

Year	Atmosphere [µSv]	Water body [µSv]	Sum [µSv]
2020	4.73E-1	2.57E-1	6.60E-1
2021	4.03E-1	2.57E-1	6.60E-1
2022	7.66E-2	5.95E-1	6.72E-1
2023	1.16E-1	4.92E-1	6.08E-1

The dose calculation was performed using the monitored activity concentrations as shown in the tables below.

Table 4: Activity concentration in water discharged to the water body

Year	Alpha [Bq/l]	Beta [Bq/l]	^{3}H [Bq/l]
2020	6,20E-1	1,76E+0	6,30E+1
2021	5,50E-1	9,00E-1	7,40E+1
2022	4,20E-1	2,24E+0	1,84E+3
2023	4,10E-1	1,81E+0	6,93E+2

Table 5: Activity concentration in air discharged to the atmosphere

Year	Alpha [Bq/m^{3}]	Beta [Bq/m^{3}]	^{3}H [Bq/m^{3}]	^{14}C [Bq/m^{3}]
2020	2.7E-4	1.0E-3	3.6E-1	1.2E+1
2021	2.6E-4	1.0E-3	4.3E-1	1.7E+1
2022	1.2E-4	1.2E-3	1.9E+0	9.4E-2
2023	1.2E-4	8.2E-4	3.3E+0	1.6E-1

At the TRIGA Center Atominstitut, the average yearly dose of atmospheric release (mainly ^{41}Ar of the research reactor) and the average yearly dose of waste water stayed below 0.02 mSv since the founding of the Institute.

Investigative measurements by the authorities of gaseous and liquid emissions and the internal surveillance by the operators show that maximum permissible levels were never exceeded. In addition, environmental monitoring in the surroundings of the facilities did not detect any inadmissibly high gamma dose rates or emissions during operation of the waste management facilities and the research reactor.

Corrective Measures – Article 24 Para 3

The General Radiation Protection Ordinance 2020 requires the licence holder to make the necessary operational arrangements in order to implement appropriate corrective measures to control a release and mitigate the effects. The availability of emergency plans and well-trained emergency personnel are prerequisites for the granting of a licence.

The Ordinance on Emergency Interventions stipulates the reference values for interventions in an emergency exposure situation. The reference values for the exposure of the public is 100 mSv effective dose per year. The reference value for emergency personnel involved in rescuing human lives is 250 mSv. The Ordinance also sets out the criteria for emergency exercises and the training of emergency personnel.

F.5 Emergency preparedness – Article 25

Facility Emergency Plans – Article 25 Para 1

On-site emergency plans

As described in Section E.2, a two-stage licensing process is applied in the case of radioactive waste management facilities and research reactors. The applicant for a construction licence is required to submit to the licensing authority a preliminary safety report and a preliminary on-site emergency plan. The applicant for an operating licence is required to submit final versions of the safety report and of the on-site emergency plan, based on the preliminary versions submitted in the previous stage. The licensing requirements including the emergency plans are reviewed during regulatory inspections. During these inspections, the licensing authority can order the updating of emergency plans, if necessary.

The General Radiation Protection Ordinance 2020 provides details on the specific requirements for the content and the structure of the on-site emergency plan and the conduct of emergency exercises in waste management facilities and research reactors.

The on-site emergency plan for NES is currently available in its fourth revision, a major update which happened in 2021. The emergency plan has been reviewed and updated annually based on the findings during the annual inspections ever since.

The on-site emergency plan for the TRIGA Mark II reactor is available in its latest revision from 2023. The emergency plan includes, inter alia, emergency procedures with regard to the handling of (spent) fuel elements and radioactive substances. Radioactive waste resulting from an emergency has to be delivered to NES. The TRIGA Center Atominstitut revises the safety report annually and submits it to the competent authority for perusal prior to the beginning of each calendar year.

Emergency exercises

To prove the adequateness and validity of the on-site emergency plan, emergency exercises are carried out on a regular basis.

Prior to the beginning of a calendar year, NES has to develop yearly exercise plans, which cover different emergency events. The exercise plans have to be submitted in advance to the licensing authority, which may choose to participate in specific exercises. The exercise plan typically includes eight to ten different exercises and training events such as fire alarms, flooding and medical treatment of contaminated personal. In addition to these emergency drills, there is an on-site fire brigade for the Seibersdorf campus that performs about 20 fire drills each year. At least 15 of these drills are held directly in the buildings and facilities.

The emergency plan of the TRIGA Center Atominstitut contains the emergency exercise plan for the coming year, which foresees quarterly emergency exercises (for example, loss of water in the reactor vessel, person with contaminated clothing).

The licensee has to evaluate the conduct of the exercises and document any shortcomings identified thereby. Based on the evaluation, the licensee has to elaborate improvement measures and a time schedule for their implementation. The licensee has to submit the exercise documentation, the list of improvement measures and the time schedule for implementing those measures to the competent authority.

The BMK sends experts to participate in and evaluate around half of the exercises conducted by the licensee. The exercise documentation and the list of improvement measures are also on the agenda of periodic regulatory inspections by the competent authority.

Off-site emergency plans

Pursuant to the Radiation Protection Act 2020, the BMK established a National Emergency Plan (“*Gesamtstaatlicher Notfallplan*”), which takes into account the views of all relevant ministries on the federal level. The National Emergency Plan consists of several parts, provides the basis for the emergency response on the federal level and for a coordinated reaction of all relevant authorities. The Ordinance on Interventions in Case of Radiological Emergencies 2020 sets out the requirements for the content of the emergency plans. The plans have to be periodically tested by conducting emergency exercises. Lessons identified from exercises and the operating experience have to be taken into account in periodic reviewing and updating of the emergency plans.

These plans are in accordance with the requirements of the IAEA General Safety Requirements No. GSR Part 7: Preparedness and Response for a Nuclear or Radiological Emergency, taking into account different events that could cause radiological emergencies in Austria:

- Events in nuclear power plants and other nuclear installations
- Use of nuclear weapons at a greater distance from Austria
- Events in Austrian facilities
- Satellite re-entry with radioactive sources on board
- Radiological terrorism

The off-site emergency plan regarding events in Austrian facilities focuses on events in Austrian facilities operating with dangerous radioactive sources. Among others, events at NES and at the TRIGA Center Atominstitut and their off-site consequences are covered by the plans. Since NES is an IAEA emergency preparedness category III facility according to IAEA Safety Standards Series No. GSR Part 7, urgent protective actions would only be necessary on-site. Nevertheless, other actions such as information of the public, coordination of authorities, sampling and measurements off-site, etc. have to be prepared and trained for.

National and International Notification

In accordance with § 57 of the Radiation Protection Act 2020, a radiological emergency in connection with a licensed practice has to be notified immediately to the licensing authority by the licensee. Information on the causes of the accident and the possible consequences as well as assistance in implementing protective measures have to be provided by the licensee. Licensees of waste management facilities and nuclear installations have to implement emergency preparedness measures in connection with the performed practices to protect workers in case of a radiological emergency.

In addition, detailed criteria for notification and information in case of incidents, accidents and emergencies for different practices are part of the Radiation Protection Act 2020 and the General Radiation Protection Ordinance 2020.

In case of an event which has to be notified according to the Early Notification Convention and according to Council Decision 87/600/EURATOM (ECURIE), the BMK is the competent authority for the notification to the respective international organisations. Provisions for national and international notification are a central part of the off-site emergency plan.

Territory Emergency Plans – Article 25 Para 2

EPR Organisations and Responsibilities

As stated above, the national off-site emergency plan includes events affecting Austrian territory. For the different responsibilities in the field of off-site emergency preparedness for events outside of Austria as well as on Austrian territory, see the table below:

Table 6: Responsibilities for off-site EPR

Organisation	Responsibilities
Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)	• Evaluation of the consequences of radiological and nuclear emergencies and decisions on protective actions in cooperation with Federal Ministry of Social Affairs, Health, Care and Consumer Protection • Environmental monitoring • Competent Authority for international information exchange (ECURIE, IAEA Convention on Early Notification and bilateral agreements)
Federal Ministry of Social Affairs, Health, Care and Consumer Protection	• Food monitoring • Pre-distribution system, storage and distribution of potassium iodide tablets (in cooperation with the Austrian Provinces)
Coordination Board of the National Crisis and Disaster	• Federal coordinating institution for crisis management

Organisation	Responsibilities
Protection Management coordinated by the Federal Ministry of the Interior	
Situation Centre in the Federal Ministry of Interior	• National information exchange centre • National Warning Point for international information exchange (ECURIE, IAEA Convention on Early Notification and bilateral agreements)
Nine Austrian Federal Provinces	• Implementation of protective actions • Responsible for off-site EPR in case of local events

Testing off-site emergency plans for the Austrian territory

Exercise plans for different types of emergency exercises are part of the updated off-site emergency plans at the federal level. In addition to the participation in exercises at international level (IAEA, European Commission, OECD/NEA), bilateral level (neighbouring countries) and specific exercises for training, the exercise plan requires to conduct national emergency exercises for testing the emergency plans on a regular basis. Based on lessons identified in these exercises, the BMK is responsible for updating the off-site emergency plans at federal level.

Radiation Warning Systems and Monitoring

The Radiation Protection Act 2020 obliges the BMK to operate and maintain an automatic Radiation Early Warning System ("Strahlenfrühwarnsystem") which consists of an automatic dose rate monitoring system and an automated air monitoring system. Data is exchanged on-line with the European Commission (EURDEP) and corresponding systems in the neighbouring countries of Slovenia, Switzerland, Germany, the Czech Republic, Slovakia and Hungary on the basis of bilateral agreements.

In addition, a laboratory-based monitoring system is operated together with the Federal Ministry of Social Affairs, Health, Care and Consumer Protection in order to comply with the requirements of rapid recognition and precise determination of radioactive contaminants. It mainly performs the radionuclide-specific monitoring of air, precipitation, surface water bodies, soil, feed- and foodstuffs on the basis of sampling.

In addition, the BMK is obliged to operate other warning systems such as early notification systems and decision support systems.

F.6 Decommissioning – Article 26

As stated in Section E.2 above, a decommissioning concept has to be submitted by the applicant for the construction, operation or decommissioning of a facility. This ensures that decommissioning and all associated activities are taken into account at an early stage. Prior to issuing a decommissioning licence, the licensing authority has to approve the final decommissioning plan and examine whether adequate technical and financial resources as well as qualified staff for carrying out the decommissioning activities are available.

NES decommissioned several facilities on its premises in the past decades. The waste management facilities currently in operation are scheduled to operate for the coming decades. For each of these facilities, a decommissioning concept is available and adequate financial provision for decommissioning has been made.

Concerning the TRIGA Mark II research reactor, a decommissioning plan was submitted by the operator. At the moment, decommissioning of the research reactor is not foreseen to commence before 2040. Since all fuel elements used for operating the reactor will be returned to the USA, this concept mainly focuses on the disposal of irradiated reactor components and on the decontamination and remediation of the site.

As during operation of a facility, the regulatory authority carries out inspections during decommissioning of a facility. In case of non-compliance of the licensee with the obligations and requirements stipulated in the decommissioning licence, the authority can take the necessary measure to establish compliance and remedy any shortcomings.

Staff and Financial Resources – Article 26 (i)

Adequate financial resources for the decommissioning of no longer used R&D facilities are guaranteed by the "Decommissioning Agreement", a service contract between the Republic of Austria and NES. The Austrian Government has taken over responsibility for the costs of decommissioning of nuclear facilities (research reactors and waste management facilities) which have been and are operated and owned finally by the Austrian State. For this reason, no special decommissioning fund has been established.

NES has its own department "Decommissioning and decontamination", which has completed the decommissioning of the ASTRA research reactor, among others, and performs decommissioning activities on-site. It therefore employs qualified staff with extensive experience in decommissioning. Also, employees from the department "Radioactive waste management" are educated and have experience in decontamination and decommissioning practices and techniques. Younger personnel is systematically trained and educated to preserve and pass on expertise. NES is provided with adequate financial resources for the recruitment of qualified external staff, if necessary.

In case of the TRIGA Mark II research reactor, the TU Wien and the Federal Real Estate Limited Company ("*Bundesimmobiliengesellschaft, BIG*") as owner of the property and the reactor building have made financial provisions for the future decommission.

Radiation Protection – Article 26 (ii)

The Radiation Protection Act 2020 and the General Radiation Protection Ordinance 2020 apply to the decommissioning of nuclear facilities as well. This legislation covers all aspects of Article 26 (ii). Further aspects and complementary obligations for the licensee are laid down in the individual decommissioning licences.

Emergency Preparedness – Article 26 (iii)

The legal requirements concerning emergency preparedness apply independently of whether a facility is in operation or under decommissioning. These requirements cover all aspects of Article 26 (iii).

Record Keeping – Article 26 (iv)

Records of essential information for decommissioning are kept during the operation. This information allows a more efficient sampling of important materials and components and is very helpful for the determination of the necessary radiation safety measures. After completion of decommissioning, the licensee has to prove to the competent authority that all radioactive material as well as activated components of the facility or buildings have been decontaminated. The records are kept by the competent authority to preserve the information.

G Safety of Spent Fuel Management – Articles 4-10

The TU Wien concluded a supply contract with the US Department of Energy and the Euratom Supply Agency, guaranteeing that all 90 fuel elements currently at the TRIGA Reactor will be accepted for return by the US Department of Energy. This contract was signed in the context of the core conversion in 2012. The fuel at the TRIGA Reactor is under EURATOM and IAEA safeguards inspection.

Pursuant to a memorandum of understanding between the TU Wien and the US Department of Energy signed in 2023, the deadline for return of the above-mentioned fuel elements is extended to 2040 at the latest. The TRIGA Center Atominstitut will obtain another 15 LEU fuel elements, ensuring the continued operation of the research reactor. These additional fuel elements will also be sent to the USA by 2040 at the latest.

The storage facility at the TRIGA Center Atominstitut allows either wet or dry storage depending on the fuel element activity. The total capacity for dry storage is 168 and for wet storage 90 TRIGA standard fuel elements in the reactor tank. Since the core conversion in 2012, no spent fuel elements have been stored, neither in the dry nor in the wet storage.

Typically for TRIGA research reactors worldwide, spent fuel elements are stored right inside the reactor hall and are therefore under the safety and security management of the reactor building. There are several types of storage facilities available at TRIGA research reactors:

- Special designed storage racks inside the reactor tank about 3 meters below the pool water surface
- Racks in a pool adjacent to the reactor shielding block filled with water
- Fuel storage pits embedded in the reactor hall floor, which can be used either for fresh or for spent fuel storage

At the TRIGA research reactor in Vienna, the first and the third mentioned type of storage can be used:

- The storage racks directly in the reactor tank which are suspended along the tank wall about 3 m underwater, which can accommodate up to 90 fuel elements (fresh or spent).
- Six storage pits in the floor of the reactor hall 3 m deep and about 30 cm in diameter, each of which can accommodate up to 28 fuel elements (168 fuel elements in total). These storage pits can either be filled with water for shielding purposes, or in case of fresh fuel elements or low activity spent fuel elements, these pits are filled with ambient air and vertically shielded by a 25 cm thick lead plug.

H Safety of Radioactive Waste Management

H.1 General Safety Requirements – Article 11

The protection of individuals, society and the environment against radiological and other hazards is subject to the Austrian legislation on radiation protection and to the legislation on environmental protection (mainly the Environmental Impact Assessment Act 2000 and associated ordinances). Compliance with the legal requirements regarding radiation protection is enforced by the BMK as the competent authority for waste management facilities and research reactors. Priority to the safety of a practice or facility is given during licensing procedures as well as during regulatory inspections.

During the operation, the protection of the workers is assured by requirements and compliance checks of the competent authority, Austrian Labour Inspectorate ("*Arbeitsinspektorat*") and the Occupational Health Services ("*Arbeitsmedizinische Dienste*").

Civil protection is a competence of the Federal Minister of the Interior, implemented by the Provincial Authorities. Compliance with the legislation on protection of the general public and the environment from non-radiological hazards is verified by the nine Provincial Authorities ("*Bundesländer*").

Criticality and Removal of Heat – Article 11 (i)

Criticality and removal of residual heat are not relevant for the LILW that arises in Austria.

Generation of Radioactive Waste – Article 11 (ii)

Minimisation of radioactive waste is a requirement according to the Radiation Protection Act 2020. As the polluter pay principle is in force, minimisation of radioactive waste is also in the economic interest of each waste producer.

Compliance with the minimisation requirement is verified by the competent authorities during the licensing procedure and during periodic inspections. There has never been any need for a regulatory enforcement action regarding minimisation of radioactive waste.

Interdependencies – Article 11 (iii)

Taking into account interdependencies between the different steps in radioactive waste management is required by the Austrian radioactive waste management policy (see chapter B.3).

Optimisation is required by the Austrian radiation protection legislation at all stages of radioactive waste management, thus interdependencies among the different steps are taken into account in practice. NES continuously performs considerations for optimising the treatment, conditioning and storage of the radioactive waste. The licensing procedures as well as the periodic inspections by the regulatory authority verify whether interdependencies among the different steps in radioactive waste management are adequately taken into account.

Without a final repository operating or at an advanced planning stage, waste acceptance criteria (WAC) are not defined for future disposal of the waste packages currently in interim storage at NES. Therefore, NES performs conditioning of the waste as safe as necessary for long-term interim storage and as flexible as possible in order to respond to future WAC of a disposal facility. In defining the conditioning process, NES takes into account comparable international WAC and general requirements for waste treatment (e.g. minimisation of void volume in waste package, no free liquids, no reactive/organic/burnable material, etc.), as well as WAC of existing or planned disposal facilities in other countries.

Furthermore, Austrian waste producers are responsible to ensure that the waste collected is compatible with the acceptance conditions of NES. The waste acceptance criteria for interim storage defined by NES take into account international experience with respect to waste acceptance criteria of surface disposal facilities. Furthermore, NES is attaching great importance to ensure a high level of flexibility with regard to any future additional conditioning for the disposal of the waste.

Protection of Individuals, Society and the Environment – Article 11 (iv)

The Austrian radiation protection legislation aims at the protection of individuals, society and the environment from the effects of ionising radiation. The applicable dose limits set out therein are in line with the EU Basic Safety Standards Directive and the IAEA Basic Safety Standards. In particular, a dose limit for members of the public of 1 mSv effective dose per year and a dose limit for workers of 20 mSv per year are stipulated.

At the NES site, there is an intensive programme of emission and immission control in operation, which monitors if adequate protection of persons and the environment from ionising radiation is upheld (e.g. emission measurements of off-gas, waste water, etc.; control of surrounding area e.g. soil, air, water, etc. for radioactivity; cf. Section F.4). The results are regularly checked by a technical support organisation. Every year, NES has to send a report of the environmental monitoring programme to the BMK, which is verified as part of the annual inspections.

The protection of the environment against hazards other than radioactivity is the subject of different legal instruments, e.g. the Environmental Impact Assessment Act 2000.

Biological, Chemical and other Hazards – Article 11 (v)

Biological, chemical and other hazards are subject to the environmental protection legislation, which also aims at human health protection, especially with requirements concerning air and water quality. An Environmental Impact Assessment is required prior to the construction and operation of large-scale projects. This assessment is reviewed by the competent environmental protection authorities before the licence is issued. Hazards other than radiation encountered by workers during practices with radioactive substances are covered by the general legislation on safety at working places, enforced by the supervision of the Austrian Labour Inspectorate ("*Arbeitsinspektorat*").

Impacts on Future Generations – Article 11 (vi)

The burdens emanating from present-day nuclear activities shall not be greater than those permitted for the current generation. Several legal requirements stipulated in the Radiation Protection Act 2020 aim to avoid any impact from the application of radioactive substances on future generations. Thus, the legislation requires that after termination of operation, all radiological hazards be removed from a facility licensed under the Radiation Protection Act 2020.

There are currently no disposal facilities for radioactive waste in operation or under construction in Austria. Protection criteria for the post-closure phase of a disposal facility for radioactive waste have yet to be established.

Burdens on Future Generations – Article 11 (vii)

It is Austria's policy to collect, treat, condition and store all radioactive waste to minimise the burden for future generations. The costs of these activities have to be borne by the producers of the waste. Adequate financial means are available and earmarked to support any future disposal strategy. A disposal facility for Austrian LILW would have to be designed in such a way that no further measures are required to ensure long-term safety after closure.

H.2 Existing facilities and past practices – Article 12

Since the beginning of the 1960s, the management of all radioactive waste generated in Austria has been carried out at the Seibersdorf site. This activity is traditionally based on long-term contracts with the Republic of Austria, which means that the waste treatment facilities and the measures to ensure safety had and have to comply with the legal requirements and the respective state of the art. While initially radioactive waste was essentially only collected and sealed in packs, more and more facilities for processing and conditioning were set up and put into operation over time.

At the beginning, a number of storage halls and other related facilities were built at NES, allowing to store different categories of waste (liquid burnable, liquid non-burnable, solid burnable, solid non-burnable, etc.) in specifically designed buildings. In 1965, a concrete trench (separated in three boxes) and a temporary storage box (composed of concrete rings) were added for taking up intermediate level waste. An incineration plant as well as a sealed-off manipulation box for sorting radioactive waste followed in the late 1970s and a high-force compactor was put into operation in the mid-1990s.

A large modernisation project started in 2008 and is now essentially completed. Many treatment und storage facilities at NES were modernised or constructed anew (for example a so-called "New Handling Centre" was constructed, where most of the conditioning equipment was centralised; detailed information see Annex L.1).

Consequently, all outdated waste treatment facilities have been decommissioned and dismantled. In addition, all nuclear research facilities no longer used at the entire area of the "historical Seibersdorf research centre" are actually in the process of being decommissioned under contracts with the Republic of Austria and other relevant organisations.

All existing "historic waste", which concerns around 10.000 200-litre-drums temporarily stored at NES until about 2009, will be reconditioned according to state of the art procedures. This project was started in the year 2016 and is ongoing (see also Annex L.1).

Parallel to the expansion of the processing methods, safety and security precautions and safety features have also been increasingly developed and refined (starting with the installation of a water treatment plant in the 1960s). Extensive efforts have been made during the last decades not only to improve the safe containment of radioactive waste (minimising the risk of releases or spreading of contamination), but also to prevent unauthorised access to the radioactive material.

H.3 Siting of proposed facilities – Article 13

Safety, Impact and Information – Article 13 Para 1

Pursuant to the provisions set out in the Radiation Protection Act 2020, a specific requirement for the granting of a construction licence is that siting for a waste management facility shall comply with internationally recognised safety standards. The General Radiation Protection Ordinance 2020 stipulates that the main objectives of siting, design, construction, commissioning, operation and decommissioning of waste management facilities are to prevent accidents and, in case of an accident, to mitigate the consequences. Therefore, relevant site-related factors likely to affect the safety of such facilities have to be evaluated during the licensing process. The safety report of the licence applicant has to describe and evaluate the safety impact of such facilities on individuals, society and the environment.

The General Radiation Protection Ordinance 2020 stipulates that the licensee of a waste management facility shall provide to its staff and members of the public, in an appropriate manner, information about normal operating conditions and about incidents which cannot be disregarded from a radiation protection point of view. The Hazardous Incidents

Information Ordinance stipulates the information which has to be provided for the potentially affected public by operators of existing facilities licensed according to the radiation protection legislation.

Transboundary consultations with Contracting Parties in the vicinity of a waste management facility that might be affected by that facility are ensured via the instruments of strategic environmental assessment and/or environmental impact assessment. If no such assessment is foreseen, general data relating to the facility is provided in the framework of bilateral exchanges with neighbouring countries of Austria. Furthermore, as a Member State of the European Union, for facilities falling under the provisions of Article 37 of the EURATOM Treaty, before granting a construction licence, Austria has to submit general data for a disposal facility to the European Commission, which in turn will issue an opinion on the likely transboundary implications of the planned facility.

During the reporting period, no siting activities have taken place. The siting procedure for a future disposal facility in Austria will undergo a strategic environmental assessment.

Effects on other Contracting Parties – Article 13 Para 2

Evaluation of potential accident scenarios for existing facilities shows that no effects beyond the Austrian border are to be expected. For a potential future disposal facility, the national legislation would not allow that the possible effects on other Contracting Parties be greater than for Austria itself. The EU Directive on Environmental Impact Assessments and the Espoo Convention are fully transposed into Austrian law. The licensing procedure according to the Environmental Impact Assessment 2000 allows potentially affected countries to have a voice in the procedures. Furthermore, bilateral agreements with neighbouring countries for the exchange of information on nuclear and other installations are in force.

H.4 Construction, safety assessment and operation – Article 14

Limitation of Radiological Impacts – Article 14 (i)

The licensing procedure for the construction of a waste management facility requires the presentation of a preliminary safety report and a preliminary on-site emergency plan. This preliminary safety report must demonstrate which measures are foreseen to limit possible radiological impacts and discharges or uncontrolled releases that could have a negative impact on human life and health and the environment.

Decommissioning – Article 14 (ii)

The Radiation Protection Act 2020 requires a preliminary safety report to be submitted during the procedure for obtaining a construction licence. This preliminary safety report has to contain a decommissioning concept for the waste management facility.

Closure of Disposal Facility – Article 14 (iii)

Currently, there are no disposal facilities at the design stage. However, the construction of such a facility would also require a technical provision for the closure of such a facility. The requirements regarding the decommissioning of facilities apply *mutatis mutandis* to the closure of a disposal facility.

Technologies – Article 14 (iv)

The radiation protection legislation requires that in the design and construction of a waste management facility, only such technologies are employed that are state-of-the-art and in line with internationally recognised safety standards. This requirement also finds consideration during regulatory inspections, for which the BMK takes into account recent developments in science and technology. If required or deemed necessary, facilities and/or equipment of NES are modernised and upgraded to the state of the art.

H.5 Assessment of Safety of Facilities – Article 15

Safety Assessment – Article 15 (i)

According to the Radiation Protection Act 2020, the licence applicant has to submit a preliminary safety report prior to the authorisation of the construction of the facility. This safety report has to outline the radiation risks for the installation itself and its surrounding and has to include facility-specific safety assessments. The competent authoritiy verifies during the licensing procedure whether the assessments carried out by the applicant are adequate to ensure the safety of the facility and comply with the relevant legal obligations.

Furthermore, an environmental impact assessment for large-scale projects is required prior to the construction based upon the Environmental Impact Assessment Act 2000. In transposing the relevant EU legislation, an environmental assessment has to be carried out for facilities dedicated to the disposal of radioactive waste or to the storage of radioactive waste for more than ten years.

Post-Closure Safety Assessment – Article 15 (ii)

There is no disposal facility in operation or planned. However, an environmental assessment of radiological and non-radiological hazards is a requirement according to the Environmental Impact Assessment Act 2000.

Update of Safety Assessment – Article 15 (iii)

The licensing procedures set out in the Radiation Protection Act 2020 require the applicant for an operating licence to submit a safety report, which is an "evolution" of the preliminary safety report that had to be presented when applying for a construction licence. The licence holder must review the safety report at appropriate intervals, update it if necessary and immediately notify to the competent authority any significant changes.

H.6 Operation of Facilities – Article 16

Design and Safety Requirements – Article 16 (i)

The operating licence for a radioactive waste management facility is granted based on a safety report demonstrating inter alia the suitability of the site. In the case of radioactive waste management facilities, the BMK supervises the construction of the facility and makes sure that the facility is constructed in accordance with the requirements set out in the construction licence. The operating licence shall be granted if the licensee has successfully demonstrated compliance with all legal and administrative requirements.

The licensing authority can prescribe further radiation protection measures if there are findings gained during the construction. The operating licence is issued after the trial operation in the frame of the construction licence has demonstrated that the facility fulfils all safety and other requirements.

Defining and Revising Operational Limits and Conditions – Article 16 (ii)

Preliminary operational limits and conditions for a facility are laid down in the preliminary safety report which is part of the necessary documentation for the application of a construction licence. These limits and conditions are checked for their usefulness and suitability in the testing phase (trial operation) of the facility. The experiences gained from the testing phase lead to the final determination of these values and are finally laid down in the operating licence. According to the Radiation Protection Act 2020, any changes of the operational limits and conditions (e.g. due to operational experience) require a permission of the competent licensing authority which has the sole competence to revise these values.

Accordance with Established Procedures – Article 16 (iii)

The requirements and conditions for the operation, maintenance and monitoring of a radioactive waste management facility are specified in the operating licence. The corresponding procedures, as described in the facility operation documents, are reviewed by the BMK. Their adequacy is a condition for the issuance of the operating licence. The BMK supervises the radioactive waste management facilities, carries out inspections and enforces compliance with the requirements, if necessary.

The safety assessment has to be updated by the applicant during each stage of the licensing procedure and when required by the BMK. During operation of the facility, the operator has to review the safety assessments at appropriate intervals, make the necessary amendments and inform the competent authority without undue delay of any changes.

Engineering and Technical Support – Article 16 (iv)

According to the Radiation Protection Act 2020, the fulfilment of requirements regarding the staff and the organisation is a prerequisite for the granting of the operating licence for a radioactive waste management facility. The requirements concerning staff and organisation are outlined in the General Radiation Protection Ordinance 2020. The BMK inspects whether the facility employs the necessary qualified staff and intervenes if it determines that the lack of engineering and technical support may have a negative impact on safety.

Characterisation and Segregation of Radioactive Waste – Article 16 (v)

The General Radiation Protection Ordinance 2020 requires the operator of a waste management facility to characterise the radioactive waste based on its physical, chemical, mechanical, biological and radiological properties. This characterisation has to be documented and taken into account when managing the waste. Prior to handing over the waste to NES, the producer has to comply with the relevant acceptance criteria.

NES defines the acceptance criteria for the delivery of radioactive waste from the producers, which are approved by the BMK. The producers of radioactive waste are obliged to segregate and label the waste according to categories like liquid-combustible, liquid-non-combustible, solid-combustible, solid-non-combustible, biogenic waste or disused sealed radioactive sources. The polluters must also provide information on the radionuclides and their activities.

NES manages radioactive waste according to clearly defined procedures, which have been approved by the BMK during the licensing procedure and which are verified in regular intervals.

Reporting of Incidents – Article 16 (vi)

The operator of a radioactive waste management facility has to report immediately the following incidents to the competent authority, in line with the requirements of the General Radiation Protection Ordinance 2020 and the emergency plan of NES:

- A release of radioactive substances into the environment that goes beyond the approved discharge
- A radiation protection relevant contamination or release of radioactive substances within the facility
- Malfunctions, damage or failures of safety-relevant systems or system parts
- Damage or leakage in safety-relevant pipelines or containers
- Safety-relevant incidents during the treatment of radioactive waste
- Safety-relevant external influences such as earthquakes or floods
- Safety-relevant plant-internal incidents such as fire or plant-internal flooding
- Contamination of persons or incorporations who have required medical attention
- All emergencies and security incidents such as break-in and terrorist attacks
- Possible releases of non-radiological hazardous substances
- Incidents that might alarm the surrounding public like smoke emission from fire

Reporting channels are clearly defined and tested regularly. NES first informs the BMK by telephone about any incident, and then submits a written confirmation outlining the relevant details of the incident. Further reports are required at a later stage regarding the cause, any measures to prevent the reoccurrence of the incident, and on the effectiveness of the implemented measures.

Collection and Analysis of Operating Experience – Article 16 (vii)

The General Radiation Protection Ordinance 2020 requires the operator of a waste management facility to verify the safety of the facility and/or the practices for the management of radioactive waste in appropriate intervals in a systematic and verifiable manner, and to continually improve safety as far as reasonably achievable. The licence holder must keep records that are decisive for assessing the safety of the facility from a radiation protection point of view. The records must also contain the information required for the reconstruction of the causes of events listed in the paragraph above. The competent authority may oblige the licence holder to fulfil additional prescriptions.

Decommissioning Plans and Closure of Disposal Facility – Article 16 (viii)-(ix)

According to the Radiation Protection Act 2020, a decommissioning concept is an integral part of the licence for the operation of a radioactive waste management facility. Detailed specifications for the contents of the decommissioning concept are prescribed in the General Radiation Protection Ordinance 2020. The licence holder must update the decommissioning concept if necessary and, in the event of significant changes, submit it to the competent authority without delay. The BMK checks the decommissioning concept during regular inspections.

At the time of reporting, there are no plans for the closure of a disposal facility, since there is no such facility in operation.

H.7 Institutional measures after closure – Article 17

Keeping Records – Article 17 (i)

In Austria, no disposal facility is in operation. The Austrian legislation does not yet contain specific legal requirements for the record-keeping of the location, design and inventory of a disposal facility.

Institutional Controls – Article 17 (ii)

Specific regulations for the institutional controls after closure of a disposal facility will be decided in due time, as the plans for disposal are still in an early stage. However, the disposal of radioactive waste would have to be implemented in a way so as to not rely on active surveillance and maintenance. The Radiation Protection Act 2020 allocates the corresponding competences to the BMK.

Intervention Measures – Article 17 (iii)

Austria has implemented a national monitoring programme of the radioactivity in the environment. This monitoring is performed by the BMK. The environment of a closed disposal facility will be subject to the environmental radiation monitoring programme. Intervention measures to be taken in the case of increased radiation in the environment are established by the radiation protection legislation. The responsibility for such potential intervention measures after closure would lie with the BMK.

I Transboundary Movement – Article 27

I.1 General Requirements - Article 27 Para 1

The transboundary movement of radioactive waste or spent fuel out of, through or into the federal territory of Austria is subject to the regulations laid down in the Radiation Protection Act 2020 and the Ordinance on the Shipment of Radioactive Waste 2009.

Transportation of fissile material on Austrian territory is generally prohibited unless obligations under international law exist. Fissile material for the purpose of peaceful use is allowed to be transported if not for the production of nuclear power or for disposal.

Authorisation by State of Destination – Article 27 Para 1 (i)

According to the Ordinance on the Shipment of Radioactive Waste 2009, an approval can be granted if all of the following requirements are fulfilled:

- No legal reason for exclusion exists (see I.2),
- no indirect or imminent danger for the human life or health including human descendants from ionising radiation,
- the State of destination and the States of transit (if any) have agreed to the shipment for the stated purposes within the framework of an international agreement or within the applicable European Community or EURATOM Law,
- the exporter has entered into a binding written agreement with the importer of the radioactive waste which stipulates that the exporter shall take back the waste if the shipment cannot be completed according to the relevant legal provisions or the conditions attached to the approval.

Movements through States of Transit – Article 27 Para 1 (ii)

IAEA's Regulations for the Safe Transport of Radioactive Material No. SSR-6 (Rev. 1) are incorporated in the UN Recommendations on the Transport of Dangerous Goods. They become legally binding by the following modal conventions to which Austria is a party:

- The European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)
- The Regulation Concerning the International Carriage of Dangerous Goods by Rail (RID), Annex C to the Convention Concerning the International Carriage by Rail (COTIF)
- The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN)
- The SOLAS Convention with the International Maritime Dangerous Goods (IMDG) Code
- The Convention on International Civil Aviation with its Annex 18 and the ICAO-Technical Instructions for the Safe Transport of Dangerous Goods by Air.

All these regulations are applicable for national and international transport of dangerous goods in Austria, either by themselves or by reference in the Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 or in the Austrian Act on the Transport of Dangerous Goods (GGBG). This Act also establishes the institutional framework for the administration and enforcement of the said regulations.

Requirements for State of Destination – Article 27 Para 1 (iii)

Although NES in principle possesses the technical capacity, by way of a shareholders' decision, NES must not accept radioactive waste (even for treatment) that did not originate in Austria. Therefore, an import of radioactive waste from a foreign country is not possible, since there are no other radioactive waste management facilities in operation in Austria.

Meeting the Requirements for State of Destination – Article 27 Para 1 (iv)

According to § 8 and § 15 of the Ordinance on the Shipment of Radioactive Waste 2009, an authorisation is required for the transboundary movement of radioactive waste from Austria to another state. The conditions are explained in detail therein, as can be seen above in "Article 27 Para 1 (i)", which ensures that the respective requirements of the Convention are fulfilled.

Re-entry in case of non-conformity – Article 27 Para 1 (v)

In case of a shipment of radioactive waste from Austria to a destination outside of the Austrian territory, the Ordinance on the Shipment of Radioactive Waste 2009 explicitly requires a written and legally binding agreement between the holder and the consignee, obliging the holder to take back the radioactive waste in case the shipment procedure cannot be accomplished or the conditions attached to the approval of the shipment are not fulfilled.

The competent national authorities that approved the transit for a shipment may not refuse the reshipment if the initial shipment was approved for treatment or reprocessing purposes and if the reshipment concerns radioactive waste or other products equivalent to the original material after treatment or reprocessing when all relevant legislation is respected. In case of a shipment failure, the national authorities must allow the repatriation of the radioactive waste, if a transboundary movement cannot be completed in conformity with the relevant legislation and the reshipment is undertaken in a safe manner on the same conditions and with the same specifications as stated in the initial application.

I.2 Shipments south of Latitude 60 – Article 27 Para 2

According to § 147 of the Radiation Protection Act 2020, the competent authority has to refuse a licence for shipments

- to a destination south of latitude 60 degrees south or
- to a State Party to the Cotonou ACP-EC Agreement which is not a member of the European Community (except for repatriations after treatment) or
- to a third country, which does not have the technical, legal and administrative capacity to safely dispose the radioactive waste or the spent fuel within the meaning of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

J Disused Sealed Sources – Article 28

J.1 Possession, Remanufacturing and Disposal – Article 28 Para 1

Practices with radioactive sources require a licence. The BMK maintains a database called the Central Source Registry to which holders of radioactive sources have to report and where all relevant information regarding radioactive sources on Austrian territory is kept. Detailed provisions regarding the handling of radioactive sources are given in the General Radiation Protection Ordinance 2020. To ensure that high-activity sealed sources do not arise for disposal in Austria, the licence requirements for practices with such sources stipulate that the applicant provide a return agreement with the manufacturer or the supplier of the source.

In order to minimise radioactive waste, the preferred management option concerning disused sealed sources is the return to the manufacturer. In cases of disused sealed sources where this is not possible, recycling (e.g.: reuse by a third party) is encouraged.

If the sources are delivered to NES, they are typically managed as radioactive waste, and the costs are borne by the waste producers. However, NES also has to examine whether reuse of the sources might be feasible, and if yes, has to seek permission from the regulatory authority. For example, in 2020, 64 ^{60}Co sources with a total activity of 58.8 TBq could be recycled.

The radiation protection legislation includes provisions for the recovery and restoration of regulatory control over orphan sources. The BMK provides information to undertakings, for which the probability of detecting orphan radioactive sources is enhanced, to ensure that proper detection systems and measures to identify orphan sources are implemented. Employees of said undertakings are informed and trained on how to identify radioactive sources and which procedures they have to adhere to. Orphan sources are delivered to NES for conditioning and interim storage. The state takes over the expenses if no waste owner can be identified.

J.2 Re-entry into Territory – Article 28 Para 2

There are no industrial manufacturers of sealed radioactive sources in Austria. As such, no applications for re-entry of disused sealed sources were received by the competent authorities. In principle, the re-entry of disused sealed sources into Austrian territory would be allowed.

The requirements for shipments of radioactive sources are laid down in the Council Regulation (Euratom) No 1493/93 of 8 June 1993 on shipments of radioactive substances between Member States, which is directly applicable for the import and export of radioactive sources. The Radiation Protection Act 2020 regulates shipments of radioactive sources between Austria and third countries with concurring requirements.

K General Efforts to Improve Safety

As shown in the present report, the safety of spent fuel management and the safety of radioactive waste management in Austria complies with the obligations of the Joint Convention. However, Austria strives for continuing improvements of safety.

With respect to the implementation of the national programme, including the decision on the plan for disposal, the following activities are highlighted:

K.1 Establishment of the Austrian Board for Radioactive Waste Management

As described in detail in Section B.3, the Austrian Government established the Austrian Board for Radioactive Waste Management ("Advisory Board") in 2021. The Board's tasks are to provide recommendations and advice to the Government with regards to the disposal of the Austrian radioactive waste. During its first three years, the Austrian Board for Radioactive Waste Management has compiled topics and questions in order to outline the status quo of radioactive waste in Austria and develop a step-by-step roadmap for disposal. During this phase, neither the search for a suitable location of a disposal site nor the decision on a particular type of repository was envisaged.

As of the time of reporting, the work of the Advisory Board has progressed far. The Advisory Board has held ten sessions, commissioned several reports regarding the four key issues identified during this early stage of the national programme – current and future inventory of Austrian radioactive waste to dispose of, evaluation of possible disposal options, concept for public participation and a roadmap for disposal – and developed first recommendations to be submitted to the Government in 2024. It is intended that all results of the work of the Advisory Board be made public.

Any material related to the Advisory Board is available on the website entsorgungsbeirat.gv.at (German/English).

K.2 Modernisation of waste treatment facilities at NES (see also Annex L.1) and ongoing efforts to minimise waste

The modernisation efforts at NES, which were launched in 2008, are now essentially completed. All facilities are in operation or received a licence for active trial operation (New Handling Centre, Incineration Plant). The licences for regular operation of the New Handling Centre and the Incineration Plant are expected to be issued in the coming years.

With the modernisation efforts completed, NES operates all the facilities necessary to treat all the radioactive waste that accrues in Austria from medicine, industry and research as well as from decommissioning activities. There is enough capacity to store radioactive waste produced in Austria for the coming decades. Maintaining the state of the art of the treatment facilities will be on the agenda in the future.

NES achieved another important milestone for waste minimisation when the operating licence for the Soil Sorting Facility was obtained in late 2022. With this facility, contaminated material like soil and building rubble can be measured and sorted depending on the activity. This facility greatly reduces the amount of radioactive waste arising from the ongoing decommissioning projects in Seibersdorf (reduction in volume of up to 95 %).

K.3 Additional conditioning and reconditioning (see also Annex L.1)

Since the 1970s, radioactive waste is collected, treated and stored in Seibersdorf. Together with the modernisation efforts at NES, in 2009, a comprehensive reconditioning project that includes all waste packages which were treated with outdated technology or not conditioned at all was started. This concerns about 10.000 waste drums stored in the interim storage facilities 12/12A.

All old drums with conditioned radioactive waste are moved individually from the interim storage facilities and inspected in the New Handling Centre. The content is removed, treated and put into new 200-litre-drums, which are of flange-type and equipped with a liner made of reinforced plastic on their interior. After drying in a special drum dryer and precise documentation, the drums are relocated into the newly constructed interim storage facility (next to the old building), where they are arranged horizontally on special storage racks. The content of very old drums, which to some extend lack a documentation, is analysed, reconditioned according to the state of the art and filled into new drums.

This additional conditioning and reconditioning of radioactive waste at NES allows for storage periods up to 2045 and beyond and is another successful effort for the minimisation of radioactive waste. Due to the application of state-of-the-art conditioning techniques, a waste reduction of at least 15% in total mass over the whole project lifetime is expected.

During the reporting period, this project progressed as planned. Approximately 2.000 drums (200 litre) were reconditioned during the reporting period. Since the start of the project, more than 4.000 drums (200 litre) have been reconditioned. This project is scheduled to be finished by 2035.

K.4 International review missions

The Federal Government, in particular the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, invited the IAEA to conduct an ARTEMIS mission in Austria from 20 to 30 November 2022. The scope of the review mission included the national policy, the national framework as well as the National Programme for Radioactive Waste Management in Austria. Austria has thus fulfilled its obligations under Article 14(3) of Directive 2011/70/Euratom. The ARTEMIS review team presented Austria with a final report at the end of the mission, containing three recommendations and four suggestions for the improvement of safety of radioactive waste management. The report also highlighted several areas of good performance, such as the inventory-keeping of radioactive waste as well as the operations of waste management facilities and the robust storage facilities at NES. The ARTEMIS review team concluded that Austria meets the internationally applicable IAEA safety standards for the management of radioactive waste and has a well-developed framework for the safe and responsible management of radioactive waste and spent fuel and adequate solutions for its waste streams in place.

However, according to the experts, finding a solution for disposal will be one of the main challenges for the future. The experts provided advice to the Austrian Government and the regulatory authority with respect to the management of spent fuel and radioactive waste. Among others, the experts recommended that the Austrian Government take steps to ensure functional separation of responsibility for regulatory oversight of safety from co-ordination, financial oversight and implementation of the National Programme for Radioactive Waste Management. Further recommendations and suggestions pertained to an implementation plan for disposal and how to provide for public engagement during the decommissioning of waste management facilities.

The mission report is available on the websites of the IAEA and the BMK. Concrete proposals to address the recommendations and suggestions have been developed and are currently under review.

K.5 Openness and transparency

General information regarding radioactive waste management in Austria is available on the websites of the BMK, NES and the Advisory Board. National Reports under the Joint Convention as well as the results of the review are made public on the website of the BMK. This is also the case for the reports and results of international review missions as well as for material resulting from the work of the Advisory Board.

L Annexes

L.1 Nuclear Engineering Seibersdorf GmbH (NES)

The following chapters describe in short the existing radioactive waste management facilities of NES, the only operator of predisposal and interim storage facilities in Austria, as well as selected important projects.

Materials Reception Building

The Materials Reception Building is arranged next to the Waste Water Treatment Facility. The whole material transfer to and from the NES waste management plant (radiation area) is carried out via this building. Hence, one part of the building is reserved as a large air-lock for trucks. The second part of the Materials Reception building is used for entry-checking, pre-classification und buffering of incoming waste. Waste is entered into the digital material flow system, which is explained in the chapter “Documentation” below.

Segregation

Pre-sorting of radioactive waste is required from the waste producers. For specific tasks, such as dismantling of larger equipment, a special room (“sorting box”) equipped with a negative pressure ventilation system is used. This sorting-box was refurbished to improve material flow and radiation protection. Depending on the hazards involved, work is carried out in force-ventilated suits or full-face masks.

Waste Water Treatment Facility

In this facility, waste water from the Seibersdorf site is treated. The four waste water sources include incinerator operations, operation of other waste treatment facilities and laboratories with radioactive material, all other laboratories on site (theoretically inactive waste water), and the IAEA Nuclear Materials Lab (NML) delivering potentially α-contaminated waste water.

Figure 2: Waste water treatment plant Seibersdorf (scheme), © NES

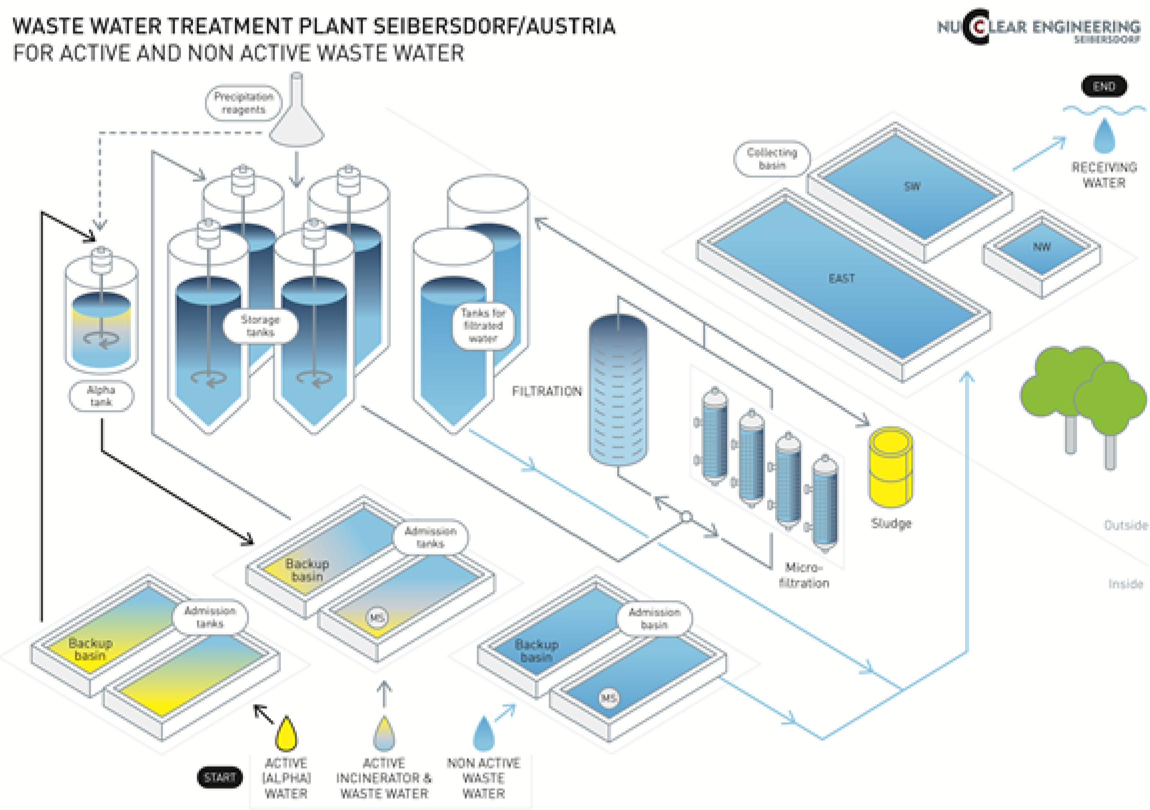


Figure 2 shows a schematic depiction of the facility. As a first step, waste water is delivered via direct pipeline connections from the point of origin into separate admission basins. Then measurements are performed to determine the activity of the waste water. If below regulatory limits, the water is transferred directly into the collecting basin and, after repeated measurements, discharged into the environment. In the opposite case, the water is pumped into the storage tanks and after that decontaminated by precipitation and filtration. Thereby the contaminated waste water is treated by addition of suitable reagents like copper salts and $[Fe(CN)_6]^{4-}$ for Cs^+ precipitation. The active precipitative is separated from the liquid in filtration units. The resulting sludge is further conditioned as described above.

Filtration can be carried out using diaphragm techniques (microfiltration in cross flow mode). This process is able to remove the radionuclides from the waste water omitting the addition of filter aid, thus a large reduction of waste volume is achieved. The microfiltration process yields a concentrate, which is further treated by flocculation and sedimentation, the resulting sludge is dried and conditioned in the supercompactor. The liquid is pumped back into the storage tanks, rechecked for activity, and transferred into the collecting basin.

As an alternative, the filtration can be carried out with a disk filter using a filter aid (diatomaceous material). This process is more robust than the microfiltration but yields a higher quantity of sludge.

New Handling Centre including equipment

The existing Workshop Building was extended to a New Handling Centre (NHC). In this new building, NES concentrated most of its conditioning facilities for radioactive waste. The NHC also provides for state-of-the-art radiation safety according and for an optimised flow of material.

In this building, the following equipment was installed:

- Two Caissons ("sorting/manipulation boxes") made of stainless steel: One caisson is mainly used for the additional conditioning and reconditioning works (as described thereinafter), the second caisson will also be used for additional conditioning and reconditioning works as well as for conditioning and decontamination of bulky materials. Operations within the Caissons are carried out in forced air-ventilated hazmat suits.
- A vertical High-Force-Compactor (1500 t)
- A hot cell (with underground storage) replacing the former Hot Cell Laboratory
- A centre for manipulation of radiation sources
- A drum drying system
- Cementation equipment
- Laboratories (Measurement and quality assurance)

Additional conditioning and reconditioning

The interim-storage time (up to 2045) requires measures to be taken for the conditioned waste in stock from before the new storage concept. All these drums will be taken from the storage facility and inspected. The content will be removed and put into new 200-litre drums, which will be flange-type and equipped with a liner made of reinforced plastic on their interior. After drying and precise documentation for each container, the drums will be put to the new storage facilities, where they will be arranged horizontally (each drum can be inspected individually over the whole time of storage).

Approximately 10.000 (mostly 200 litre) drums will be treated within the project that consists of three phases:

Phase 1 (completed)

This phase consists of the reconditioning of pellet-drums (repackaging, drying, characterisation). About 1500 drums were reconditioned during this phase.

Phase 2 (in progress)

Reconditioning of homogeneously cemented drums. Historically, sludges and ashes have been cemented in 200-litre-drums. These drums will be dismantled, milled and repackaged. During these processes, characterisation is being done as well. The dismantling and milling are carried out in the Caissons using remote-controlled machinery (operated out of the Caisson).

Phase 3 (in progress)

This phase consists of reconditioning inhomogeneously cemented drums. These consist of historic waste that was mostly in 100-litre-drums that have been cemented into 200-litre-drums. These drums are dismantled and are having their concrete lining cut using the same remote-controlled machinery as described for phase 2. Afterwards the inactive concrete is removed and the radioactive waste conditioned again and characterised. Conditioning in this step means that combustible waste is segregated and sent to the incineration plant. Non-combustible waste goes to the supercompactor and will be dried subsequently.

Especially phases 2 and 3 of the reconditioning project will minimise the waste as incineration, supercompaction but also metal melting and clearance are being considered. So far (end of March 2024) 1.500 drums (phase 2) and 1.100 drums (phase 3) have been reconditioned.

Supercompactor

Non-burnable solid radioactive waste can be treated using the supercompactor (see figure 3). In the year 2016, a new 1500 t compactor in vertical design, which is fully remote controlled, started operation.

The supercompactor is situated in a separate room with material- and airlocks. The operator remote controls all movement from a control desk outside the room. Only for service and intervention personnel can access the room in forced air ventilated hazmat suits.

The produced pellets are automatically loaded into 200-litre-drums using a double cover airlock system.

Depending on the waste characteristics, a volume reduction factor of 2 to 10 can be achieved.

Examples of waste being supercompacted are: Demolition waste from decommissioning projects like contaminated soil and rubble, laboratory waste like glass or secondary waste like air filters or dried sludges from the water treatment plant.

Figure 3: Supercompactor with parts of handling system, © NES

Cementation equipment

Cementation (grouting) is a conditioning and immobilisation method, which was commonly used at NES but the importance of which has decreased during recent years. Homogeneous cementation is carried out in-drum by a dedicated in-drum mixer (waste with cement and water).

Interim storage

Conditioned radioactive waste is stored within four dry-engineered construction storage facilities (storage facilities no. 12, 12A, 13, 14 and 15).

In the “old” storage buildings LH12/12A, the drums are tightly packed (see figure 4, left), in the new storage buildings LH13, LH14 and LH15, the drums, which are now labelled with QR codes providing information about the content of each drum (see chapter Documentation below), are stored horizontally on specially designed racks (see figure 4, right). This configuration enables the inspection of each single waste drum at all times. The inspection scheme for drums in this new configuration is as follows: All drums initially entering the interim storage facility are inspected. After this initial inspection, follow-up inspections are carried out, so that each drum is inspected at least every five years. The inspections include a visual control and wipe tests for additional contamination control.

All new buildings are equipped with a thermal insulation and a heating- and dehumidification system in order to reduce the risk of corrosion for the steel drums.

All reconditioned and newly conditioned waste drums are stored in the storage halls no. 13, 14 and 15 in the above-mentioned configuration. After removal of all drums from LH12/12A, this facility will be decommissioned.

As of end of 2023, 12.579 mainly 200-litre-drums containing conditioned radioactive waste, as well as five "*Mosaik*©" containers and five "*Konrad Type II*" containers with radioactive waste from the decommissioning of the former ASTRA reactor were stored in the interim storage (the capacity of LH13, 14 and 15 together is 18.000 drums).

Figure 4: Conditioned waste in interim storage facility 12A (left) and conditioned waste in interim storage facility 13 (right), © NES

Incinerator

The shaft incinerator is an excess air unit having a capacity of about 40 kg per hour and a combustion volume of 1 m in diameter and 5 m in height.

Over the years, a number of modifications to the original design have been carried out in order to improve safety, to keep up the technical standard and to meet requirements of changing regulations. Especially the off-gas cleaning system has been changed considerably compared to the original design.

In 2007 a modern, online-monitoring-system for the exhaust air of the incinerator plant was installed. The system consists of an isokinetic sampling system installed in the stack, an aerosol monitor as well as separate monitors for tritium, carbon-14 and iodine.

This facility was refurbished in the years 2017–2021 to further reduce the risk of contamination-carryover to achieve an improved flow of material and works and to improve (non-radiologic) off-gas characteristics.

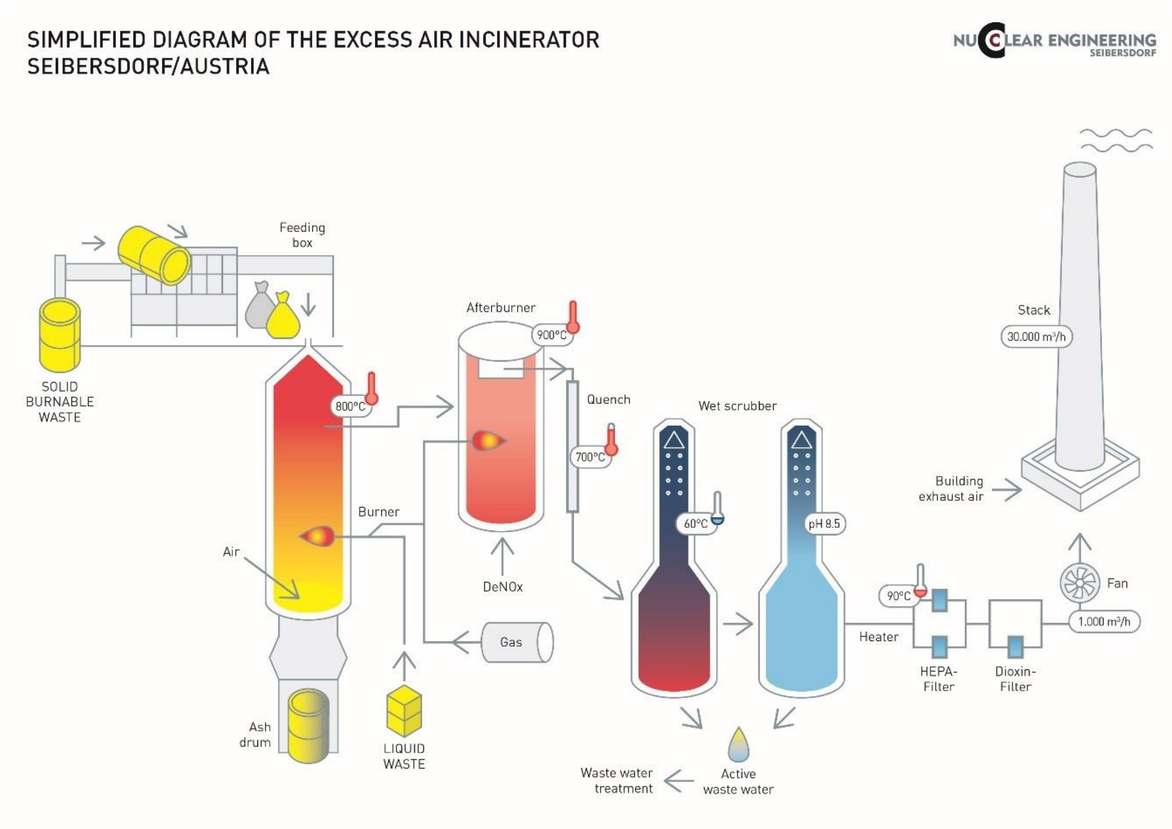
Specifically, to improve the flow of material (waste to be incinerated, bottom and fly ash), the respective components (waste feeding and ash removal system) have been modified to reduce the risk for the operators. Most operations, which were executed manually before, are performed by highly automated mechanical devices. For the remaining operations, glove box and double cover air-lock techniques will be employed. To improve non-radiological off-gas characteristics, an afterburner and an activated carbon in a fixed bed filter were installed.

Layout of the plant (see figure 5)

- The primary combustion chamber is a shaft furnace. Solid waste (in bags of approx. 3 kg) is fed from the top through a lock. A lateral burner fed with LPG (Liquefied Petroleum Gas) is used for heating up the furnace and additionally for the combustion of liquid waste. Ashes are discharged periodically at the bottom. The capacity is approx. 40 kg/h, the temperature is 800°C.
- The gases from the furnace flow to a secondary combustion chamber, additional air is introduced, and an LPG-fired burner rises the temperature to 900°C. Additionally, aqueous urea solution can be added to reduce nitrogen oxides (selective non-catalytic reduction - SNCR).
- This is followed by a quench, where fresh water is injected and the temperature is lowered to 700°C.
- A two-stage scrubber follows: in the first, fresh water is injected to lower the temperature to 60°C (controlled) and to absorb highly acidic gases (e.g. HCl, HF); in the second stage, sodium hydroxide solution is injected to keep the pH-value to 8.5 and to absorb sulfur dioxide. The gases are then reheated to approx. 90°C.
- HEPA-filters remove fine particles (0.1 -0.3 µm) to better than 99.75 %.

- The last stage is a fixed bed filter with active charcoal to remove trace organic contaminants (e.g. “Dioxins”).
- An induced draft fan (IDF) delivers the gases (approx. 1200 Nm³/h) to a mixing chamber, where the outgoing air of the building (approx. 30,000 Nm³/h) is added and finally discharged through the stack.

Figure 5: Simplified diagram of the Excess Air Incinerator, © NES



Operation of the incinerator

Depending on the amount of radioactive waste to be combusted, the incinerator is run in campaigns. It is operated in two shifts a day, i.e. from 6 a.m. until 10 p.m., 5 days a week, with two operators in one shift.

The treatment of the waste results in a volume reduction of about 50:1, comparing raw material to ashes. Operating such a facility creates secondary waste, changing the picture of volume-reduction significantly. Apart from operational waste, HEPA-filters, contaminated parts from maintenance and repairs, a number of replacements have to be included.

Activity throughput of the incinerator

The activity of institutional waste is very low. Due to its characteristics, routine measurements and reported activity values of the raw waste are very inaccurate. So, the activity of waste fed into the incinerator is badly known and cross contamination within the incinerator unit causes an additional problem, i.e. the surfaces of the plant exposed to the off-gas adsorbs radioactive particles from the passing off-gas and simultaneously releases such particles into it. These factors together indicate that activity balancing is very difficult.

96 % of ^{3}H is found in the waste water from the wet scrubber, the rest in the off gases. ^{14}C is emitted with the off gases.

Drum drying system

Before transferring the drums to the interim storage, most conditioned drums of NES are dried to ensure the long-term chemical stability of the content and to minimise the risk of internal corrosion in the drum.

For this purpose, a 32-drum drying system is in operation (see figure 6, left); main technical data are as follows:

- Capacity: Simultaneous drying of up to 32 pcs. 200-litre-drums (drying of containers with other geometry is also possible)
- Drying temperature: Adjustable up to a maximum of 140 °C
- Fully automatic operation (except loading-/unloading-procedures controlled/performed manually)
- Drying performed at slightly negative pressure (kept for radiological reasons)
- Electric heating

Figure 6: Drum drying system for up to 32 drums (left) and in-drum dryer for single drums (right), © NES

An in-drum dryer for single drums under vacuum is used for "special cases" (e.g. solids and sludges containing volatile organics). It consists of a heating chamber, a condensation system, a vacuum pump and an inertisation system (flushing with nitrogen), which is triggered by sudden pressure increase (see figure 6, right).

Vacuum drying allows drying at relatively low temperatures, so it facilitates the fast and effective drying of sensitive products and the oxidation of sensitive products is prevented. Solvents can also be recovered. Vacuum drying is an effective method for drying porous or very high surface area material.

Measuring facilities

Clearance facilities

To minimise waste, NES carries out clearance measurements of slightly radioactive materials like concrete rubble and soil by using either a RADOS-clearance measurement system (see figure 7, left) or a newly developed Soil Sorting Facility. Thus, cleared material can be disposed of as inactive waste as long as the activities measured are below the legally stipulated clearance thresholds.

Figure 7: Low-level measurement facility RADOS system (left) and Soil Sorting Facility (right), © NES

Soil Sorting Facility

NES developed and built a Soil Sorting Facility (see figure 7, right) to process bulk material. It is used to sort and evaluate fine-grained, free-flowing bulk material (grading curve 0-32 mm) such as soil, gravel, broken concrete and building rubble. For this purpose, the material with a defined bulk thickness is placed on a conveyor belt, measured by means of beta and gamma detectors and automatically sorted on the basis of these measured values. The material is fed into the soil sorting facility in 200-litre-drums and discharged again in 200-litre-drums; the throughput is about 1.2 m³ per hour.

The purpose of the facility is to sort the material into uncontaminated or slightly contaminated material and more radioactively contaminated material. At the same time, data is continuously recorded for the drums generated in this way. A data set of radiological measurement data is generated for each drum to enable a subsequent radiological assessment of the individual drums. Ultimately, the aim of the facility is to group as large a proportion of the material as possible into drums containing harmless material and to provide the necessary data for these drums for restricted clearance. The radioactively contaminated material is separated, collected in dedicated drums and managed as radioactive waste.

Waste assay system

Due to the fact that gamma-emitting raw and conditioned radioactive waste shows a high variability both in terms of nuclide composition and physical make-up (raw waste versus the different forms of conditioned waste) and form (i.e. different geometries and drums), a flexible approach is needed together with an assay system that is configurable and uses various assay methods.

The assay system on site therefore supports various methods and can for instance act as an Integral Gamma Scanner (IGS) for homogenous matrix types using a single far-field emission spectrum for the assay, a Segmented Gamma Scanner (SGS) for data acquisition for more heterogeneous matrix types using a number of near-field emission spectra or as a Tomographic Gamma Scanner (TGS) for three-dimensional transmission and emission images, respectively.

Measurement-time constraints also weigh in on which assay methods are used. To allow for a higher throughput. The system also supports automated supervisor functions allowing the drums staged to be assayed automatically according to a preloaded table.

The assay system (figure 8) consists of the following components:

- Collimated, coaxial p-type high purity germanium (HPGe) detector mounted on a vertical detector lift assembly
- Digital Signal Processor (DSP), a reference pulser as well as an acquisition interface board providing a full featured Multi-Channel Analyser
- A highly collimated ^{60}Co transmission source (9.25 GBq nominal activity) with tungsten shutter and lead storage shield atop a vertical lift assembly
- Drum rotator, translation assembly and conveyor system for automated measurement of up to six 200-litre-drums

Figure 8: Waste Assay System in the measuring facility at Seibersdorf, © NES

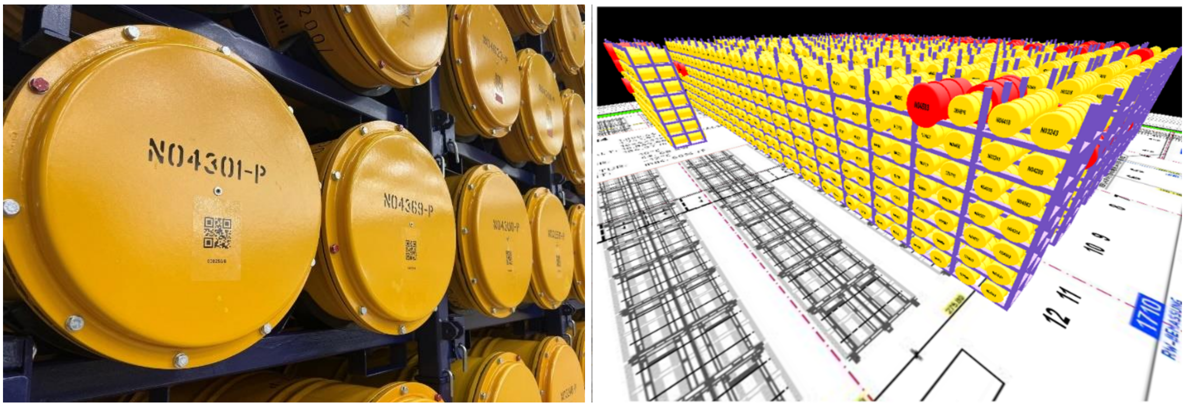
Documentation

Documentation is integral part of all processes and facilities mentioned before and is part of a digital-material flow system at NES that is described in this chapter. All relevant data, beginning with the information of the customers across all levels of processing and conditioning steps to interim storage are stored in a comprehensive database system. This system, called "DOKURAD" (DOCUmentation of RADioactive waste), has been completely newly designed, programmed and optimised in the recent years. The current version of DOKURAD encompasses, inter alia, the following information:

- Basic information about waste items (including such information as waste type, source or origin of the waste),
- Characterisation and measurement data,
- Its current position or storage location (or reference to its successor in case it is no longer a physical item),
- Data from treatment and conditioning,
- Links to files including documents, measurement reports as well as photos.

Part of the optimisation of this in-house database solution is a process management part that is linked to a QR code based system for the material flow of all radioactive waste and containers within the premises of the waste management site at NES. This system was implemented in 2020 and extended to more and more facilities and processes since then.

Figure 9: Conditioned waste in interim storage facility 14 with QR codes (left) and screenshot of the interim storage visualisation of DOKURAD with filtered drums marked red (right), © NES



Besides the QR labeling of storage locations, containers and waste items, the new handheld computers (and QR code readers) are probably the most important enhancement of the implementation of the digital material flow system. It has a custom DOKURAD Android app which allows operators on site to access DOKURAD data from anywhere via WIFI. These devices show waste and container information, as well as routing information of waste packages including planned and completed treatment steps. They also facilitate documentation of waste and container transports on site. For that, the operator simply scans the QR codes of the transported drums, then the QR code of the new location and then commits by pressing a button. The update happens immediately in DOKURAD. Other operations available via the handheld computer are:

- Transfer into a new container
- At the incinerator facility: Booking that the waste has been fed into the facility
- Marking a processing step as completed (for example at the gamma-scanner and incineration facility)
- Inventory checking via the mobile computer

In addition to the mobile app, a suite of purpose-specific desktop apps was developed. These are used at facilities where the documentation task benefits from the use of a larger screen or a proper keyboard. In the case of the reception facility, the computer is also equipped with printers for printing both adhesive and non-adhesive QR labels, which must be attached to incoming waste packages.

Regarding other facilities, the barcode solution for the supercompactor is a special case as the supercompactor has its own internal drum flow system. This has been adapted so that the system could be connected to DOKURAD to be part of the more general digital material flow system. The changes involved extending the facility with its own barcode scanners, such that the operators no longer have to manually enter data on the panels at the ports of the facility to provide information on which drum is being docked. The changes also involved making a modification to the logging framework of the system such that relevant events were also recorded in DOKURAD.

Other facilities integrated into the digital material flow system include the incinerator facility, the 32-drum drying facility, the gamma-scanner, and the caissons where the reconditioning project is mainly taking place. All of them also include displays called “material flow monitors” that allow the operators to see not only items that are currently processed at the respective facility, but also items that are waiting to be fed into the facility, and items that have been already processed.

The last part of the system is made up of backoffice apps which handle tasks such as viewing and editing waste information, viewing inventories, accessing all material flow monitors, process and campaign management, import and analysis of measurement results, container management and administration of rules. A 3D visualisation of the interim storage is also possible (see figure 9 right).

L.2 References to international Regulations and Directives

Council Directive 2013/59/Euratom of 5 December 2013 **laying down basic safety standards for the protection against the dangers from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom**, OJ L 13, 17.1.2014, p. 1.

Council Directive 2011/70/Euratom of 19 July 2011 **establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste**, OJ L 199, 2.8.2011, p. 48.

Council Directive 2006/117/Euratom of 20 November 2006 on the **supervision and control of shipments** of radioactive waste and spent fuel, OJ L 337, 5.12.2006, p. 21.

Council Decision 87/600/Euratom of 14 December 1987 on **Community arrangements for the early exchange of information in the event of a radiological emergency**, OJ L 371, 30.12.1987, p. 76.

Council Regulation (Euratom) No 1493/93 of 8 June 1993 on **shipments of radioactive substances between Member States**, OJ L 148, 19.06.1993, p. 1.

Commission Regulation (EU) No 965/2012 of 5 October 2012 **laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) 216/2008 of the European Parliament and of the Council,** OJ L 296, 25.10.2012, p. 1.

Convention on Early Notification of a Nuclear Accident, INFCIRC/335, of 18 November 1986.

Convention concerning International Carriage by Rail (COTIF), Bern, 9 May 1980, ratified by Austria on 8th March 1983, announced in Federal Law Gazette no. 225/1985 of 11th June 1985.

International Convention for the Safety of Life at Sea (SOLAS), London, 1 November 1974, ratified by Austria on 27th May 1988, announced in Federal Law Gazette no. 435/1988 of 5th August 1988.

Convention on International Civil Aviation, Chicago, 7 December 1944, ratified by Austria on 27th August 1948, announced in Federal Law Gazette no. 97/1949 of 6th May 1949.

European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), Geneva, 30 September 1957, ratified by Austria on 11th August 1973, announced in Federal Law Gazette no. 522/1973 of 7th November 1973.

European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN), Geneva, 26 May 2000, ratified by Austria on 9th November 2004, announced in Federal Law Gazette III no. 67/2008 of 28th May 2008.

L.3 References to national laws, ordinances and other documents

Federal Constitutional Act for a Nonnuclear Austria („*Bundesverfassungsgesetz für ein Atomfreies Österreich*"), Federal Law Gazette I No. 149/1999, 13 August 1999.

Radiation Protection Act 2020 („*Strahlenschutzgesetz 2020 – StrSchG 2020*"), Federal Law Gazette I No. 50/2020, 17 June 2020.

Administrative Penal Act 1991 *(„Verwaltungsstrafgesetz 1991 – VStG"*), Federal Law Gazette No. 52/1991, 31 January 1991, as amended by Federal Law Gazette I No. 88/2023, 20 July 2023.

General Administrative Procedures Act 1991 („*Allgemeines Verwaltungsverfahrensgesetz 1991 - AVG*"), Federal Law Gazette No. 51/1991, 31 January 1991, as amended by Federal Law Gazette I No. 88/2023, 20 July 2023.

Environmental Impact Assessment Act 2000 *(„Umweltverträglichkeitsprüfungsgesetz 2000 – UVP-G 2000"),* Federal Law Gazette No. 697/1993, 14 October 1993, as amended by Federal Law Gazette I No. 26/2023, 22 March 2023.

Administrative Enforcement Act 1991 *(„Verwaltungsvollzugsgesetz 1991 – VVG"*), Federal Law Gazette No. 53/1991, 31 January 1991, as amended by Federal Law Gazette I No. 14/2022, 28 February 2022.

Act on the Transportation of Dangerous Goods („*Bundesgesetz über die Beförderung gefährlicher Güter - Gefahrgutbeförderungsgesetz*"), Federal Law Gazette I No. 145/1998, 20 August 1988, as amended by Federal Law Gazette I No. 104/2019, 29 October 2019.

Medical Radiation Protection Ordinance („*Medizinische Strahlenschutzverordnung - MedStrSchV*"), Federal Law Gazette II No. 375/2017 of 6th February 2018, as amended by Federal Law Gazette II No. 353/2020, 31 July 2020.

General Radiation Protection Ordinance 2020 („*Allgemeine Strahlenschutzverordnung 2020 – AllgStrSchV 2020*"), Federal Law Gazette II No. 339/2020, 29 July 2020.

Ordinance on Interventions in Case of Radiological Emergencies or in Case of Lasting Exposure 2020 („*Interventionsverordnung – IntV 2020*"), Federal Gazette II No. 334/2020, 30 July 2020.

Ordinance on the Shipment of Radioactive Waste 2009 („*Radioaktive Abfälle-Verbringungsverordnung 2009*"), Federal Law Gazette II No. 47/2009, 19 February 2009, as amended by Federal Law Gazette II No. 331/2020, 22 July 2020.

Hazardous Incident Information Ordinance ("*Störfallinformations-Verordnung*"), Federal Law Gazette No. 391/1994, 25 May 1994, as amended by Federal Law Gazette II No. 191/2016, 15 July 2016.

National Programme for the Management of Radioactive Waste ("*Nationales Programm für die Entsorgung radioaktiver Abfälle*"), Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2023 (Link).

Mandate for the Austrian Board for Radioactive Waste Management, Federal Government, 2021 (Link).

L.4 References to reports on international review missions

REPORT OF THE INTEGRATED REGULATORY REVIEW SERVICE (IRRS) MISSION TO AUSTRIA, IAEA-NS-IRRS-2018/04, 2018 (Link).

REPORT OF THE INTEGRATED REVIEW SERVICE FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT, DECOMMISSIONING AND REMEDIATION (ARTEMIS) MISSION TO AUSTRIA, IAEA-NS-ARTEMIS, 2022 (Link).

Table of Tables

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Abbrevations

ACP-EC	Cotonou ACP-EC Agreement which is not a member of the European Community, partnership agreement
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement Concerning the International Carriage of Dangerous Goods by Road
Advisory Board	Austrian Board for Radioactive Waste Management
AIT	Austrian Institute of Technology
ALARA	As low as reasonably achievable (ALARA) principle
ARTEMIS	Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation
BMBWF	Federal Ministry of Education, Science and Research
BMI	Federal Ministry of the Interior
BMK	Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology
BWR	Boiling Water Reactor
Bq	Becquerel
COTIF	Convention Concerning the International Carriage by Rail
DoE	US Department of Energy
EC	European Commission
ECURIE	European community Urgent Radiological Information Exchange system
EIA	Environmental Impact Assessment
EMAS	Eco-Management and Audit Scheme
EPR	emergency preparedness
EU	European Union
EURATOM	European Atomic Energy Community
FAC	Federal Alarming Centre (FAC) in the Federal Ministry of Interior (BMI)
GGBG	Austrian Act on the Transport of Dangerous Goods
HEPA	High-Efficiency Particulate Air/Arrestance
HLW	High level waste

IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiation Protection
INFCIRC	International Atomic Energy Agency Information Circular
IRRS	Integrated Regulatory Review Service (IRRS)
LEU	Low-enriched uranium
LILW-LL	Low and intermediate level waste – Long-lived
LILW-SL	Low And intermediate level waste – Short-lived
NES	Nuclear Engineering Seibersdorf GmbH
NML	IAEA Nuclear Materials Lab
NORM	Naturally Occurring Radioactive Material
NPP	Nuclear Power Plant
RID	International Carriage of Dangerous Goods by Rail
SOLAS	SOLAS (Safety for Life at Sea) Convention with the International Maritime Dangerous Goods (IMDG) Code
TU Wien	Vienna University of Technology
TRIGA	Training, Research, Isotopes, General Atomic
VSLW	Very short lived waste
WAC	Waste Acceptance Criteria

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