RADIOACTIVE WASTE MANAGEMENT PROGRAMMES IN OECD/NEA MEMBER COUNTRIES

AUSTRIA
[2016]

NATIONAL NUCLEAR ENERGY CONTEXT

Austria does not operate any nuclear installations. Only two "nuclear facilities", nuclear installations in the broader sense, are in operation: one research reactor and one central waste processing and interim storage facility. Two other research reactors had been shut down in 1999 and 2004 and were completely decommissioned.

In the 1970s, a nuclear power plant was constructed in Zwentendorf, but as a consequence of the negative vote in a referendum it was never put into operation. All nuclear fuel elements were removed in the late 1980s. Thus, Austria has never operated a nuclear power plant and has no intention to do so in the future. Austria's use of nuclear energy for peaceful purposes has significantly been influenced by the passing of the law prohibiting the use of nuclear fission for energy purposes in 1978 and by passing the Constitutional Law on a Non-Nuclear Austria in 1999. Currently, Austria operates only one research reactor at the Institute of Atomic and Subatomic Physics, which is administered by the Vienna University of Technology.

In October/November 2012, irradiated fuel elements from the research reactor were shipped to the Idaho National Lab and replaced by 77 19.8% enriched standard TRIGA fuel elements. With this new core the TRIGA Reactor Vienna went critical on 27 November 2012. These fuel elements will finally be returned to the USA after 2025. Therefore, spent fuel management in Austria is limited to the interim storage of the spent fuel elements of the TRIGA Reactor which is currently empty.

SOURCES, TYPES AND QUANTITIES OF WASTE

Radioactive waste is defined as radioactive material for which no further use is foreseen. Radioactive material means any substance that contains or is contaminated with one or more radionuclides with an activity or concentration that cannot be neglected, as far as radiation protection is concerned, and unless they are exempt from regulatory control. Exemption and clearance levels are laid down in the General Radiation Protection Ordinance. The nuclide specific values for clearance are derived from the internationally accepted concept of 10 µSv/year additional dose. Clearance measurements have to be certified directly or indirectly by the competent authority.

Effective from 1st January 2004, Nuclear Engineering Seibersdorf GmbH (NES) adopted the Commission Recommendation of 15 September 1999 on a classification system for solid radioactive waste 1999/669/EC, Euratom.

- Transition radioactive waste: Type of radioactive waste (mainly from medical origin) which will decay within the period of temporary storage and may then be suitable for management outside of the regulatory control system subject to compliance with clearance levels. Waste in the transition phase e.g. short-lived decay waste from medical applications containing I-125 is left to decay at the producers' sites or is brought to Seibersdorf for 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 half-life less than or equal to 30 years with a restricted alpha long-lived radionuclide concentration (limitation of long-lived alpha emitting radio-nuclides to 4000 Bq/g in individual waste packages and to an overall average of 400 Bq/g in the total waste volume).
  - Long-lived waste (LILW-LL): Waste with long-lived radionuclides and alpha emitters whose concentration exceeds the limits for short-lived waste.

- 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 for such waste. High level waste does not arise in Austria.

The main sources of LILW in Austria are the use of radioactive material in medicine, industry and research (approx. 15 tons/year) as well as the ongoing decommissioning and dismantling activities of nuclear research facilities (30-110 tons/year). 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, why only a lower part ends in the interim storage as conditioned radioactive waste. The resulting amount of conditioned waste is approx. 250 drums per year.

The following activity inventory and waste volume is present at the Nuclear Engineering Seibersdorf GmbH (NES) interim storage facility (by end of 2013):

- short-lived waste (LILW-SL): ~ 9.95E+15 Bq, approx. 2240 m³
- long-lived waste (LILW-LL): ~ 4.854E+12 Bq, approx. 60 m³

The major amount of solid waste is material from decommissioning and 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 are used for medical applications as radiation sources for high dose treatment. Such sources are few in number but they show high activities. A special category of sources are radium sources, used from around 1900 to about 1960 for medical treatment. They were produced in different qualities and some of them showed a tendency for leakage. Due to the high radiotoxicity of radium, their usage was discontinued and radium was replaced by safer sources as soon as they were available. More than 14 g of radium were conditioned and are stored in the interim storage facility. Naturally Occurring Radioactive Material (NORM) originating from different industrial processes has been treated and conditioned at Nuclear Engineering Seibersdorf GmbH (NES) until 2006. Since 2008, the treatment of residues originating from handling of NORM is regulated by a radiation protection ordinance in compliance with international recommendations and regulations.

By the end of year 2013, 11210 mainly 200-litre-drums containing conditioned radioactive waste are stored in the interim storage facility, as well as five Mosaik© containers and five Konrad Type II containers with decommissioning waste from the ASTRA reactor.

Spent nuclear fuel

There are no spent fuel management facilities in Austria since Austria does not operate nuclear power plants. Spent fuel elements from research reactors are sent back to the USA under the contract No.DE-NA0001641 between the United States Department of Energy, the Vienna University of Technology and EURATOM- ESA.

An interim storage is located at the site of the reactor in the Institute of Atomic and Subatomic Physics, which is administered by the Vienna University of Technology; it is currently empty after the core conversion in October 2012.

RADIOACTIVE WASTE MANAGEMENT POLICIES AND PROGRAMMES

The Austrian Federal Constitutional Law on Non-Nuclear Austria prohibits any kind of handling of nuclear weapons and related facilities (§ 1) as well as the construction and use of facilities for production of energy by nuclear fission (§ 2) on the Austrian territory. In line with Austria's attitude towards nuclear power no facilities for spent nuclear fuel and high-level radioactive waste management are in operation in Austria.

Austria's radioactive waste management policy follows the 'polluter pays' principle. Producers of radioactive waste are legally responsible for the safe management and disposal of the waste they generate. They have to bear the costs of treatment, interim storage and, in addition, contribute to a special, separated fund, which is exclusively dedicated to the future final disposal and administered by Austrian national authorities. This final disposal fee ("Vorsorgeentgelt") comprises the costs for the future transfer to a final repository, for a possible additional treatment required by the final repository waste acceptance criteria, and for long term stewardship of the final repository. This fee is estimated based on fees assessed by several existing repositories abroad. Should the funds prove insufficient to cover the actual costs of final disposal at a later time despite of due state-of-the-art estimation, the Austrian state will provide for the needed sum. Compared to countries producing nuclear power, only very small quantities of various categories of radioactive waste arise in Austria. However, all categories of radioactive waste have to be transported, treated, conditioned, and stored applying the same safety standards and techniques used for larger quantities of waste. To keep the prices for treatment, conditioning and interim storage at an acceptable level the Austrian State provides for the technical infrastructure and state-of-the-art equipment of Nuclear Engineering Seibersdorf GmbH (NES).Since 2009 a comprehensive modernisation project for radioactive waste-management at Nuclear Engineering Seibersdorf is ongoing. There are investments in new buildings, infrastructure and new waste management facilities. The goal of this measure is to upgrade the facilities at NES to a state-of-the-art level. Old drums with conditioned radioactive waste will be reconditioned using modern equipment. The drums with conditioned radioactive waste will be stored in newly constructed interim storage halls with optimized storage conditions. These upgrades enable an extension of the interim storage of the conditioned radioactive waste from 2030 to 2045. In 2013 the Joint Agreement between the Republic of Austria, the Community of Seibersdorf and NES was renewed for this reason until 2045.

According to the Waste Management Directive (Council Directive 2011/70/EURATOM for the responsible and safe management of spent fuel and radioactive waste) Austria has to establish a national program to ensure the timely implementation of all steps of spent fuel and radioactive waste management from generation to disposal. Austria is currently elaborating/drafting such a program and will ensure that the public has the necessary opportunities to participate in the pertinent proceeding.

Regarding the final disposal of the radioactive waste, the Republic of Austria is obliged to remove all conditioned radioactive waste interim stored at the site of NES to a final or long-term repository until the end of 2045 at the latest. The question regarding the location of the final storage is still open. Currently, there are no plans to construct a final repository in Austria in the near future. Austria being a small country without nuclear power plants sees an international co-operation for the disposal of radioactive waste as the most reasonable solution. Therefore Austria is an active participant of the European Repository Development Organisation (ERDO). The goal of ERDO is the implementation of one or more shared regional repositories for radioactive waste in the EU.

Programmes and projects

Radioactive waste management facility

The only radioactive waste management facility existing in Austria is Nuclear Engineering Seibersdorf GmbH (NES). This limited liability company with a controlling majority stake owned by the Austrian Government is located at the Seibersdorf site south of Vienna. NES is responsible for the treatment, conditioning and interim storage of all radioactive waste generated in Austria. The following treatment, conditioning and waste handling facilities are in operation:

- LILW incinerator (40 kg/h)
- Waste water treatment facility (precipitation, filtration)
- Sludge dryer
- Drum drying facility
- Waste assay system
- Hot-cell facility
- Buffer storage facilities for raw radioactive waste
- Interim storage facilities for conditioned radioactive waste.

Most conditioned radioactive waste is stored within two dry engineered construction storage facilities (storage facilities no. 12 and 12A). At present the capacity is limited to 15000 200-litre-drums. Since 2010 a new storage facility (no.13) is in operation. The capacity of storage facility no.13 is approx. 2900 200-litre-drums. This storage facility is equipped with a thermal insulation and a heating- and dehumidification-system in order to reduce the risk of corrosion for the steel drums. An additional storage facility (no. 14) was constructed. The building has the same technical equipment as no.13. It is expected that the facility no.14 will be commissioned in the year 2016. By the end of 2014, 11200 waste packages (mainly 200 – litre drums) were stored in interim storage.

RESEARCH AND DEVELOPMENT

Research

At present, there is no substantial research on radioactive waste management in Austria.

Development

In compliance with the Joint Agreement between the Republic of Austria, Nuclear Engineering Seibersdorf GmbH and the Community of Seibersdorf, long-term interim storage ("transfer-storage") of radioactive waste has to be assured until 2045. This extension of the storage time for the existing (and future) radioactive waste requires

- significant investments in new buildings and machinery
- additional measures for the stored containers with radioactive waste (additional- and re-conditioning)

at Nuclear Engineering Seibersdorf. The main buildings and machinery associated to the new concept are already erected/installed, parts of it are already in operation.

New Manipulation Centre including equipment

The existing Workshop Building was extended to a New Manipulation Centre (NMC). In this new building Nuclear Engineering Seibersdorf concentrated most of its conditioning facilities for radioactive waste. The NMC will also provide for radiation safety according state of the art and for an optimized flow of material.

In the new building the following equipment was installed:

- two Caissons ("sorting/manipulation boxes") made of stainless steel: One caisson will be used for the additional- and re-conditioning works (as described thereinafter), the second caisson will be used for conditioning and decontamination of bulky materials
- a new, vertical High-Force-Compactor (1500 tons)
- a new Hot Cell (with underground storage) to replace the existing Hot Cells at Seibersdorf, which will be de-commissioned
- a centre for manipulation of radiation sources
- drum drying system
- cementation equipment
- laboratories for measurement and quality assurance

Reconstruction of existing Incineration plant

This facility will be refurbished 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.

Additional- and Re-Conditioning

The extended storage time (at least up to 2045) requires measures to be taken for the waste in stock:

- Additional conditioning:
  The drums will be taken from the storage facilities and will be inspected. All drums will be removed and the content will be put to new 200-litre-drums. The new drums will be of flange-type and equipped with a liner made of reinforced plastic on their interior. After drying and preparation of the documentation for each container, the drums will be put back to the storage facilities, where they will be arranged (horizontally) such, that each drum can be inspected individually over the whole time of storing.

- Re-conditioning:
  The content of very old containers, which partly even lack an appropriate documentation, will be conditioned according state of the art before putting the waste into new drums. By conditioning the

very old waste with modern facilities, a reduction of totally approx. 1350 200-litre-drums at Nuclear Engineering Seibersdorf is expected.

Storage concept

A new storage concept for the 200-litre-drums was already implemented in storage facility no.13: All drums are stored horizontally in a way that will enable individual drum inspection during the whole time of storage. When the new storage facility (no.14) will be in operation the existing storage facilities no.12 and 12A will be refurbished in the same way as no. 13 and no.14.

DECOMMISSIONING AND DISMANTLING PROJECTS

Radioactive waste management

Since the year 2012 the decommissioning of an old storage facility for radioactive waste (sources) on the NES site in Seibersdorf is going on. In addition, work has begun for the decommissioning of the old hot-cell laboratory, which should be finished within the next 10 years.

Funding

Two nuclear facilities exist in Austria: a 250 kW TRIGA Mark II research reactor at the Atomic Institute Vienna and the NES waste management facility in Seibersdorf. The financial resources for their decommissioning are guaranteed by the Austrian state. No special decommissioning fund has been established.

TRANSPORT

The import, export and transit of radioactive waste (including spent fuel declared as waste) are subject to an authorization issued under the Ordinance on the Supervision and Control of Shipments of Radioactive Waste and Spent Fuel into, out of or through the Austrian Federal Territory, which implements the Council Directive 2006/117/EURATOM. As a general rule, the import of radioactive waste for final disposal or interim storage is generally prohibited. Any transportation of fissionable material on Austrian territory is prohibited unless under an international agreement. The transport of fissionable material for the purpose of peaceful use is allowed as far as it is not used for the production of nuclear power. The transport of fissionable material arising from the nuclear energy production is also prohibited if the purpose is final disposal.

According to this Ordinance, each crossing of the Austrian border of radioactive waste needs consent or approval by the competent Austrian authority. The Annexes to the Ordinance define, inter alia, the form of the applicable standard documentation and the list of quantities and concentration levels for radioactive waste. The Standard Document according to the Council Directive 2006/117/EURATOM has to be used. In addition, general safety requirements are laid down in the revised Radiation Protection Act (1969) and the General Radiation Protection Ordinance (2006).

COMPETENT AUTHORITIES

The main responsibilities for regulation, licensing and supervision of the radioactive waste management are concentrated in the Federal Ministry of Agriculture, Forestry, Environment and Water Management.

However, also due to the federal structure of Austria, there are additional competencies, that affect this field:

The **Federal Minister of Agriculture, Forestry, Environment and Water Management** is the competent licensing and supervisory authority with respect to radiation protection for the construction and operation of all major nuclear facilities other than for medical use including radioactive waste management facilities.

The **Federal Minister of the Interior** is the competent authority for supervision of nuclear facilities with regard to physical protection and in charge of transport safety measures with regard to the carriage of nuclear materials.

The **Federal Minister of Science, Research and Economy** is the competent authority for the licensing of the construction and operation as well as for the inspection of university-based accelerators and the TRIGA Mark II Reactor.

The **Federal Minister of Justice** is responsible for all legal matters relating to the Nuclear Liability Act.

The **Heads of Governments of the Federal Provinces** are the common radiation protection authorities and responsible for licensing and supervision according to the Radiation Protection Act. They also issue licenses according to the Environmental Impact Assessment Act.

FINANCING

According to the Joint Agreement between the Republic of Austria (represented by the Federal Ministry of Agriculture, Forestry, Environment and Water Management), the Community of Seibersdorf

and NES, the necessary financial resources for the infrastructure and equipment of the Austrian waste management facility are guaranteed by the Austrian State. The ultimate responsibility of the Austrian Federal State for the final disposal of all radioactive waste currently and in future interim stored at NES ensures the availability of sufficient financial resources for the decommissioning of nuclear facilities and the final disposal of radioactive waste.

According to the Radiation Protection Act, the producers of radioactive waste are responsible for its safe management including disposal. They are obliged take care that the radioactive waste is brought into a form suitable for transport, storage and disposal. For this reason, the treatment of radioactive waste is financed according to the polluter-pays-principle by the relevant licence holder, the holder of the waste (especially arising from recycling of scrap), and the authorities detecting and confiscating radioactive material or receiving orphan sources. When the radioactive waste is delivered to NES for treatment and interim storage, a charge ("Vorsorgeentgelt") taking into account a risk premium ("Risikozuschlag") has to be paid. This charge comprises the estimated costs for interim storage, pre-disposal treatment and transport to the final repository as well as for disposal and long term management of the final repository. The final disposal fee is calculated using cost estimates based on costs of existing foreign repositories. However, should the collected funds in spite of the state-of-the art estimations at a later period of time prove to be insufficient to pay for the real costs of final disposal, the Austrian Federation covers the difference. The contributions of the producers are handed over to a special separated fund administered by Austrian national authorities, which is exclusively dedicated for financing the later final disposal in an appropriate repository.

PUBLIC INFORMATION

Further information can be obtained under the addresses given below:

Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft
Abteilung I/7 Strahlenschutz; Untere Donaustraße 11, 1020 Wien, Österreich
Website: http://www.strahlenschutz.gv.at; **E-mail**: strahlenschutz@bmlfuw.gv.at