THE CONTROL OF SAFETY OF RADIOACTIVE WASTE MANAGEMENT AND DECOMMISSIONING IN AUSTRIA

1.1 National framework

1.1.1 National policy

The Austrian Federal Constitutional Law on Nuclear Free 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 should be operated in Austria.

Austria operates one central radioactive waste management and interim storage facility – Nuclear Engineering Seibersdorf GmbH (NES) - for pre-disposal management including treatment, conditioning and interim storage of low- and intermediate level radioactive waste (LILW). High-level radioactive waste (HLW) does not arise in Austria. LILW originating primarily from medicine, research, industry and decommissioning is brought to NES; some short-lived radioactive waste is kept in interim storage at the polluter. There is no final repository for disposal of radioactive waste currently in operation. Up to now no decision has been taken about a geological disposal or a near-surface long-term storage. Austria favours an international or regional cooperation in radioactive waste management.

Austria has signed and ratified the Joint Convention on the Safety of Spent Fuel Management and on Safety of Radioactive Waste Management in 2001. In October 2011 the 4th National Report has been prepared and sent to the IAEA.

1.1.2 Overview of relevant institutions

- NES is the only centralised waste management facility in Austria, where all conditioned low level and intermediate level radioactive waste (LILW) arising in Austria is currently interim stored.

- The Radiation Protection Division of the Federal Minister of Agriculture, Forestry, Environment and Water Management (Bundesminister für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft) is the competent licensing and supervisory authority of the radioactive waste management facility in Seibersdorf.

- The Federal Minister of Economy, Family and Youth (Bundesministerium für Wirtschaft, Familie und Jugend) is the competent authority for energy policy and safeguards.

1.2 Regulatory framework

1.2.1 Regulatory function

The Radiation Protection Division of 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 Economy, Family and Youth is the competent authority for energy policy and safeguards.

1.2.2 Organisation and resources

The Radiation Protection Division of the Federal Minister of Agriculture, Forestry, Environment and Water Management has eleven employees. It is funded by the national budget of the Ministry.

1.3 National implementing organisations

The national implementing organisations are the same as mentioned under 1.2.

2. LEGAL FRAMEWORK

The legislative and regulatory framework comprises the legal areas of radiation protection, installation safety, safeguards and physical protection of nuclear material and nuclear facilities. Since Austria constitutes a Federal State, a number of federal (Bund), regional (Länder) and provincial (Bezirksverwaltungsbehörden) authorities are involved in the regulation of these matters.

The Austrian legislation in Radioactive Waste Management is influenced by international treaties such as EURATOM, IAEA, OECD/NEA and ICRP. Therefore, the Austrian legal framework is in compliance with internationally accepted safety principles as specified in the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

2.1 Primary Legislation and General Regulations

The following regulations constitute the main legislation with regard to radioactive waste management activities in Austria:

The Radiation Protection Act ["Strahlenschutzgesetz", BGBl. No. 227/1969], with major amendments in 2002 and 2004 and a minor amendment in 2006 taking into account recent EU legislation

and the five new Radiation Protection Ordinances contain detailed provisions concerning radiation protection, installation safety and the handling of radioactive waste.

Law Prohibiting the Use of Nuclear Fission for Energy Purposes, **Constitutional Law on a Nuclear-free Austria** ["Bundesverfassungsgesetz für ein atomfreies Österreich", BGBl. I No. 149/1999]: The use of nuclear energy for peaceful purposes in Austria has significantly been influenced by the passing of the Law Prohibiting the Use of Nuclear Fission for Energy Purposes in 1978 and of the Constitutional Law on a Nuclear-free Austria in 1999. The Constitutional Law on a Nuclear-free Austria prohibits the construction and putting into service of installations for the production of energy by means of nuclear fission as well as – with some exemptions – the transport of fissile materials in Austria. Where an international obligation exists, the international obligation would prevail. The use of installations for research and development activities is compatible with the quoted constitutional law.

General Administrative Procedures Act ["Allgemeines Verwaltungsverfahrensgesetz", BGBl. No. 51/1991]: Beyond specific provisions for licensing as referred to in specific laws the General Administrative Procedures Act applies.

Act on Liability for Damage Caused by Radioactivity ["Atomhaftungsgesetz 1999", BGBl. No. 170/1998].

Environmental Impact Assessment Act ["Umweltverträglichkeitsprüfungsgesetz 2000", BGBl. No. 697/1993].

2.2 Regulations concerning specific activities or facilities

The following regulations relate to specific activitites in radioactive waste management:

The **General Radiation Protection Ordinance** ["Allgemeine Strahlenschutzverordnung", BGBl. II No. 191/2006] has been enacted in 2006. This ordinance comprises regulations concerning radioactive waste management.

Ordinance on the Supervision of Radioactive Waste ["Radioaktive Abfälle-Verbringungsverordnung", BGBl. No. 47/2009], implementing Council Directive 2006/117/Euratom on the Supervision and Control of Shipments of Radioactive Waste and Spent Fuel.

Ordinance for Naturally Occurring Radioactive Material ["Natürliche Strahlenquellenverordnung", BGBl. II No. 2/2008]: The Austrian Radiation Protection Legislation defines waste that contains only naturally occurring radioactive materials as radioactive waste provided that the exposure to the general public exceeds legally binding limits in the case of release of this material to the environment or in case of disposal in repositories for non-radioactive waste. If such material is declared waste (i.e. if no further use is foreseen), it is subject to the same requirements as other radioactive waste and is considered to be radioactive waste for the purpose of the convention.

2.3 Guidance on implementation

According to Article 5 of the Radiation Protection Act, the design of installations with higher potential risk needs to be licensed prior to the start of the construction in order to save costs and facilitate the subsequent licensing procedure. According to Article 6, an operating license is granted if the installation has been constructed in compliance with the specified conditions and obligations, if a radiation

protection officer has been appointed and if the regular operation of the installation entails no hazard from ionising radiation. A license further needs safety assessment, final safety analyses and a concept for emergency preparedness. The operator is obliged to have guidelines for operation and radiation protection. A concept for decommissioning and dismantling, a concept for the recycling or reuse of radioactive substances and the management of radioactive waste are obligatory for any installation. The authority establishes specific guidelines and requirements for the facilities.

The operation of all installations licensed under this law is regularly inspected by the licensing authority according to Article 17 in order to assure that the facility keeps the state of the art. In case of endangerment of the human health and life and if the requirements of the license are not observed, the competent authority may prohibit the further operation.

3. WASTE MANAGEMENT STRATEGY AND CURRENT PRACTICE

3.1 Waste classification and quantities

The Austrian radioactive waste classification system is based on the IAEA classification scheme (IAEA Safety Series No 111-G-1.1):

- 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 i.e. short-lived decay waste from medical applications containing 125I is left to decay at the producers' sites, i.e., hospitals, 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 neglectable.

  - Short-lived waste (LILW-SL): This category includes radioactive waste with nuclides half-life of 137Cs and 90Sr (around 30 years) or less, with a limited alpha long-lived radionuclide concentration (4 000 Bq/g in individual waste packages and overall average of 400 Bq/g in the total waste volume).

  - Long-lived waste (LILW-LL): This includes long-lived radionuclides and alpha emitters whose concentration exceeds the limits for short-lived waste.

- High level waste (HLW): HLW does not arise in Austria, since there are neither nuclear power plants nor uranium mines nor other nuclear fuel cycle facilities.

The main sources of LILW in Austria is the use of radioactive material in medicine, industry and research (about 15 tons/year) as well as the ongoing decommissioning and dismantling activities of nuclear research facilities.

The following activity inventory is present at NES interim storage facility (end of 2010):

- total activity of short-lived radioactive waste: ~ 9.9E+15 Bq, approx. 2170 m³

- total activity of long-lived radioactive waste: ~ 4.5E+12 Bq, approx. 60 m³

The major amount of solid waste is combustible waste from the use of radioactive material in medicine. Liquid waste originates mainly from the NES incinerator operations (wet scrubber) and, in the past, from research reactor operations. Only a small fraction of liquid waste originates from medical facilities and universities.

The quantity of low and intermediate level waste resulting from decommissioning the ASTRA research reactor is about 80 tons. Sealed sources such as 60Co, 137Cs, 241Am and others are widely used for industrial purposes. Sources containing 60Co and 137Cs are used for medical applications as radiation sources for high dose treatment. Such sources are few in number but their radioactivity dominates the total activity inventory in the NES interim storage.

The interim storage facility houses approximately 11000 200-litre-drums containing conditioned radioactive waste, as well as two Mosaik© containers and two Konrad Type II containers with radioactive waste from the decommissioning of the ASTRA research reactor.

3.2 Waste management strategy

The aim of treatment and conditioning is to transform the radioactive waste into a chemically stable form and to isolate it safely from the environment. The volume reduction of the waste is also necessary to lower the future cost of interim and long term storage. At the same time procedures have to minimise radioactive waste and monitor the releases of radioactivity in accordance with applicable environmental regulations, i.e. HEPA filtration of gas effluents from the incinerator. A comprehensive program of environmental radiation monitoring is in place to ensure that any unexpected releases of radioactivity can be detected and that the necessary actions can be taken in a timely manner.

A number of treatment and conditioning systems are operated by Nuclear Engineering Seibersdorf. Depending on the type of waste, several treatment techniques are applied:

- Combustible waste is incinerated. In the past, the resulting incinerator ash has homogeneously been cemented. Since 2007 ash is stored in 100-litre-drums which are placed into custom made of stainless steel cartridges. These cartridges are purged with nitrogen, shut by welding and placed into 200-litre-drums. Volume reduction: > 40:1.

- Non-combustible compactable waste is supercompacted; the pellets are loaded into 200-litre-drums made of steel for interim storage, volume reduction: ~4:1.

- Aqueous liquids are treated by neutralisation and evaporation to dryness, usually after mixing with sludge from the waste water treatment plant. The resulting powder is supercompacted; volume reduction: >30:1.

- Filters are super compacted; the pellets are loaded into 200-litre-drums for interim storage.

- Conditioned 200-litre-drums are dried in the 32-drum-dryer to minimize the risk of corrosion effects and chemical reactions inside the drums.

- Graphite blocks formerly used in the ASTRA research reactor core are stored in a Konrad Type II container.

- Higher active waste originating from ASTRA research reactor decommissioning (near core construction material and in core experimental equipment) has been cut into smaller pieces and placed into appropriately shielded Mosaik and Konrad Type II containers.

- Radioactive sealed sources are segregated according to their half life, i.e. 60Co, 137Cs, 241Am. They are enclosed in stainless steel cartridges and/or lead shielding and retrievably stored in 200-litre-drums.

- Radium sources are encapsulated by welding them into stainless steel capsules; they are retrievably stored in lead shielding. Other sources are collected in small steel containers and stored in shielded drums.

- High-activity sources can be handled in the hot cell facility and are stored in storage tubes in one of the hot cell boxes.

Before the conditioned drums are transferred to the interim storage they are characterized regarding radionuclide content with the waste assay system.

3.3 Waste management issues at national level

According to the Joint Agreement between the Republic of Austria, NES and the Community of Seibersdorf, the waste management and interim storage facility is scheduled to be in operation until 2030. From that time on the Austrian Government is responsible for transferring all interim stored waste into an appropriate final disposal facility. Currently, significant investments in new buildings and machinery at NES are made for assuring a waste management at the state of the art and for ensuring an appropriate interim storage of the conditioned waste at NES at least until the year 2030.

Until now no decision has been taken for a final disposal concept. Austria favours an international or regional cooperation in radioactive waste management.

3.4 Financing of Radioactive Waste Management

It is Austria's policy to collect, treat, and condition all radioactive waste for safe interim storage in order to minimise the burden for future generations. Although the problem of final disposal is not yet solved, adequate financial means are being established to support any future final disposal strategy.

According to the Joint Agreement between the Republic of Austria, 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 must take care that the radioactive waste is brought into a form suitable for transport, storage and disposal (conditioning), to store it pending disposal, and eventually to dispose it at their own costs. 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 State covers the difference. The contributions of the producers are transferred to a special separated fund administered by Austrian national authorities, which is exclusively dedicated for financing the later final disposal in an appropriate repository.

4. DECOMMISSIONING

4.1 Status of decommissioning projects

Currently, decommissioning of a hot cell facility at Nuclear Engineering Seibersdorf is the only actual project and is ongoing. In 2006, the decommissioning of two research reactors in Austria was completed according to schedule: the 10 MW ASTRA research reactor at the Austrian Research Centers Seibersdorf and 10 kW Siemens ARGONAUT reactor at the Graz Reactor Institute. The fuel elements have been shipped back to the United States.

4.2 Financing

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 future decommissioning are guaranteed by the Austrian state. No special decommissioning fund has been established.