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Implementation of the Obligations of the

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

Second National Report of Switzerland
in Accordance with Article 32 of the Convention

September 2005

Executive Summary

An entirely new Nuclear Energy Act has come into force in Switzerland on 1 February 2005. It has replaced the former Atomic Act of 1959 and addresses more specifically spent fuel and radioactive waste management. It has also introduced modifications in the licencing procedure and made it compatible with European legislation. The Regulatory Guidelines are currently being revised to conform to the new Act.

In addition to the on-site waste conditioning and storage facilities at the four Swiss nuclear power plants, and besides the fuel ponds in the five nuclear reactor units, Switzerland has two spent fuel management facilities and three radioactive waste management facilities. They comprise different interim storage facilities, waste treatment and conditioning facilities, and a collection centre for radioactive waste from medicine, industry and research. Two research reactors are in the decommissioning stage.

The present report, after considering in detail the requirements laid down in the Convention, concludes that the safety of spent fuel management and radioactive waste management in Switzerland is in compliance with the obligations of the Convention.

Contents

Section A Introduction

Country and State

With a total surface area of 41'285 km² and a population of roughly 7.5 million inhabitants, Switzerland is a small state. Structurally, Switzerland has evolved as a federal State with 26 member states, known as Cantons. Constitutionally delimited competencies and central tasks are given to the federal authorities. An important number of popular rights are guaranteed on a federal level. All other legislative power remains with the cantons, which have thus retained a high degree of autonomy. The municipalities also enjoy considerable rights of self-government.

The Federal Council, composed of seven ministers of equal rank, acts as federal government. The Swiss Parliament consists of two chambers. The National Council represents the population as a whole. Its 200 members are elected for a term of four years. The Council of States has 46 members who represent the Swiss Cantons: 20 Cantons elect two representatives each, regardless of size; the remaining six Cantons elect only one representative each for historical reasons.

The voting population has the constitutional right to sanction changes to the Federal Constitution and has a right of referendum on the level of federal laws: Changes or a new article to the Federal Constitution can be requested by means of a popular initiative signed by at least 100'000 voters. All constitutional changes must be submitted to a popular vote (obligatory referendum). If a minimum of 50'000 voters challenge a proposal for a new federal law, the proposal is put to the vote (facultative referendum). The cantonal constitutions contain similar rules on popular initiatives and referendums as on the federal level.

Background of Nuclear Power in Switzerland

Historically, electricity generated in Switzerland came exclusively from hydro power without any recourse to fossil fuels, the latter not being available as a natural resource in the country. In the mid 1950's, an interest in the relatively new nuclear energy technology was manifested to cover an increasing electricity demand. In accordance with the general policy concerning the production of electricity, the promotion and use of nuclear energy was left to the initiative of the private sector. It was recognized, however, that the implementation of any nuclear programme and project requires a legislative frame to ensure safety and radiation protection, and that such a legislation should be established exclusively at the federal level. Therefore, a corresponding article was introduced into the Federal Constitution and approved by vote of the Swiss population in 1957. Based on this article, the Atomic Act was put into force in 1959.

The Atomic Act attributed to the Federal Council (federal government) the exclusive competence to grant licences for the construction of, operation of and modification to nuclear facilities. Licences were based on a detailed review and assessment of nuclear safety. The supervision of nuclear facilities implied the legal competence to take, at any time, appropriate measures to enforce compliance with the licensing conditions.

During the 1960's, several nuclear power plant (NPP) projects were initiated. Four of them reached the stage of realization, leading to the five currently operating units, commissioned between 1969 and 1984. These five units contribute roughly 40% of the total national electricity production, the rest being essentially covered by hydro power complemented by a small amount from other energy sources.

Due to the increasing opposition to nuclear power during the 1970's, it has not been possible, however, to realize several other nuclear projects for which sites had already been approved. The situation at the end of the 1980's culminated in 1990 in a double decision taken by the Swiss population:

- To accept the further operation of the existing NPPs;
- To impose a ten years stop (moratorium) on granting licences for new NPPs (as well as other nuclear facilities including reprocessing plants, with the exception of facilities for radioactive waste management).

In 2003 two public votes on the prolongation of the above moratorium and on the gradual phase-out of existing NPPs were held, respectively; both propositions were rejected by the Swiss population. Simultaneously, an entirely new Nuclear Energy Act, which provides the legal framework for further operation of existing NPPs and for construction of new NPPs, was passed by the Parliament. The option of holding a public vote on the Nuclear Energy Act was not exercised. The Nuclear Energy Act came into force on 1 February 2005 and replaced the Atomic Act of 1959.

Nuclear Power Plants

There are today four different utilities producing electricity from nuclear energy in five units: Beznau I and II, Mühleberg, Gösgen and Leibstadt.

Switzerland is a small and densely populated country. The number of suitable sites for NPPs is therefore limited. Two sites are situated near the German border, at a distance of 0.5 km (Leibstadt) and of 5 km (Beznau). The two other sites are about 40 km away from the French and 20 km from the German border respectively. The geographical position of all Swiss nuclear facilities is indicated on the map in Figure 1.

Facilities for Nuclear Education, Research and Development

The major part of nuclear research in Switzerland is performed at the Paul Scherrer Institute (PSI). Work is carried out at PSI in the following areas in collaboration with other national and international research institutes and with industry: elementary particle physics, biological sciences (including radiation protection), solid state research and material science, nuclear energy research, non-nuclear energy research and environmental research related to the production of energy, medical research and medical treatment (oncology). These include research related to spent fuel and radioactive waste management.

PSI operates several nuclear facilities: the research reactor PROTEUS, a hot laboratory, and waste management facilities. The former research reactors DIORIT and SAPHIR are in the state of decommissioning.

The former Lucens experimental NPP was decommissioned and dismantled after experiencing a loss of coolant accident in 1969. With the exception of a small nuclear waste storage area, this site was declassified and released for non-nuclear activities in March 1995. In 2003 the nuclear waste from this storage area was transported to the Central Storage Facility (ZZL). The site was completely released from nuclear legislation by the Federal Council in 2004.

Nuclear Waste

Each NPP has facilities for the conditioning and interim storage of radioactive waste resulting from its operation. At the Beznau NPP site, there is an additional facility for the dry storage of spent fuel elements and vitrified high level waste which is not yet operational. At Gösgen NPP site, a separate building for the wet storage of spent fuel elements has been licensed and is in the construction phase.

PSI operates the National Collection Centre for all non-nuclear radioactive waste, *i.e.*, waste coming from medicine, industry and research. It has facilities for the treatment and conditioning of this radioactive waste and operates the Federal Storage Facility (BZL).

In Würenlingen, the Central Storage Facility for radioactive waste (ZZL) has been constructed by the utility-owned company ZWILAG. In addition to storage capacity for spent fuel, vitrified high-level waste and other intermediate and low level radioactive waste, the facility also includes facilities for the conditioning of specific waste streams and the incineration or melting of low level waste. The storage facility started active operation in June 2001. The conditioning facilities have been available for active operation since December 2003. Test campaigns of the plasma incinerator with active waste started in 2004.

The application for the general licence for a repository for low and intermediate level waste at the Wellenberg site in the Canton of Nidwalden was submitted in 1994. The cantonal legislation required a mining concession for the construction of such a repository. The granting of this mining concession was rejected by the citizens of the canton in 1995. A new application for a mining concession relating only to an exploratory drift was submitted in January 2001 and rejected once again at a cantonal referendum in September 2002. Subsequently, the NPP operators abandoned the Wellenberg project. A new site has to be found for such a repository. A site selection process is under development by the federal authorities.

Concerning the disposal of high level and long-lived intermediate level waste, the work still concentrates on the demonstration of the feasibility of such a repository in Switzerland. As a result of a broad selection process, Nagra (on behalf of the NPP operators) chose the host rock Opalinus clay in the north of Canton Zurich for further geological investigations. The results of these investigations form the basis of a feasibility demonstration, which was submitted for review to the federal authorities in December 2002. The technical review by the competent Swiss authorities was concluded in August 2005. A broad public consultation is currently carried out. In 2006 the Federal Council intends to take a decision concerning the feasibility demonstration and the way to proceed with the high level waste programme.

Figure 1: Geographical position of nuclear facilities in Switzerland. Triangles mark NPPs, the square marks spent fuel and radioactive waste management facilities outside NPPs (all at the same site), and the circles the four largest Swiss cities.

Section B Policies and Practices (Article 32 Paragraph 1)

In accordance with the provisions of Article 30, each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:

- ***(i) spent fuel management policy;***
- ***(ii) spent fuel management practices;***
- ***(iii) radioactive waste management policy;***
- ***(iv) radioactive waste management practices;***
- ***(v) criteria used to define and categorize radioactive waste.***

B.1 Spent Fuel Management (Clauses i and ii)

The back-end of the nuclear fuel cycle is not prescribed by the Swiss legislation. The former Atomic Act contained no detailed provisions on spent fuel and radioactive waste management. The new Nuclear Energy Act states a series of conditions which must be fulfilled for an authorization of the export of spent fuel for reprocessing to be granted. The conditions include an international agreement with the country of destination, the existence in that country of an adequate facility corresponding to the international standards and the fact that the country of destination has ratified the Joint Convention. Furthermore, shipment of spent fuel for reprocessing abroad is not allowed for a period of 10 years starting in July 2006. During this period, spent fuel has to be managed as radioactive waste.

The strategy chosen by the NPP operators includes both reprocessing and storage of spent fuel, the latter with a view to later reprocessing or direct disposal. The reprocessing takes place abroad (France and UK). Plutonium and uranium gained from reprocessing is used for fuel fabrication and recycled in Swiss NPPs. The radioactive waste arising from reprocessing is returned to Switzerland. For the interim storage of spent fuel and of radioactive waste returned from reprocessing abroad, a dry storage building at Beznau NPP (ZWIBEZ) and a Central Storage Facility (ZZL) have been built. In addition to that, a building for the wet storage of spent fuel is currently under construction at the Gösgen NPP.

In Switzerland, five power reactors (3 PWR, 2 BWR) at four sites (Beznau, Mühleberg, Gösgen and Leibstadt) are in operation, totalling around 3'200 MWe. A total amount of about 4’400 t of spent fuel is expected, conservatively assuming 60 years operation of each NPP. The contracts between the Swiss NPP operators and the foreign reprocessing companies (COGEMA in France and BNFL in the UK) cover roughly 1'200 t of spent fuel.

By the end of 2004, about 1'120 t of spent fuel had been shipped from the Swiss NPPs to the reprocessing facilities in France and the UK. The Central Storage Facility ZZL started storage operation in the year 2001. By the end of 2004, 12 transport and storage casks containing about 190 t of spent fuel elements from the NPPs had been shipped to and

emplaced in ZZL. Also the transport and storage cask containing the spent fuel of the former research reactor DIORIT at PSI had been transferred to ZZL. This facility has a capacity of 200 transport and storage casks containing either spent fuel elements or vitrified high level waste from reprocessing.

B.2 Radioactive Waste Management (Clauses iii and iv)

According to the legislation on nuclear energy, the producers of radioactive waste are responsible for the safe management and disposal of the waste they generate and have to bear the costs. The responsibility for conditioning and interim storage of radioactive waste from NPPs remains with the NPP operators. The Federal State has taken over the responsibility for the collection, conditioning, storage and disposal of radioactive waste generated by the use of radioisotopes in medicine, industry and research. The producers of this kind of radioactive waste are charged a fee for this service.

The nuclear energy legislation and the corresponding regulations require that the raw waste be conditioned as soon as possible. Organic waste should be incinerated as far as possible. Each conditioning process needs an approval from the regulatory authority prior to its application. Nagra, the organization responsible for radioactive waste disposal, has to assess and attest the suitability for disposal of each type of waste package to be produced.

All radioactive waste is to undergo final disposal in repositories situated in suitable geological formations; near-surface disposal is not allowed. The producers of radioactive waste, *i.e.*, the NPP operators and the Federal State (for the waste from medicine, industry and research) have formed the National Cooperative for the Disposal of Radioactive Waste (Nagra) which is responsible for the disposal of all kinds of radioactive waste.

Two repositories are foreseen, one for mostly short-lived low and intermediate level waste and the other for high level waste (including spent fuel if not reprocessed) and long-lived intermediate level waste. The realization in Switzerland of the repository for low and intermediate level waste is intended as soon as possible. Due to the necessary cooling time prior to disposal, a repository for high level waste is needed only several decades from now. However, the nuclear energy legislation requires the demonstration of the feasibility in Switzerland of safe and permanent disposal of radioactive waste. This demonstration had been conducted many years ago for low and intermediate level waste. It needs to be completed for high level and long-lived intermediate level waste. Disposal of high level waste in the framework of a bilateral or multilateral project is maintained as an option.

Since no repositories are in operation yet, all radioactive waste is currently stored in interim storage facilities. Each NPP has, for its own operational waste, conditioning facilities and interim storage capacity. The radioactive waste from medicine, industry and research is conditioned and stored at the research centre PSI. The total volume of conditioned waste stored at the NPP and at PSI amounted to 4’933 m^3 by the end of 2004.

Combustible low level waste was incinerated at a pilot plant at PSI until the end of 2002. This facility has been shut down and will undergo decommissioning and dismantling. A new facility for the incineration and melting of low level radioactive waste by means of a plasma incinerator has been built at the Central Storage Facility ZZL. Test campaigns with active waste started in 2004. Two operation campaigns of this facility are expected to take place each year.

The radioactive waste returned from reprocessing abroad of Swiss spent fuel is stored at ZZL. By the end of 2004, five transport and storage casks each containing 28 canisters with vitrified high level waste have been taken back from COGEMA and emplaced at ZZL.

The repository for low and intermediate level waste is planned to accommodate about 100'000 m^3 of waste. A large part of this waste volume will arise from the decommissioning of the NPPs and nuclear research facilities. The site of Wellenberg in the Canton of Nidwalden in Central Switzerland was selected in 1993 for the realization of this repository. An application for a general licence was made in 1994. The granting of a mining concession by the Canton was rejected twice by the citizens of the Canton, first in June 1995 for the repository and then in September 2002 for an exploratory drift. As a consequence, the site of Wellenberg had to be abandoned. For the realization of a repository for low and intermediate level waste a new site selection has to be undertaken. For that purpose a site selection procedure providing opportunities of stakeholder participation is currently being developed by the federal authorities.

Concerning the disposal of high level waste (including spent fuel if not reprocessed) and long-lived intermediate level waste, the work is still concentrated on the demonstration of the feasibility of such a repository in Switzerland. The project "Gewähr" submitted in 1985 by Nagra, which was a feasibility study based on a repository in the crystalline basement of Northern Switzerland, did not fully succeed in providing the required demonstration. The Federal Council then ordered that research be continued and extended to sedimentary rocks. As a result of a broad selection process, Nagra chose the Opalinus clay formation in the north of Canton Zurich for further geological investigations. The results from the deep exploratory drilling at Benken and from a 3-D seismic survey in that region, as well as results from the Mont Terri rock laboratory, international projects and other sources (boreholes, surface exposure, tunnels) provided the geological background for the new feasibility demonstration. The project “Opalinus Clay” was submitted to the authorities in December 2002. The technical review by the competent Swiss authorities was concluded in August 2005. A broad public consultation is currently carried out. It is expected that the Federal Council will take a decision on the feasibility demonstration in 2006. At the same time, the Federal Council will define the subsequent steps in view of the disposal of high level and long-lived intermediate level waste.

B.3 Categorization of Radioactive Waste (Clause v)

Material or waste are considered to be radioactive if they fall within the scope of application of the legislation on radiation protection as defined in the Radiological Protection Ordinance. A solid material is considered radioactive if at least one of the following criteria is fulfilled:

- The specific (Bq/kg) and absolute (Bq) activity of the material exceeds the nuclide specific clearance level specified in the Ordinance.
- The surface contamination (Bq/cm^2) of the material exceeds the nuclide specific value specified in the Ordinance.
- The dose rate at a distance of 10 cm from the surface of the material exceeds 0.1 μSv per hour, after deduction of the background.

Similar criteria are defined for liquids and gases.

The clearance level for the activity is derived from the nuclide specific dose factors for ingestion; the intake by ingestion of an activity corresponding to the clearance level would lead to an effective dose of 10 μSv. The surface contamination has to be averaged on a surface of 100 cm^2. The limiting value is derived from consideration of skin exposure and of intake by ingestion and inhalation. The applicable dose factors are tabulated in the Radiological Protection Ordinance and conform to those of the IAEA Standards (IAEA Safety Series No. 115).

Material or waste which is not radioactive according to the criteria described above is either recycled or treated as conventional waste and disposed of in accordance with its waste category.

In Switzerland, the main sources of radioactive waste are the NPPs. The operation of NPPs gives rise to operational waste and to waste from the reprocessing of the spent fuel. Large volumes of waste will eventually arise from the decommissioning and dismantling of the NPPs. Further radioactive waste arises from the use of radionuclides in medicine, industry and research, and from the decommissioning of nuclear research facilities. Switzerland has neither uranium mines nor facilities for enrichment, fuel fabrication or reprocessing.

With the Nuclear Energy Ordinance the following new classification has been introduced:

- High level waste (HAA): Vitrified fission product waste from the reprocessing of spent fuel, or spent fuel if declared as waste.
- Alpha-toxic waste (ATA): Waste with a concentration of alpha-emitters exceeding 20’000 Bq/g of conditioned waste.
- Low and intermediate level waste (SMA): All other radioactive waste.

Section C Scope of Application (Article 3)

C.1 Reprocessing (Paragraph 1)

This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.

The new Nuclear Energy Act states the conditions to be fulfilled for granting an export licence for spent fuel for the purpose of reprocessing (see Section B.1). Reprocessing is therefore considered as part of spent fuel management by Switzerland.

There are, however, no reprocessing facilities in Switzerland. By the end of 2004, 1'120 t of spent fuel had been shipped to the reprocessing plants in France and the UK, but only a small amount of vitrified high level waste had been returned to Switzerland for interim storage at ZZL (Table D.2).

Spent fuel from NPPs is held in storage on site for some years. It is then sent abroad for reprocessing or stored for several decades at the Central Storage Facility (ZZL). Radioactive waste arising from reprocessing of Swiss spent fuel is returned to Switzerland. The Convention applies to the management of radioactive waste from reprocessing returned to Switzerland.

C.2 Waste Containing only Naturally Occurring Radioactive Material (Paragraph 2)

This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.

The Radiological Protection Ordinance defines the conditions under which naturally occurring radioactive material falls under the provisions of the radiation protection legislation. If such material is radioactive waste (*i.e.*, if it is not further used), it is subject to the same requirements as other radioactive waste and is considered to be radioactive waste for the purposes of the Convention. The waste must be delivered to the National Collection Centre at PSI, where it is conditioned and stored for later disposal.

At present there is no such radioactive waste in storage at PSI and no such waste is expected to arise.

C.3 Radioactive Waste within the Defence Programme (Paragraph 3)

This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defence programmes, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.

The Swiss legislation applicable to radioactive waste management contains no exceptions for waste material originating from military applications. Such radioactive waste must be delivered to the National Collection Centre at PSI.

Only a small amount of radioactive waste has come from military applications. It has been conditioned and stored at PSI together with similar material from other sources and is considered to be radioactive waste for the purposes of the Convention.

Section D Inventories and Lists (Article 32 Paragraph 2)

This report shall also include:

(i) a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features;

(ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;

(iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;

(iv) an inventory of radioactive waste that is subject to this Convention that:

(a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;
(b) has been disposed of; or
(c) has resulted from past practices.

This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;

(v) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.

The first part of the present section gives an overview of the waste classes defined in Switzerland and gives their composition in relation to the IAEA definitions as outlined in the IAEA Safety Series No. 111-G-1.1. The second part gives the lists and inventories requested in Article 32 Paragraph 2.

D.1 Waste Register and Waste Classes

Swiss Waste Register (ISRAM)

The conditioning of radioactive waste (including spent fuel if declared waste) requires an approval from the Swiss regulatory body HSK. The requirements on the conditioning process, the waste package type and its documentation are defined broadly in the Nuclear Energy Ordinance and in detail in the Guideline HSK-R-14. The documentation includes a detailed description of the waste package type and its inventory. The Swiss NPPs, the waste management facilities and Nagra have agreed on a common electronic data base, ISRAM, where this information is kept. Further to the description of the waste package types produced after its implementation, the data base has also been augmented to contain the corresponding data on the then pre-existing waste package types. It is also used by the NPPs to keep track of the raw waste in interim storage and by the NPPs and the Central Storage Facility ZZL to keep the data on the spent fuel in storage. Thus ISRAM provides the

waste owners and Nagra with a complete and detailed account of the radioactive waste existing in Switzerland. HSK is informed on the waste inventories in periodical reports.

Waste Classes

With the introduction of the new legislation on nuclear energy, the following classification of radioactive waste has been established:

- High level waste (HAA): Vitrified fission product waste from the reprocessing of spent fuel, or spent fuel if declared as waste.
- Alpha-toxic waste (ATA): Waste with a concentration of alpha-emitters exceeding 20'000 Bq/g of conditioned waste.
- Low and intermediate level waste (SMA): All other radioactive waste.

HAA corresponds to the IAEA class HLW. ATA and SMA roughly correspond to the IAEA classes LILW_LL and LILW_SL, respectively.

For information, and in order to present an overview of all radioactive waste now existing in Switzerland, the types and inventories of waste in storage at the NPPs are reported in Table D.2. All the waste currently in storage at the NPPs is classified as SMA. The radioactive waste originating from medicine, industry and research and stored at PSI is mainly classified SMA. Some SMA waste is also stored at ZZL.

D.2 Facilities and Inventories

D.2.1 Spent Fuel Management Facilities (Clause i)

Besides the spent fuel ponds in the five nuclear power reactor units at the four NPP sites, the following spent fuel management facilities exist in Switzerland:

- **ZZL**: A Central Storage Facility in Würenlingen, owned and operated by the ZWILAG company, itself a subsidiary of the NPP companies. Its storage hall for dry storage of spent fuel and vitrified high level waste can accommodate 200 transport and storage casks. The storage facility started operation in 2001.
- **ZWIBEZ**: An interim storage facility at Beznau NPP. The storage hall for dry storage of spent fuel and vitrifed high level waste can accommodate 48 transport and storage casks. The storage facility has received an operation licence but has not yet been commissioned to begin storage of spent fuel or vitrified high level waste.

The construction of a wet storage facility for spent fuel at Gösgen NPP was licensed in 2004 and has started. This storage pond will have a capacity to accommodate 1'008 spent fuel elements of Gösgen NPP.

D.2.2 Inventory of Spent Fuel in Storage (Clause ii)

As of the end of 2004, the inventories of spent fuel in the storage ponds of the NPP were as follows (number of spent fuel elements):

- Beznau NPP: 485;
- Gösgen NPP: 124;
- Leibstadt NPP: 1'606;
- Mühleberg NPP: 296 (plus 1 fuel rod).

As of the end of 2004, ZZL contained eight transport and storage casks with a total of 720 spent fuel elements of the BWR type and four transport and storage casks with a total of 148 spent fuel elements of the PWR type. A thirteenth transport and storage cask contains 349 fuel elements from the DIORIT research reactor, which previously had been stored in that same cask on the site of PSI.

Further data (masses, activities) concerning spent fuel in storage is given in Table D.1.

Table D.1: Inventories of spent fuel in storage as of 31 December 2004.

Facility	Number of spent fuel elements stored	Total mass (t HM)	Total activity (Bq)
Beznau NPP	485	158.4	$1.3 \cdot 10^{19}$
Gösgen NPP	124	51.0	$4.8 \cdot 10^{18}$
Leibstadt NPP	1606	289.0	$8.5 \cdot 10^{18}$
Mühleberg NPP	296	48.6	$2.9 \cdot 10^{18}$
ZZL	1217	189.8	$2.5 \cdot 10^{18}$

D.2.3 Radioactive Waste Management Facilities (Clause iii)

At present, the following radioactive waste management facilities exist in Switzerland:

- **Nuclear Power Plants**: All four Swiss nuclear power plants have on-site waste treatment and conditioning facilities as well as on-site stores for low and intermediate level operational waste. The principal conditioning technique used is cementation, but the spent ion exchange resins from the operation of the PWRs are also either embedded in polystyrene (Beznau NPP) or bituminized (Gösgen NPP).
- **ZZL**: A Central Storage Facility in Würenlingen, owned and operated by the ZWILAG company. It features a storage hall for dry storage of spent fuel and vitrified high level waste that can accommodate 200 transport and storage casks, a storage building for

intermediate level waste with a capacity of 4'000 m^3 of waste, and a storage hall for low and intermediate level waste with a capacity of 16'500 m^3 of waste. Further, ZZL has facilities for the sorting and decontamination of materials and for the conditioning of waste. It also has a plasma furnace for melting and incineration of low level radioactive waste. The storage facility started active operation in June 2001. The sorting, decontamination and conditioning facilities have been available for active operation since December 2003. Test campaigns of the plasma incinerator with active waste started in 2004.

- **ZWIBEZ**: An interim storage facility at Beznau NPP. It consists of a storage hall for the storage of low level operational waste from Beznau NPP with a capacity of 6'000 m^3 of waste, and a hall for dry storage of spent fuel and vitrifed high level waste that can accommodate 48 transport and storage casks. The storage hall for low level waste was licensed in 1990 and started operation in 1994, whereas the dry storage hall, which was licensed at the same time, will be commissioned to begin storage of spent fuel in the next few years.
- **PSI**: The Paul Scherrer Institute (PSI) operates the National Collection Centre for all non-nuclear radioactive waste, where the waste is sorted and conditioned. In this connection, PSI also operates the Federal Storage Facility (BZL) for this waste, with a capacity of 2'100 m^3 of waste.

D.2.4 Inventory of Radioactive Waste in Storage (Clause iv-a)

The inventories of the waste management facilities listed in Section D.2.3 are reported in Table D.2. This gives a comprehensive overview of the radioactive waste stored in Switzerland. It should be noted that the volumes and total activities of the waste stored at PSI are considerably larger than reported in the First National Report of Switzerland of April 2003. This difference is due in part to recent deliveries of large quantities of tritium containing waste, but also to the correction of earlier accounting errors.

D.2.5 Disposal of Radioactive Waste (Clause iv-b)

There are no radioactive waste disposal facilities in Switzerland. Preparations are under way, however, to identify suitable sites for geologic repositories for the Swiss radioactive waste (see Section B.2).

From 1969 to 1982, approximately 2'300 m^3 of low and intermediate level waste was disposed of by sea dumping in the North Atlantic within the framework of campaigns organized by the OECD Nuclear Energy Agency.

D.2.6 Radioactive Waste from Past Practices (Clause iv-c)

Radioactive waste from industrial facilities (primarily watch industry) that have been closed down in recent years are being transferred to the National Collection Centre at PSI and are

dealt with in the same manner as all the other radioactive wastes from medicine, industry and research that are collected by the Centre.

One experimental nuclear power reactor has been dismantled in Switzerland: This facility, at Lucens in the Canton of Vaud, was shut down in 1969 following an accident after a short period of operation, and was later decommissioned. The site was released from regulatory control in 1995 with the exception of a shed containing approximately 240 t of unconditioned, solid radioactive waste in six containers, which were transported to ZZL for storage and conditioning in 2003. As a consequence the part of the site (with the shed) that had not been released from regulatory control in 1995 was released in 2004.

D.2.7 Nuclear Facilities Being Decommissioned (Clause v)

Two Swiss research reactors are in the state of being decommissioned:

- The DIORIT reactor at PSI. The decommissioning started in 1994 and is in its final phase.
- The SAPHIR reactor at PSI. The decommissioning started in 2002 and is in its final phase.

These facilities are considered as radioactive waste management facilities for the purpose of the Convention. The decommissioning waste is conditioned and temporarily stored on site, pending transfer to the Federal Storage Facility (BZL).

Table D.2: Waste inventories at the radioactive waste management facilities. The data are rounded and refer to the end of 2004. HAA = high level waste; ATA = alpha-toxic waste; SMA = low and intermediate level waste; cond. = conditioned waste; uncond. = unconditioned and partly conditioned waste.

Site name	Waste class	Waste volume (m^3)	Waste mass (t, net)	Total activity (Bq)
Beznau NPP (excluding ZWIBEZ)	SMA, cond. SMA, uncond.	543 34		$5.9 \cdot 10^{14}$ $1.6 \cdot 10^{13}$
Gösgen NPP	SMA, cond. SMA, uncond.	356 21		$1.3 \cdot 10^{14}$ $5.6 \cdot 10^{11}$
Leibstadt NPP	SMA, cond. SMA, uncond.	1429 40		$1.9 \cdot 10^{14}$ $5.4 \cdot 10^{10}$
Mühleberg NPP	SMA, cond. SMA, uncond.	1000 73		$2.3 \cdot 10^{14}$ $9.4 \cdot 10^{11}$
ZZL	HAA SMA, cond. SMA, uncond	 42 314	56	$2.0 \cdot 10^{18}$ $1.8 \cdot 10^{12}$ $6.5 \cdot 10^{12}$
ZWIBEZ	SMA, cond. SMA, uncond.	522 79		$4.0 \cdot 10^{12}$ $5.8 \cdot 10^{10}$
PSI	ATA, cond. ATA, uncond. SMA, cond. SMA, uncond.	35 40 1100 476		$1.0 \cdot 10^{15}$ $1.6 \cdot 10^{14}$ $7.7 \cdot 10^{15}$ $3.7 \cdot 10^{15}$

Section E Legislative and Regulatory System

E.1 Implementing Measures (Article 18)

Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.

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

Conclusion

The Swiss Party complies with the obligations of Article 18.

E.2 Legislative and Regulatory Framework (Article 19)

E.2.1 Overview (Paragraph 1)

Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.

The safety of spent fuel and radioactive waste management is governed by the federal legislation on nuclear energy and on radiation protection. This legislation consists mainly of the following laws and ordinances:

- Nuclear Energy Act (2003, in force since 1 February 2005)
- Radiological Protection Act (1991)
- Nuclear Energy Ordinance (2004, in force since 1 February 2005)
- Radiological Protection Ordinance (1994)
- Ordinance on the Decommissioning Fund (1983)
- Ordinance on the Collection of Radioactive Waste (2002)
- Ordinance on the Waste Management Fund (2000)

The requirements of the legislation are detailed in Regulatory Guidelines issued by the Swiss Federal Nuclear Safety Inspectorate (HSK). A complete list of the Regulatory Guidelines is given in Annex L.2.2.

As demonstrated below, this legislation covers the requirements set forth in Paragraph 2. Thus the obligation under Paragraph 1 of Article 19 of the Convention is met.

E.2.2 Radiation Safety (Paragraph 2 Clause i)

This legislative and regulatory framework shall provide for the establishment of applicable national safety requirements and regulations for radiation safety.

National requirements for radiation safety are established in the legislation on radiological protection (Radiological Protection Act and Radiological Protection Ordinance). This legislation aims at protecting human health and the environment against ionising radiation. It implements the internationally agreed principles of justification of a practice, optimization of radiation exposure and dose limitation. Important requirements regarding spent fuel and radioactive waste management are as follows:

- The generation of radioactive waste must be minimized.
- Radioactive waste generated in Switzerland must in principle be disposed of domestically.
- Import of radioactive waste for disposal in Switzerland is allowed only under an international agreement.
- Material or waste is considered to be radioactive if at least one of the following criteria is fulfilled:
  - the activity exceeds the nuclide specific clearance level set in the ordinance,
  - the surface contamination exceeds the nuclide specific value set in the ordinance,
  - the dose rate at a distance of 10 cm from the surface exceeds 0.1 μSv per hour, after deduction of the background.
- The dose limit for occupational exposure is 20 mSv per year.
- The dose limit for individuals of the population is 1 mSv per year.
- A dose constraint lower than the above limit for individuals of the population must be set for each facility.
- The limits for immissions of radioactivity in the environment include
  - nuclide specific airborne concentrations,
  - nuclide specific concentrations in accessible waters,
  - a maximal dose of 1 mSv per year from direct exposure in working and living places.
- The discharges from facilities must be limited so that the immission limits and the dose constraint are met.
- Radioactive waste arising from medical, industrial and research facilities must be delivered to the National Collection Centre at the research centre PSI which is a nuclear facility governed by the nuclear energy legislation.

These requirements are in line with the internationally agreed standards on radiation protection. More detailed criteria concerning radiation protection are set in Regulatory Guidelines of the regulatory authority HSK.

E.2.3 Licensing System (Paragraph 2 Clause ii)

This legislative and regulatory framework shall provide for a system of licensing of spent fuel and radioactive waste management activities.

The Nuclear Energy Act establishes the need for a series of licences regarding nuclear materials, radioactive waste and nuclear facilities. According to the Nuclear Energy Act, a nuclear facility is any facility intended for the use of nuclear energy, the extraction, production, utilization, processing or storage of nuclear materials, and the management of radioactive waste. Nuclear materials are substances that can be used for obtaining energy via nuclear fission processes. Spent fuel is clearly a nuclear material, as long as it has not been declared as radioactive waste by its owner.

Spent fuel and radioactive waste management activities are generally carried out in nuclear facilities. Radioactive waste management includes conditioning, interim storage and final disposal. The Nuclear Energy Act requires the following licences for nuclear facilities:

- General licence: This is mainly a political decision prior to the realization of a nuclear facility. The main prerequisites for granting a general licence are
  - protection of human health and the environment,
  - no conflict with preservation of natural and cultural heritage and spatial planning,
  - no conflict with international agreements and national security,
  - a conceptual plan for the decommissioning or closure of the facility,
  - evidence of the management of radioactive waste arising from the facility.

  The general licence defines the site, the purpose and the essential features of the planned facility, and the maximum permissible radiation dose to the public from the facility. For storage and disposal facilities, the main features include the nature of fuel or waste to be stored or disposed, the capacity and the approximate layout of the surface and underground constructions.

  The general licence is granted by the Federal Council (federal government) and must be approved by Parliament. The approval is subject to facultative referendum (see Section A).

- Construction licence: The main prerequisites are again protection of human health and the environment and compliance with the obligations stated in the general licence. The construction licence defines the reactor output respectively the capacity of the storage or disposal facility, the main elements of the technical implementation and the basic requirements regarding emergency preparedness. The licensing authority is the Federal Department of Environment, Transport, Energy and Communications (UVEK).

- Operation licence: The main prerequisites for an operation licence are
  - compliance with the obligations of the general and construction licence,
  - protection of human health and the environment,
  - compliance with the nuclear safety and security requirements,
  - fulfilment of the requirements regarding staff, organization, quality assurance and emergency preparedness.

The operation licence defines in particular the limits for the discharge of radioactive substances into the environment and the radiological monitoring of the surroundings. It is granted by UVEK.

- Decommissioning order: This applies to all nuclear facilities except disposal facilities. The order is based on the decommissioning project which has to be submitted by the owner of the facility upon termination of operation. It defines in particular the timetable and the steps of decontamination, dismantling and demolition, and the management of the arising radioactive waste. The authority giving the order is UVEK. After successful and complete decommissioning, UVEK declares that the former nuclear facility is no longer subject to the legislation on nuclear energy.
- Closure order: This applies only to disposal facilities. The order is based on the project for closure which has to be submitted by the owner of the repository. It is given by the Federal Council upon expiry of the monitoring period after termination of emplacement of waste packages. After closure the Federal Council may order further surface monitoring for a limited period of time, after which it will declare that the disposal facility is no longer subject to the nuclear energy legislation.

For a change of purpose of a nuclear facility or for a comprehensive upgrading of a NPP, an amendment to the general licence is required. For significant deviations from a construction or operation licence and decommissioning or closure order, an amendment to the licence or order is needed.

Handling of nuclear materials and radioactive waste outside nuclear facilities also requires a licence. The obligation for a licence applies especially to the domestic transport, the import, export and transit of spent fuel and radioactive waste. The licensing authority for such licences is the Federal Office of Energy (BFE). Specific prerequisites must be met for the granting of a licence for the export of spent fuel for reprocessing purposes. They include in particular an international agreement with the country of destination, the existence in that country of an adequate facility corresponding to the international standards, and the fact that the country of destination has ratified the Joint Convention. Similar prerequisites are fixed for licences to import or export radioactive waste for management purposes (conditioning, storage or disposal).

A speciality of the Swiss legislation on nuclear energy is that geological field investigations in view of the disposal of radioactive waste need a licence. The licence is granted by UVEK. The prerequisites for granting this licence include the aptitude for investigations to provide the necessary basis for subsequent safety assessments of the envisaged repository without affecting the suitability of the site. The licence defines in particular the main aspects of the investigations, including the approximate location and extent of drillings and underground structures.

The licensing process is conducted by BFE and consists in general of the following main steps:

1. Submission of the application with a description of the project and a safety analysis report;

2. Review of the project by the nuclear safety authorities (HSK and KSA) and possibly other concerned authorities;
3. Consultation of federal offices and cantonal governments;
4. Deposition of the licence application documentation for public consultation; individuals, communities and organizations can raise objections against the project;
5. Compilation by BFE of all the material collected, and proposal to UVEK for a decision;
6. Decision by UVEK, generally along with a list of licence obligations. Appeals against this decision may be filed with a board of appeals.

Handling of radioactive material not subject to the Nuclear Energy Act requires a licence according to the radiation protection legislation. For activities in nuclear facilities, use of radioactive tracers for geological investigations in view of disposal, import, export and domestic transport of radioactive material from and to nuclear facilities, HSK is the licensing authority. In all other cases, the Federal Office of Public Health (BAG) is the licensing authority.

E.2.4 Prohibition of Operation without a Licence (Paragraph 2 Clause iii)

This legislative and regulatory framework shall provide for a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a licence.

According to the Nuclear Energy Act, a spent fuel or radioactive waste management facility is a nuclear facility. The Nuclear Energy Act requires a licence for the operation of such a facility. There are no exceptions to this requirement. Violations will be prosecuted and punished with prison or with a fine.

E.2.5 Institutional Control, Regulatory Inspection, Documentation and Reporting (Paragraph 2 Clause iv)

This legislative and regulatory framework shall provide for a system of appropriate institutional control, regulatory inspection and documentation and reporting.

Spent fuel and radioactive waste management may only take place in nuclear facilities. The Federal Council has appointed HSK as supervisory authority as regards nuclear safety and radiation protection in the nuclear facilities, and BFE as the supervisory authority for physical protection and safeguards. As the main part of the regulatory body, HSK coordinates these supervisory activities. HSK also supervises the preparations for the disposal of radioactive waste and the transport of radioactive material from and to nuclear facilities. In addition to HSK, the Swiss Federal Nuclear Safety Commission (KSA) has been established which advises the Federal Council and UVEK on nuclear safety and radiation protection matters.

In its function as a supervisor of the nuclear facilities, HSK has established a comprehensive inspection system (see Section E.3 below).

The nuclear energy legislation requires comprehensive documentation on the construction, modification and operation of nuclear facilities. Detailed specifications on documentation and reporting are set forth in Regulatory Guidelines.

The NPP operators periodically report to the relevant supervisory authorities about the condition and operation of the facility, and notify to them without delay any incidents that may have occurred. The authorities regularly inform the general public on the condition of the nuclear facilities and on any matters pertaining to nuclear material and radioactive waste.

E.2.6 Enforcement (Paragraph 2 Clause v)

This legislative and regulatory framework shall provide for the enforcement of applicable regulations and of the terms of the licences.

HSK is in charge of enforcing the legislation and the regulations applicable to nuclear facilities. It is empowered to take the necessary enforcement measures (see Section E.3 below). Different steps of construction and operation of nuclear facilities require permits of HSK.

E.2.7 Allocation of Responsibilities (Paragraph 2 Clause vi)

This legislative and regulatory framework shall provide for a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.

According to the Nuclear Energy Act the producers of spent fuel and radioactive waste are responsible for its management including disposal. They have to bring the radioactive waste into a form suitable for transport, storage and disposal (conditioning), to store it pending disposal, and eventually to dispose it in a geological repository at their own cost. They also have to manage spent fuel. According to the present legislation, this can be done either by storage pending direct disposal or by reprocessing with subsequent storage and disposal of the radioactive waste arising from reprocessing.

The Federal State assumes responsibility for the collection, conditioning, storage and disposal of radioactive waste generated by the use of radioisotopes in medicine, industry and research. The Federal State has the right to take over the management of radioactive waste from NPPs in case the operators do not meet their duties; this would be at the expense of the concerned NPP operators.

As described under Section E.2.3 above, the authorities empowered to grant the different licences needed for spent fuel and radioactive waste management are clearly defined in the Nuclear Energy Act.

The nuclear safety authorities (in particular HSK) have the responsibility to supervise the nuclear facilities and to enforce the applicable legislation and regulations.

E.2.8 Regulating Radioactive Materials as Radioactive Waste (Paragraph 3)

When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention.

The Radiological Protection Act and the Nuclear Energy Act give the following definition of radioactive waste: "Radioactive waste is radioactive material or radioactively contaminated material that is not further used." This is consistent with the internationally agreed definition. Spent fuel is not considered as waste but rather as recyclable material that is exploited by reprocessing, unless it is declared by its owner to be radioactive waste that has to be disposed of. This policy takes due account of the objectives of the Convention.

Conclusion

The Swiss Party complies with the obligations of Article 19.

E.3 Regulatory Body (Article 20)

E.3.1 Establishment and Designation (Paragraph 1)

Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.

The regulatory body, in general, entrusted with the implementation of the legislative and regulatory framework referred to in Article 19 above, is divided between several organizations:

- The **Federal Council** grants the general licence, which has to be approved by the Parliament and is subject to a facultative referendum. It also issues the closure order for disposal facilities.
- The **Federal Department of Environment, Transport, Energy and Communication** (UVEK) is the licensing authority for the construction and operation licences for nuclear facilities and for geological investigations in view of disposal. It also issues the decommissioning order.
- The **Federal Office of Energy** (BFE) is the licensing authority for other licences according to the Nuclear Energy Act (*e.g.*, transport, trade, import and export of nuclear fuel and radioactive waste). BFE also conducts the licensing process for nuclear facilities. It is the competent authority for supervision of nuclear facilities with regard to physical protection and safeguards.
- The **Swiss Federal Nuclear Safety Inspectorate** (HSK) is the competent authority for supervising nuclear facilities with respect to radiation protection and nuclear safety at all stages of the life cycle. HSK has three main functions: (a) it specifies the

detailed safety requirements in Regulatory Guidelines, (b) reviews licence applications, and (c) supervises the nuclear facilities, the preparations for the disposal of radioactive waste and the transport of radioactive material from and to nuclear facilities. HSK has also certain licensing competences according to the radiation protection legislation (see Section E.2.3).

- The **Federal Office of Public Health** (BAG) is the main licensing authority for the handling of radioactive material that does not fall under the Nuclear Energy Act (see Section E.2.3). It also supervises the handling of radioactive material in medical and research institutions and in other situations where the protection of the general public is the primary concern.
- The **Swiss Accident Insurance Institute** (Suva) supervises industrial practices and other situations where the protection of workers is the primary concern.

In addition to these organizations within the federal administration, the following advisory bodies on spent fuel and radioactive waste management have been established:

- The **Swiss Federal Nuclear Safety Commission** (KSA) comments on licence applications and on fundamental nuclear safety and radiation protection issues.
- The **Interdepartmental Working Group on Radioactive Waste Management** (AGNEB) prepares technical and political documents for governmental decisions on radioactive waste management.
- The **Geological Commission on Nuclear Waste Management** (KNE) advises BFE and HSK on geological aspects of radioactive waste disposal.

HSK is the Swiss regulatory authority in the narrow sense, *i.e.*, the principal supervisory authority. HSK is part of BFE but acts, on the technical level, independently from the rest of BFE and from UVEK. HSK conducts its review of licence applications solely on the basis of nuclear safety criteria, exclusive of any political or economical considerations.

HSK's primary task is to supervise and assess the nuclear safety and radiation protection of the nuclear facilities, including spent fuel and radioactive waste management. HSK performs its supervisory functions by inspections, setting requirements, issuing enforcement orders, and granting execution permits within the terms of issued licences.

A quality management system has been implemented by HSK and certified to ISO 9001:2000 in December 2001. The certificate was renewed in December 2004 based on an audit.

The activities and responsibilities of HSK are laid down in a process oriented management system. The management system is applied to all relevant activities of HSK and supports also its well structured inspection and enforcement policies. It is subject to continuous improvement through self evaluations, internal audits, management reviews, evaluation of performance indicators and routine checks by the certification agency.

HSK currently employs 95 persons and is divided into four divisions:

- Division for Reactor Safety with the following sections:

  - Section for Electrical and Control Engineering
  - Section for Mechanical and Civil Engineering
  - Section for Probabilistic Safety Analysis and Accident Management
  - Section for Reactor, Fuel and Systems Engineering
- Division for Radiation Protection and Emergency Preparedness with the following sectors:
  - Section for Radiation Measurement Technology and Radioecology
  - Section for Human and Organizational Factors
  - Section for Occupational Radiological Protection
  - Section for Accident Consequences and Emergency Preparedness
- Division for Transport and Waste Management Safety with the following sections:
  - Section for Transport and Waste Technology
  - Section for Geological Disposal
- Division for Support, Coordination and Communication with the following sections:
  - Section for Inspection Management
  - Section for Information, Safety Research and International Programs
  - Section for Human Resources and Logistics

HSK's annual budget is in the order of 35.5 million CHF, *i.e.*, about 22.5 million EUR. All expenses of the safety authorities (with the exception of the legal and regulatory framework) adding up to almost 30 million CHF per year, are covered by fees from licence holders.

Nuclear safety and radiation protection research, as far as promoted and endorsed by the regulatory body, is endowed with a budget of 2 million CHF and is covered by public funds. Additional 3.5 million CHF are financed by the operators of the NPPs and by public funds.

The implementation of the legislative and regulatory framework concerning spent fuel and radioactive waste management lies mostly with the Division for Transport and Waste Management Safety. This division comprises 12 persons. They deal with matters concerning the transport of radioactive material, the conditioning, storage and disposal of spent fuel and radioactive waste, as well as the decommissioning of nuclear facilities. They evaluate the proposed methods for conditioning radioactive waste, issue the necessary approvals and execution permits and supervise the operation of the corresponding facilities. They have a leading role in HSK’s review on the safety of facilities for storage and disposal of spent fuel and radioactive waste. They supervise the construction and operation of such facilities. They follow and appraise the geological investigations in preparation of spent fuel and radioactive waste disposal. In their role as the Swiss competent authority, they also issue the package and shipment approval certificates for the transport of radioactive material in Switzerland and supervise such transports to and from nuclear facilities.

In summary, Switzerland has established a regulatory organization entrusted with the implementation of the legislative and regulatory framework related to spent fuel and radioactive waste management. This regulatory organization is provided with the necessary authority, competence and financial and human resources to fulfil its assigned responsibilities.

E.3.2 Independence (Paragraph 2)

Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation.

The owners of spent fuel and radioactive waste in Switzerland are primarily the NPP operators. The Federal State has taken over the responsibility for the collection, conditioning, storage and disposal of radioactive waste from medicine, industry and research. In order to meet their responsibility regarding the disposal of spent fuel and radioactive waste, the NPP operators and the Federal State have established the National Cooperative for the Disposal of Radioactive Waste (Nagra). Nagra is responsible for the disposal of all kinds of radioactive waste, including spent fuel, if declared as waste. The responsibility for conditioning and interim storage of NPP waste remains with the NPP operators.

Both the responsibility for the management of radioactive waste from medicine, industry and research, and the regulatory task reside within the federal government. These two functions, however, belong to different departments (ministries), and the regulatory authorities are granted complete independence in their judgements.

The Nuclear Energy Act clarifies and expands the position, duties and responsibilities of the Inspectorate (HSK) as the supervisory authority for nuclear safety and radiation protection in the field of nuclear energy. HSK is the largest and most important unit within the regulatory organization.

The Nuclear Energy Act explicitly declares that the supervisory authorities are independent of technical directives and formally independent of the licensing authorities. The work to legally establish HSK's fully independent status, and to achieve formal independence from the licensing authorities, has started recently. In the meantime, the implementation of elements of new public management (FLAG) has enabled HSK to make a clear step towards administrative independence.

In conjunction with the implementation of FLAG, HSK has published a four-year business plan and carries the responsibility for a government approved global budget. The FLAG regime became effective in January 2004 and helps HSK to improve its flexibility for budget decisions and recruiting of personnel.

Conclusion

The Swiss Party complies with the obligations of Article 20.

Section F Other General Safety Provisions

F.1 Responsibility of the Licence Holder (Article 21)

F.1.1 Licence Holder (Paragraph 1)

Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.

In Switzerland, spent fuel is managed either by reprocessing or by storage with a view to later reprocessing or direct disposal. Radioactive waste management includes conditioning, storage and disposal in a deep geological repository. All these activities are or will be carried out in nuclear facilities. The Nuclear Energy Act explicitly states in Article 22 that the licence holder is responsible for the safety of the facility and its operation. The specific obligations of the licence holder resulting from this fundamental responsibility are listed in the mentioned article of the Nuclear Energy Act and elaborated in more detail in the Nuclear Energy Ordinance.

As described in Section E.2.7, the responsibility for the safe and permanent management of spent fuel and radioactive waste lies with the producers. The producers of spent fuel and radioactive waste are primarily the NPP operators. Reprocessing of spent fuel is carried out abroad (in France and the UK). Spent fuel is stored at NPPs and at the Central Storage Facility. Conditioning and interim storage of operational waste is carried out at the NPPs. All these facilities are nuclear facilities which are operated according to the corresponding licences and supervised by HSK, the Swiss nuclear regulatory authority.

In order to ensure that the licence holders meet their responsibility, Switzerland has established a regulatory body entrusted with the implementation of the legislative and regulatory framework (see Section E.3). HSK forms the main part of this regulatory body and has been given the necessary authority and competence to fulfil its enforcement functions. The supervision of the nuclear facilities carried out by HSK makes sure that the licence holders fully meet their responsibility and obligations.

The Federal State takes over the responsibility for the collection, conditioning, storage and disposal of radioactive waste generated in medicine, industry and research. According to the Radiological Protection Ordinance, the research centre PSI is the National Collection Centre and is in charge of conditioning and storage of this kind of waste. The National Collection Centre is a nuclear facility subject to the Nuclear Energy Act. PSI holds the licences to operate the nuclear facilities necessary for these activities. The supervision exercised by HSK ensures that PSI meets its responsibility regarding the safety of its radioactive waste management facilities.

All radioactive waste, including spent fuel if not reprocessed and declared as waste, is to undergo final disposal in geological repositories. No such repository is yet in operation. An eventual repository will be a nuclear facility subject to the Nuclear Energy Act. The licence holder will be responsible for the safety and operation of such a repository. With its

supervision, HSK will ensure that this licence holder also will fully meet its responsibility and obligations.

F.1.2 Unlicenced Facilities, Activities and Materials (Paragraph 2)

If there is no such licence holder or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.

In the Nuclear Energy Act, the Federal State has reserved the right to take over the management of radioactive waste from NPPs in case the operators do not meet their duties. This would be at the expense of the concerned NPP operators, and the Federal State would establish a dedicated organization independent of the licensing and supervisory authorities.

The Radiological Protection Ordinance defines the different kinds of non-nuclear radioactive waste that must be delivered to the National Collection Centre at PSI. The Federal Office of Public Health (BAG) regulates the details concerning the treatment and collection of non-nuclear radioactive waste (see also Ordinance on the Collection of Radioactive Waste). This includes cases where no licence holder or other responsible party exist.

Conclusion

The Swiss Party complies with the obligations of Article 21.

F.2 Human and Financial Resources (Article 22)

F.2.1 Qualified Staff (Clause i)

Each Contracting Party shall take the appropriate steps to ensure that qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility.

The Nuclear Energy Act requires qualified senior staff to manage and operate any nuclear facility and to fulfil all legal, regulatory and licence requirements. This is a prerequisite for granting an operation licence for nuclear facilities, including spent fuel and radioactive waste management facilities. The operation licence of the nuclear facility can be withdrawn in case these conditions are not or no longer met. Precise requirements on the organization and operating staff of a nuclear facility are set out in the operation licence and in the technical specifications. Regulatory Guidelines define specific regulatory requirements on the organization (HSK-R-17), the operating staff of NPPs (HSK-R-27), and on the radiation protection staff (HSK-R-37). These requirements also apply to other nuclear facilities (*i.e.*, spent fuel and radioactive waste management facilities) by analogy where appropriate.

The implementation of these legal requirements is ensured in practice a) by review of the projects submitted to licence and by b) supervision of the operation of the nuclear facility.

F.2.2 Adequate Financial Resources (Clause ii)

Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning.

Two funds have been established by law in order to ensure the availability of sufficient financial resources for the decommissioning of nuclear facilities and the final management of spent fuel and radioactive waste. The Ordinance on the Decommissioning Fund for Nuclear Facilities defines the allocation of financial resources for the decommissioning and for the disposal of decommissioning waste. The Ordinance on the Waste Management Fund defines the allocation of financial resources to cover the costs for the final management of spent fuel and radioactive waste from NPP operation. The Waste Management Fund was established to cover the management costs arising after shutdown of the NPPs. Current expenditures related to spent fuel reprocessing and storage of spent fuel and radioactive waste, as well as to research and development, planning, geological investigations and, eventually, construction and operation of disposal facilities, are continuously paid for by the NPP operators.

The two funds are independent legal entities administered by a Management Commission appointed by UVEK. The annual contributions to be paid to the funds by the NPP operators are based on cost estimates, derived from specific decommissioning and disposal projects submitted by the operators and reviewed by the nuclear safety authorities. The projects, cost estimates and annual contributions are updated periodically. By the end of 2004, the balance of the Decommissioning Fund was 1’053 Mio. CHF, that of the Waste Management Fund was 2’092 Mio. CHF.

F.2.3 Financial Provision for Institutional Controls (Clause iii)

Each Contracting Party shall take the appropriate steps to ensure that financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

Regarding the closure of a disposal facility, the Nuclear Energy Act defines the following steps. Upon expiry of the period of underground monitoring following the emplacement of the waste packages, the Federal Council shall order the closure of the repository according to the corresponding project submitted by the owner of the repository. The closure of the repository will only be ordered, if the permanent protection of human health and the environment is ensured. After the repository has been closed in accordance with the applicable regulations, the Federal Council may order further surface monitoring of the environment of the disposal facility for a limited period of time. Upon expiry of this additional monitoring period, the Federal Council will declare that the disposal facility is no longer subject to the nuclear energy legislation. At that time the responsibility for the disposal facility will pass over to the Federal State. The Federal State may decide to continue monitoring of the site; this would be carried out within the framework of the general radiological surveillance of the environment.

The Waste Management Fund mentioned in Section F.2.2 covers the disposal costs up to and including the final closure of the repository and such monitoring after closure as may be ordered by the Federal Council. The continued monitoring, after the disposal facility has been cleared from nuclear regulatory control, will be carried out at costs of the Federal State.

The legislation on radiological protection puts the Federal Office of Public Health (BAG) in charge of monitoring the radioactivity in the environment. This duty includes the monitoring of the environment of past nuclear facilities cleared from regulatory control after decommissioning, and eventually will also include closed disposal facilities. As an example, the former experimental NPP at Lucens, which has been decommissioned and cleared from nuclear regulatory control, is subject to the environmental radiation monitoring programme of BAG.

Conclusion

The Swiss Party complies with the obligations of Article 22.

F.3 Quality Assurance (Article 23)

Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programmes concerning the safety of spent fuel and radioactive waste management are established and implemented.

The new Nuclear Energy Act (in force since 1 February 2005) together with the Nuclear Energy Ordinance require the implementation of appropriate quality management (QM) systems for the construction and operation of nuclear facilities, including storage and disposal facilities for spent fuel and radioactive waste. The QM systems must be developed according to an internationally agreed standard (*e.g.*, IAEA Safety Series No. 50-C/SG-Q or ISO 9001:2000) and be reviewed periodically by an independent body. All Swiss nuclear facilities involved in spent fuel and radioactive waste management have established and implemented certified QM systems based on the international industrial standard ISO 9001:2000. Significant changes in the QM systems of the responsible organization must be reported to HSK.

HSK reviews and checks the completeness and the proper function of the QM systems of spent fuel and radioactive waste management facilities according to an international nuclear standard (*e.g.*, IAEA Safety Series No. 50-C/SG-Q). By means of inspections and audits HSK ensures that the QM systems are effectively implemented.

Conclusion

The Swiss Party complies with the obligations of Article 23.

F.4 Operational Radiation Protection (Article 24)

The Radiological Protection Act and the Radiological Protection Ordinance form the legal basis for the operational radiation protection in Switzerland. This legislation aims at protecting human health and the environment against ionising radiation and is based on the recommendations of the International Commission on Radiological Protection (ICRP). It implements the internationally agreed principles of justification of a practice, optimization of radiation exposure and dose limitation. More detailed requirements are defined in further Ordinances and in HSK Guidelines, and specific obligations are stated in the operation licences granted to each nuclear facility operator.

F.4.1 Radiation Exposure (Paragraph 1 Clause i)

Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account.

The Swiss radiation protection legislation requires optimization as a fundamental principle for limiting the radiation exposure of the workers and the public. In order to satisfy this rule, Guideline HSK-R-11 requires that every licence holder of a nuclear facility (including storage and disposal facilities) must establish a QM system for operational radiation protection. The QM system must include the optimization process as an integrated part of the radiation protection planning.

It is the responsibility of the operator to define optimization as part of the QM system for operational radiation protection. Most of the facilities have a system to control and implement optimization. Depending on the level of estimated collective dose, a dose relevant job has to be controlled by a radiation protection officer, by the head of the health physics division or by an ALARA team consisting of engineers and radiation protection personnel. Every project leading to an estimated collective dose above 50 man-mSv has to be declared to HSK in advance. HSK supervises the implementation of optimization measures in the nuclear facility.

F.4.2 Radiation Doses (Paragraph 1 Clause ii)

Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.

The Radiological Protection Ordinance sets the dose limit for individuals of the population to 1 mSv per year and that for occupational exposure to 20 mSv per year (see Section E.2.2). This is in accordance with international standards. In order to ensure that these dose limits are not exceeded, reference values, limits and constraints for dose and activity have been defined in the Radiological Protection Ordinance, in the Regulatory Guidelines HSK-R-07

and HSK-R-11, as well as in the licence obligations. Article 36 of the Radiological Protection Ordinance sets the dose limits and working conditions for pregnant and nursing women.

Models on atmospheric dispersion and exposure paths (as outlined in HSK-R-41 based on IAEA Safety Series No. 50-SG-S3), including transfer factors and dose conversion factors, are used to obtain the effective dose as a function of the discharge. The discharge limits are set by HSK based on such calculations. The Regulatory Guidelines HSK-R-15 and HSK-R-25 require that the activity discharged to the environment be reported by each nuclear facility in periodical reports. The measuring instruments used in the facilities have to be calibrated periodically (HSK-R-47). HSK takes various samples and carries out independent measurements in each nuclear facility for independent analysis several times a year.

Appropriate systems of dose budget and investigation levels ensure that for persons working on different sites the dose limits are not exceeded. For instance, so called *temporary dose contingents* are defined in order to split the maximum permitted individual dose among the different nuclear facilities where the person works during the year. Employers must have a licence to send persons occupationally exposed to radiation to various facilities. It is the duty of the employer to inform the operators of the facilities about the dose budgets of his employees; the dose budget is the maximum dose an employee may accumulate during the period he works in the facility. Some facilities use additional daily or job specific dose constraints as investigation levels. In these cases electronic personal dosimeters are used to monitor the actual dose.

F.4.3 Preventive Measures Taken (Paragraph 1 Clause iii)

Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.

The Radiological Protection Ordinance requires the licence holder to take appropriate measures to prevent unplanned and uncontrolled releases of radioactive materials into the environment. The corresponding technical and administrative requirements to be considered during planning, construction, operation and decommissioning are outlined in the Ordinance on the Use of Unsealed Radiation Sources and in the Regulatory Guidelines HSK-R-07 and HSK-R-14. All other facility specific details are laid down in the licences and permits.

The Radiological Protection Ordinance requires the declaration of rooms, buildings or areas as controlled zones if the dose rate or the surface or air contamination levels exceed certain limits listed in the Ordinance. HSK-R-07 classifies the controlled zone in zone types 0, I, II, III and IV depending on the level of potential contamination.

An area has to be marked as zone 0 if the external exposure of an individual could exceed 1 mSv per year but contamination can be excluded in normal operation. One example is the storage hall for transport and storage casks at the Central Storage Facilty.

A building or room has to be declared as zone I or higher if a contamination can occur under normal operation, *e.g.*, when handling open radiation sources. In these rooms the air pres-

sure must be lower than in the surrounding, uncontrolled area. In order to continuously ensure such a low pressure, a graduation of the pressure is necessary using a series of air locks. Such zones exist in all spent fuel and radioactive waste management facilities. The National Collection Centre at PSI operates a laboratory with a zone IV box, in which employees have to wear protecting clothing and respiratory masks.

F.4.4 Radiation Exposure Due to Discharges (Paragraph 2 Clause i)

Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account.

In the licence application for the construction and operation of a nuclear facility (including storage and disposal facilities), the technical measures, *e.g.*, barriers and air filters, taken to reduce exposure to radiation caused from radioactive discharges must comply with the ALARA principle. These measures are explicitly stated as obligations when granting the licence. Each nuclear facility has to periodically report the discharged radioactivity to HSK.

F.4.5 Radiation Doses Due to Discharges (Paragraph 2 Clause ii)

Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited so that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.

The annual dose limit for the public is ensured via a partition into source related dose constraints of at most 0.3 mSv per year for each nuclear site (HSK-R-11). The dose from direct exposure must not exceed 0.1 mSv per year. Based on these dose constraints, maximum values for the total activities and activity concentrations discharged into the environment are derived from dispersion and transfer models (HSK-R-41). Depending on whether the discharge occurs in a short (shorter than a week) or long (continuous) time interval, it has to comply with the short or long term discharge limits. These release limits are verified by HSK in the periodic safety review of the nuclear facility (HSK-R-48).

Material can be declared as non-radioactive if it is out of the scope of application of the Radiological Protection Ordinance. The clearance levels are described in Section B.3 of this report. These levels are derived from the *de minimis* value of 0.01 mSv per person and year.

F.4.6 Corrective Measures (Paragraph 3)

Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.

According to the Radiological Protection Ordinance, the licence holder is obliged to make the necessary operational preparations in order to be able to cope with incidents and accidents.

These preparations include regular training of the personnel, instructions regarding the immediate measures to be taken in an emergency, and the provision of sufficient technical assistance and personnel for dealing with failures at all times. This implies employing and training an appropriate number of health physicists and other radiation protection personnel. The dose limit for outside emergency personnel involved in rescuing human lives and protecting the population is 250 mSv during the first year following the event; the dose limit for personnel involved in aftermath work is 50 mSv during the first year following the event.

In addition, the Radiological Protection Ordinance requires that the licence holder carries the responsibility for all risks. This means that in case of an unplanned or uncontrolled release of radioactive material into the environment every possible effort has to be taken by the licence holder to control the release and mitigate its effects. This includes appropriate protective measures for the personnel, the installation of failure safe locks, as well as activity and dose monitoring inside the facility, on the premises and in the neighbourhood of a facility. The monitoring results are published by HSK on its web site continuously.

In case of a radiological incident, the licence holder has to notify HSK and the National Emergency Operations Centre (NAZ) immediately (see Section F.5).

HSK approves the training courses and the qualification of the radiation protection personnel. The nuclear facilities have to report the participation of their personnel in the appropriate training courses.

Conclusion

The Swiss Party complies with the obligations of Article 24.

F.5 Emergency Preparedness (Article 25)

F.5.1 Facility Emergency Plans (Paragraph 1)

Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency.

The federal Emergency Organization in Case of Increased Radioactivity (EOR) is in charge of emergency planning and preparedness in Switzerland. The Concept on Emergency Planning and Preparedness for the Vicinity of Nuclear Power Plants (1998) defines the requirements for emergency preparedness and is based on the following Ordinances and Regulatory Guidelines:

- Emergency Protection Ordinance
- Ordinance on the Emergency Organization in Case of Increased Radioactivity
- Iodine Tablet Ordinance

- Guideline HSK-R-42: Responsibility for decisions to implement particular measures to mitigate the consequences of a severe accident at a nuclear power plant
- Guideline HSK-R-45: Planning and execution of emergency exercises in Swiss nuclear facilities
- Alert Ordinance

These requirements refer to NPPs and are used for other nuclear facilities by analogy. Prior to the operation permit of a new spent fuel or radioactive waste management facility, on-site emergency plans are required that must be approved by HSK.

To prepare emergency measures for spent fuel and radioactive waste management facilities, specific scenarios are evaluated that form the basis for the emergency planning in the environment of such facilities. Off-site emergency plans are required if possible accidents can cause off-site doses above 1 mSv (Ordinance on the Emergency Organization in Case of Increased Radioactivity). Accidents at spent fuel and radioactive waste management facilities located at NPPs (*e.g.*, ZWIBEZ) are covered by the emergency organization of the corresponding NPP. At PSI and ZZL such doses can only be attained in an airplane crash scenario. For this scenario the alerting and countermeasures are implemented for the population of the neighbouring communities.

On-Site Emergency Organization

Each new spent fuel or radioactive waste management facility is in possession of facility-specific emergency preparedness documentation which includes the following information:

- Operating procedures for abnormal situations;
- Emergency procedures;
- Reporting procedure to HSK, and in case of radiological events also to the National Emergency Operations Centre (NAZ).
- Reporting procedure to the police in case of rapidly evolving accidents (*e.g.*, airplane crash).

The emergency organization of the facility is inspected by HSK every year.

Off-Site Emergency Organization and Protective Measures

The off-site emergency organization is based on the resources within the Swiss civil defence concept. These resources consist of a well developed shelter infrastructure and well trained troops for fire and disaster mitigation. In the case of a radiological emergency the Emergency Organization in Case of Increased Radioactivity (EOR) coordinates the use of civil and military resources. EOR can issue warnings, siren signals for general alert, as well as instructions over the radio. NAZ, as a part of EOR, is responsible for the transmission of warning and alerting orders to the cantonal authorities, and also for initial countermeasures for the protection of the public.

The protective measures to be implemented for the population are based on the concept of emergency reference levels of dose as quoted in the Ordinance on the Emergency Organi-

zation in Case of Increased Radioactivity. The concept describes which protective measures are to be adopted for an expected radiation dose.

Emergency Exercises

HSK issues the permit for operation only if the on-site emergency organization is operational and has been tested by an emergency exercise. Furthermore, on-site emergency preparedness exercises are performed every year in accordance with the specifications in the Guideline HSK-R-45. In addition, each of the different emergency teams, such as the fire brigade, have to carry out their own specific exercises.

F.5.2 Territory Emergency Plans (Paragraph 2)

Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.

The Emergency Organization in Case of Increased Radioactivity (EOR) also becomes active in case of any radiological emergency coming from abroad. Automatic dose rate monitoring systems have been installed in Switzerland. The systems continuously monitor the dose rate at a large number of locations.

Conclusion

The Swiss Party complies with the obligations of Article 25.

F.6 Decommissioning (Article 26)

Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility.

The Nuclear Energy Act requires the operator of a nuclear facility to apply for a general licence as a first step. Applications for construction and operation licences can only be made once the general licence has been issued. The licensee must state the basic commitments with respect to decommissioning in the application documents for the general licence and present a decommissioning plan with the application documents for the construction licence. He has to regularly update the decommissioning plan during the operation period. At the end of the operational lifetime of the facility, he must submit a decommissioning project. After this project has been reviewed and approved by the authorities, a decommissioning order is issued by the licensing authority (UVEK). The legislation thus addresses all aspects of decommissioning at the appropriate stage of facility development.

No general license or decommissioning order has been issued yet on the basis of the new legislation. Earlier legislation required a decommissioning licence. Such licences were issued

for the prototype reactor at Lucens and the research reactors DIORIT and SAPHIR at PSI. They retain their validity under the new legislation. The experience made so far demonstrates the sound basis already given by the earlier legislation.

All NPPs are or have been subject to upgrading, backfitting and licence extension, hence there are no new significant decommissioning projects expected for the next 10 years.

F.6.1 Staff and Financial Resources (Clause i)

Such steps shall ensure that qualified staff and adequate financial resources are available.

With respect to the financial aspects of decommissioning, the legislation (Nuclear Energy Act, Nuclear Energy Ordinance and Ordinance on the Decommissioning Fund for Nuclear Facilities) provides for a fund (Decommissioning Fund). The fund covers the costs arising from decommissioning, including dismantling and management of the resulting waste. Contributions are paid annually by the owners of the four NPPs and the Central Storage Facility (ZZL). The contributions are based on the estimated costs of decommissioning of each facility and determined by the Management Commission of the fund. They are reviewed and updated every five years by the Management Commission to ensure that sufficient funds will be available at the time of decommissioning. The cost estimates refer to specific decommissioning studies presented by the NPP owners and reviewed by HSK. If during decommissioning such financial provisions prove insufficient, the owner of the facility concerned has to pay the difference within three years. In the case that the means of the fund are not sufficient to cover the costs of decommissioning of a NPP, the owners of the other NPPs are also liable for the amount in debt.

With adequate financial resources the recruitment of qualified staff can be ensured. Guideline HSK-R-17 specifies requirements that apply also to decommissioning. The decommissioning order can lay down specific obligations in this respect. The new Nuclear Energy Act requires the operator to submit a detailed decommissioning project plan. This project must address all aspects, including staff, organization and quality management.

F.6.2 Radiation Protection (Clause ii)

Such steps shall ensure that the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied.

The Radiological Protection Act and the Radiological Protection Ordinance apply to the decommissioning of nuclear facilities as well. This legislation covers all aspects of Article 26 Clause (ii) (see Section F.4). The decommissioning order lays down complementary obligations as appropriate.

F.6.3 Emergency Preparedness (Clause iii)

Such steps shall ensure that the provisions of Article 25 with respect to emergency preparedness are applied.

The legal requirements concerning emergency preparedness apply independently of whether a facility is in operation or is being decommissioned. These requirements cover all aspects of Article 26 Clause (iii) (see Section F.5). The decommissioning project must cover design accident evaluation and emergency preparedness planning for all stages of decommissioning.

F.6.4 Record Keeping (Clause iv)

Such steps shall ensure that records of information important to decommissioning are kept.

The new Nuclear Energy Act requires the facility operators to keep and to update all technical records until decommissioning is completed. After completion of decommissioning, the operator has to hand over the documentation to the regulatory authorities.

Conclusion

The Swiss Party complies with the obligations of Article 26.

Section G Safety of Spent Fuel Management

G.1 General Safety Requirements (Article 4)

Each Contracting Party shall take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards.

The protection of individuals, society and the environment against radiological hazards related to spent fuel management is subject to the Swiss legislation on radiation protection and on nuclear energy, as detailed in Section E.2. Compliance with the legal requirements regarding nuclear safety and radiation protection is verified and enforced by the Swiss Federal Nuclear Safety Inspectorate (HSK) for nuclear facilities. This is done by reviewing safety analysis reports during the licensing steps and by supervising construction and operation particularly by inspections.

G.1.1 Criticality and Removal of Heat (Clause i)

In so doing, each Contracting Party shall take the appropriate steps to ensure that criticality and removal of residual heat generated during spent fuel management are adequately addressed.

Criticality and heat removal are attended to during the licensing process of a spent fuel management facility and during operation if changes in the operational procedures are planned. These points are analysed in the safety analysis report submitted with the licence application and reviewed by the regulatory body. Safety relevant changes to a spent fuel management facility, including equipment and procedures, require a licence from UVEK or a permit from HSK. All Swiss spent fuel management facilities are in compliance with the requirements of Clause (i).

G.1.2 Generation of Radioactive Waste (Clause ii)

In so doing, each Contracting Party shall take the appropriate steps to ensure that the generation of radioactive waste associated with spent fuel management is kept to the minimum practicable, consistent with the type of fuel cycle policy adopted.

Both the Nuclear Energy Act and the Radiological Protection Act require that any handling and management of radioactive materials must take place in such a way that the generation of radioactive waste is kept to the minimum practicable. The spent fuel management facilities mentioned under Section D.2.1 have been built and are operated according to this principle. This will also be the case for future facilities.

G.1.3 Interdependencies (Clause iii)

In so doing, each Contracting Party shall take the appropriate steps to take into account interdependencies among the different steps in spent fuel management.

Spent fuel management is subject to the requirement of optimization formulated in Article 6 of the Radiological Protection Ordinance, thus interdependencies among the different steps must be and in practice are taken into account.

G.1.4 Protection of Individuals, Society and the Environment (Clause iv)

In so doing, each Contracting Party shall take the appropriate steps to provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards.

Protection of individuals, society and the environment from the effects of ionizing radiation is a subject of the radiation protection legislation (see Section E.2.2), in which the ICRP system of radiation protection, consisting of justification, optimization and dose limitation, is implemented. The applicable dose limits are compatible with the International Basic Safety Standards (IAEA Safety Series No. 115). 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 is implemented.

Compliance of spent fuel management facilities with the legislation is ensured during the licensing and operational phases. At each licensing step a safety analysis report demonstrating compliance has to be submitted and is reviewed by the regulatory body. During the operational phase, compliance is verified and enforced by regulatory supervision, mainly by inspections. The regulatory supervision includes monitoring of the radioactivity in the environment of the facility.

G.1.5 Biological, Chemical and other Hazards (Clause v)

In so doing, each Contracting Party shall take the appropriate steps to take into account the biological, chemical and other hazards that may be associated with spent fuel management.

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 for the general licence and for the construction licence. This assessment is reviewed by the appropriate environmental protection authorities before the licence is issued. Hazards other than radiation encountered by workers during handling of spent fuel are covered by general legislation on safety in working places, enforced by supervision by the Swiss Accident Insurance Institute (Suva).

G.1.6 Impacts on Future Generations (Clause vi)

In so doing, each Contracting Party shall take the appropriate steps to strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation.

Several legal requirements aim at avoiding impacts on future generations. The Nuclear Energy Act requires that all radioactivity hazards be removed from a nuclear facility upon temination of operation. Details are given in Section F.6. The same Act also requires safe and permanent management and disposal of all radioactive waste (including spent fuel if declared as waste). The requirements on the long-term safety of disposal facilities are detailed in the Regulatory Guideline HSK-R-21. Here, the principle is formulated that the risk to humans and the environment shall at no time in the future exceed the levels permissible in Switzerland today.

There are currently no disposal facilities for spent fuel in operation or under construction in Switzerland. However, the requirements on the long-term safety have been observed in the design and planning of disposal facilities, and compliance with them has been verified in the regulatory review of such projects.

G.1.7 Burdens on Future Generations (Clause vii)

In so doing, each Contracting Party shall take the appropriate steps to aim to avoid imposing undue burdens on future generations.

As explained in Section G.1.6 above, the legal requirements prevent imposing undue burdens on future generations. Regarding disposal, the Regulatory Guideline HSK-R-21 explicitly formulates, as one of the overall objectives of disposal, that no undue burdens are to be imposed on future generations.

Conclusion

The Swiss Party complies with the obligations of Article 4.

G.2 Existing Facilities (Article 5)

Each Contracting Party shall take the appropriate steps to review the safety of any spent fuel management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility.

Besides the spent fuel ponds in the NPPs, the only spent fuel management facilities which exist in Switzerland are the Central Storage Facility (ZZL) in Würenlingen and the interim storage facility (ZWIBEZ) at Beznau NPP, as described in Section D.2.1.

These facilities (including the fuel ponds at the NPPs) have been licensed as required by law. The Nuclear Energy Act and the Nuclear Energy Ordinance require the owners of all nuclear facilities to systematically and regularly assess the safety of these facilities under the supervision of HSK.

No other spent fuel management facilities exist in Switzerland.

Conclusion

The Swiss Party complies with the obligations of Article 5.

G.3 Siting of Proposed Facilities (Article 6)

G.3.1 Safety Impact Information (Paragraph 1)

Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed spent fuel management facility:

- ***(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;***
- ***(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;***
- ***(iii) to make information on the safety of such a facility available to members of the public;***
- ***(iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.***

A spent fuel management facility is a nuclear facility according to the Swiss nuclear energy legislation. The site of a nuclear facility is fixed by the general licence which is a prerequisite for further licences and has to be approved by Parliament (see Section E.2.3). The safety analysis report to be submitted with the general licence application has to include an evaluation of the site-related factors likely to affect the safety of the facility, as well as the likely safety impacts of the facility on individuals, society and the environment. Clauses (i) and (ii) are thus addressed.

The licensing procedure includes a public consultation. The documentation on the project, including the safety analysis report, the regulatory review report and the views and opinions of the cantons, is made available, and any person (also from foreign countries) can give input or raise objections. This fulfils the requirement of Clause (iii).

The Nuclear Energy Act specifically requires that the site canton as well as neighbouring cantons and countries shall be involved in the decision making regarding the general licence. Furthermore, bilateral agreements have been established with the neighbouring countries (France, Germany, Austria and Italy) with the aim of exchanging information on planned or

operating nuclear facilities that are situated close to the common national borders. This fulfils the requirements of Clauses (iv).

G.3.2 Effects on other Contracting Parties (Paragraph 2)

In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 4.

For nuclear facilities in general, adequate protection beyond the national borders is effected in practice by the fact that the evaluation of impact is carried out irrespective of national borders. Some nuclear facilities in Switzerland are located close to the German border. In the frame of a bilateral agreement with Germany, German regulatory authorities review licence applications for such nuclear facilities and assess the potential radiological effects according to the German regulations.

Conclusion

The Swiss Party complies with the obligations of Article 6.

G.4 Design and Construction of Facilities (Article 7)

G.4.1 Limitation of Radiological Impacts (Clause i)

Each Contracting Party shall take the appropriate steps to ensure that the design and construction of a spent fuel management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases.

The procedure for the construction licence for a nuclear facility, including spent fuel management facilities, requires the submission of a safety analysis report with the licence application. This safety analysis report, which is reviewed by the nuclear safety authorities, has to contain the necessary information to verify that the possible radiological impacts on individuals, society and the environment are limited. The evaluation of the radiological impacts must encompass normal operation as well as possible accidental situations.

G.4.2 Decommissioning (Clause ii)

Each Contracting Party shall take the appropriate steps to ensure that at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account.

The Nuclear Energy Act requires, for any nuclear facility, a decommissioning concept at the general licence stage and a more detailed decommissioning plan at the construction licence

stage. Under the previous legislation, a similar requirement was applied when granting the general licence to ZWILAG for the Central Storage Facility (ZZL). Further details are given in Section F.6.

G.4.3 Technologies (Clause iii)

Each Contracting Party shall take the appropriate steps to ensure that the technologies incorporated in the design and construction of a spent fuel management facility are supported by experience, testing or analysis.

The Nuclear Energy Ordinance requires for any nuclear facility that during design, construction and operation, technologies, materials and organizational structures are employed that are supported by experience and proven to be of high quality. This requirement is therefore also considered in the regulatory review of licence applications and in the regulatory supervision during of the construction phase. During planning, construction and operation, HSK bases its assessments of nuclear facilities, including spent fuel management projects, on evaluations taking into account the recent developments in science and technology.

Conclusion

The Swiss Party complies with the obligations of Article 7.

G.5 Assessment of Safety of Facilities (Article 8)

G.5.1 Safety Assessment (Clause i)

Each Contracting Party shall take the appropriate steps to ensure that before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out.

A safety assessment report is part of the documentation required by the Swiss nuclear energy legislation for each licensing step of a nuclear facility, including spent fuel management facilities. An environmental assessment is required at the general licence and construction licence stages based on the Environmental Protection Act. HSK carries out comprehensive reviews of the safety assessments.

G.5.2 Update of Safety Assessment (Clause ii)

Each Contracting Party shall take the appropriate steps to ensure that before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in clause (i).

The safety assessment has to be updated by the applicant and reviewed by HSK at each step of the licensing procedure (general licence, construction licence and operation licence). Furthermore, the Nuclear Energy Act (Article 22.e) requires periodic safety reviews during the lifetime of the NPPs, including their spent fuel management facilities. The periodic safety reviews are examined by HSK.

Conclusion

The Swiss Party complies with the obligations of Article 8.

G.6 Operation of Facilities (Article 9)

G.6.1 Operation Licence (Clause i)

Each Contracting Party shall take the appropriate steps to ensure that the licence to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements.

The operation licence for a nuclear facility, including spent fuel management facilities, is granted based, among other things, on a safety analysis report. HSK supervises the construction of the facility and makes sure that the facility is built in accordance with the construction licence. The operation licence includes the obligation that active operation of the facility requires a corresponding permit from HSK. This permit is issued after the commissioning programme has demonstrated that the facility fulfils all safety and other requirements. The regulatory process for the commissioning of nuclear facilities is specified in the Guideline HSK-R-30.

G.6.2 Defining and Revising Operational Limits and Conditions (Clause ii)

Each Contracting Party shall take the appropriate steps to ensure that operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary.

HSK supervises and inspects the commissioning and operation of each nuclear facility including spent fuel management facilities. This includes the review and approval of operational conditions for the particular nuclear facility. Any changes require a permit by HSK. HSK has

the competence to revise operational limits and conditions as necessary for reasons of safety.

G.6.3 Accordance with Established Procedures (Clause iii)

Each Contracting Party shall take the appropriate steps to ensure that operation, maintenance, monitoring, inspection and testing of a spent fuel management facility are conducted in accordance with established procedures.

Operation, maintenance and monitoring of nuclear facilities, including spent fuel management facilities, are specified in the operation licence. The corresponding procedures as described in the facility operation documents are reviewed by HSK. Their adequacy is a condition for issuing the permit to start operation. HSK is entrusted with the supervision of nuclear facilities and carries out inspections according to an annual inspection plan. HSK is empowered to enforce compliance with all requirements.

G.6.4 Engineering and Technical Support (Clause iv)

Each Contracting Party shall take the appropriate steps to ensure that engineering and technical support in all safety-related fields are available throughout the operating lifetime of a spent fuel management facility.

According to the Nuclear Energy Act, the fulfilment of requirements regarding the staff and the organization is a prerequisite for the granting of the operation licence for a nuclear facility. The requirements concerning staff and organization are outlined in the Nuclear Energy Ordinance (Article 30) and more specifically elaborated in the Guidelines HSK-R-27 and HSK-R-37. They include the availability of engineering and technical support. HSK inspects and supervises the qualification of the personnel of nuclear facilities including spent fuel management facilities. HSK has the competence to intervene if it determines that a lack of technical or engineering support impacts on the safety of the facility.

G.6.5 Reporting of Incidents (Clause v)

Each Contracting Party shall take the appropriate steps to ensure that incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body.

The requirements regarding the regular reporting (monthly, quarterly and yearly) and the reporting of incidents are specified in the Nuclear Energy Ordinance and in the Regulatory Guidelines HSK-R-15, HSK-R-25 and HSK-R-29.

G.6.6 Collection and Analysis of Operating Experience (Clause vi)

Each Contracting Party shall take the appropriate steps to ensure that programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate.

The Nuclear Energy Act explicitly requires the operator of a nuclear facility, including spent fuel management facilities, to conduct systematic safety evaluations and to observe and analyse operating experience gained in comparable facilities. The Nuclear Energy Ordinance further requires the operator to include in the safety evaluations the operating experience made and to determine the relevance for his facility of the operating experience made in comparable facilities.

G.6.7 Decommissioning Plans (Clause vii)

Each Contracting Party shall take the appropriate steps to ensure that decommissioning plans for a spent fuel management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.

The Nuclear Energy Act and the Nuclear Energy Ordinance require updating of decommissioning plans for nuclear facilities on a regular basis (10 years cycle) and, as necessary, taking account of changes made to the facilities, changes in the regulations and technological development. The Ordinance on the Decommissioning Fund requires a periodical update of the decommissioning cost estimate. The operators of the NPPs have elaborated detailed decommissioning studies for their facilities. These studies were revised in 2001 and reviewed and approved by HSK in 2002.

Conclusion

The Swiss Party complies with the obligations of Article 9.

G.7 Disposal of Spent Fuel (Article 10)

If, pursuant to its own legislative and regulatory framework, a Contracting Party has designated spent fuel for disposal, the disposal of such spent fuel shall be in accordance with the obligations of Chapter 3 relating to the disposal of radioactive waste.

According to current legislation, radioactive waste is defined as radioactive material which is no longer used. Thus spent nuclear fuel for which disposal without reprocessing is foreseen is radioactive waste by definition and must be disposed of accordingly. Up to now, no spent fuel has definitely been declared as waste by its owner.

Conclusion

The Swiss Party complies with the obligations of Article 10.

Section H Safety of Radioactive Waste Management

H.1 General Safety Requirements (Article 11)

Each Contracting Party shall take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards.

The protection of individuals, society and the environment against radiological and other hazards is subject to the Swiss legislation on radiation protection and on nuclear energy, as detailed in Section E.2, and to the legislation on environmental protection (mainly the Environmental Protection Act and associated ordinances).

Compliance with the legal requirements regarding nuclear safety and radiation protection is verified and enforced by regulatory bodies. These are mainly the Swiss Federal Nuclear Safety Inspectorate (HSK) for nuclear facilities, including radioactive waste management facilities, and the Federal Office of Public Health (BAG) for non-nuclear practices. The compliance is verified by reviewing safety analysis reports during the licensing steps and by supervising construction and operation particularly through inspections.

Protection of the environment from hazards other than radioactivity is verified in the licensing process of practices by the Federal Office of the Environment, Forests and Landscape (BUWAL). During operation, protection of workers is assured by requirements and compliance checks of the Swiss Accident Insurance Institute (Suva). Compliance with the legislation on protection of the general population and the environment from non-radiological hazards is verified by Cantonal authorities.

H.1.1 Criticality and Removal of Heat (Clause i)

In so doing, each Contracting Party shall take the appropriate steps to ensure that criticality and removal of residual heat generated during radioactive waste management are adequately addressed.

Criticality and heat removal are attended to during the licensing process of a radioactive waste management facility and during operation, if changes in the operational procedures are planned. These points are analysed in the safety analysis report submitted with the licence application and reviewed by the regulatory body. Safety relevant changes to a radioactive waste management facility, including equipment and procedures, require a licence from UVEK or a permit from HSK. All Swiss radioactive waste management facilities (see Section D.2.3) are in compliance with the requirements of Clause (i).

H.1.2 Generation of Radioactive Waste (Clause ii)

In so doing, each Contracting Party shall take the appropriate steps to ensure that the generation of radioactive waste is kept to the minimum practicable.

Minimization of radioactive waste is required by the Radiological Protection Act as well as the Nuclear Energy Act. The Nuclear Energy Ordinance further details the requirements for nuclear facilities. The compliance is subject to verification by the regulatory body during licensing review, issuance of operation permits, and regular inspections. Until now there has never been any reason for a regulatory enforcement action regarding minimization of radioactive waste.

H.1.3 Interdependencies (Clause iii)

In so doing, each Contracting Party shall take the appropriate steps to take into account interdependencies among the different steps in radioactive waste management.

Radioactive waste management is subject to the requirement of optimization formulated in the Radiological Protection Ordinance, thus interdependencies among the different steps must be and in practice are taken into account. As an example of the enforcement in the larger perspective of this obligation, the operation licence for the waste treatment and conditioning facilities of the Central Storage Facility (ZZL) contains the obligation to periodically perform an optimization study comparing the available options for the treatment, conditioning, storage and disposal of radioactive waste. The first such study is due two years after the active commissioning of these facilities, which is still in progress (see Section H.2.1).

H.1.4 Protection of Individuals, Society and the Environment (Clause iv)

In so doing, each Contracting Party shall take the appropriate steps to provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards.

Protection of individuals, society and the environment from the effects of ionizing radiation is a subject of the radiation protection legislation (see Section E.2.2), in which the ICRP system of radiation protection, consisting of justification, optimization and dose limitation, is implemented. The applicable dose limits are compatible with the International Basic Safety Standards (IAEA Safety Series No. 115). 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 (see Section E.2.2) is implemented. The protection of the environment against hazards other than radioactivity is the subject of a separate legislation.

Compliance of radioactive waste management facilities with the legislation is ensured during the licensing and operational phase. At each licensing step a safety analysis report demonstrating compliance has to be submitted and is reviewed by the regulatory body. During the

operational phase compliance is verified and enforced by regulatory supervision, mainly by inspections. The regulatory supervision includes monitoring of the radioactivity in the environment of the facility. Compliance with the environmental protection legislation is verified by the responsible Cantonal authorities.

H.1.5 Biological, Chemical and other Hazards (Clause v)

In so doing, each Contracting Party shall take the appropriate steps to take into account the biological, chemical and other hazards that may be associated with radioactive waste management.

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 for the general licence and for the construction licence. This assessment is reviewed by the appropriate environmental protection authorities before the licence is issued. Hazards other than radiation encountered by workers during handling of spent fuel are covered by general legislation on safety in working places, enforced by supervision by the Swiss Accident Insurance Institute (Suva).

H.1.6 Impacts on Future Generations (Clause vi)

In so doing, each Contracting Party shall take the appropriate steps to strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation.

Several legal requirements aim to avoid impacts on future generations. The Radiological Protection Act and the Nuclear Energy Act require that all radioactivity hazards be removed from a practice in the case that the licence is terminated. The Nuclear Energy Act requires safe and permanent management and disposal of all radioactive waste. The requirements on the long-term safety of disposal facilities are detailed in the Regulatory Guideline HSK-R-21. Here, the principle is formulated that the risk to humans and the environment shall at no time in the future exceed the levels permissible in Switzerland today. HSK-R-21 specifies the following dose and risk levels:

1. The release of radionuclides from a sealed repository due to reasonably expectable processes and events shall at no time give rise to individual doses exceeding 0.1 mSv per year.
2. The individual radiological risk of fatality due to unlikely processes and events not taken into consideration under 1. above, shall at no time exceed one in a million per year.

There are currently no final disposal facilities for radioactive waste in operation or under construction in Switzerland. However, the requirements on the long-term safety have been observed in the design and planning of disposal facilities, and compliance with them has been verified in the regulatory review of such projects.

H.1.7 Burdens on Future Generations (Clause vii)

In so doing, each Contracting Party shall take the appropriate steps to aim to avoid imposing undue burdens on future generations.

As explained in Section H.1.6 above, the legal requirements prevent imposing undue burdens on future generations. Regarding disposal, the Regulatory Guideline HSK-R-21 explicitly formulates, as one of the overall objectives of disposal, that no undue burdens are to be imposed on future generations. HSK-R-21 further states that after a repository has been closed, no further measures shall be necessary to ensure safety. The repository must be designed in such a way that it can be closed within a few years.

Sites of past practices in Switzerland needing clean-up measures for reasons of radioactivity are being restored to safe conditions under the supervision of the Federal Office of Public Health (BAG), see Section H.2.2.

Conclusion

The Swiss Party complies with the obligations of Article 11.

H.2 Existing Facilities and Past Practices (Article 12)

H.2.1 Existing Facilities (Clause i)

Each Contracting Party shall in due course take the appropriate steps to review the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility.

An overview of the existing radioactive waste management facilities is given in Section D.2.3.

- **NPPs**: All Swiss NPPs have on-site waste treatment and conditioning as well as storage facilities for their own operational waste. Construction and operation of these facilities are considered within the larger scope of the NPPs and are subject to the same regime of regulatory supervision and requirements as the NPPs. In particular, they are included in the periodic safety reviews of the NPPs, and their actual status is described when revised safety assessment documents are issued.
- **ZZL**: The Central Storage Facility (ZZL) is operated by ZWILAG and includes storage buildings for spent fuel and all kinds of radioactive waste, conditioning facilities and a plasma incinerator. The operation licence was granted in two parts, in 1995 (for storage) and in 1999 (for conditioning and incineration) after in-depth review of the projects by the regulatory body. Operation permits are needed before active operation can start. The permits are delivered by HSK when all licence obligations are met. The different parts of the facility are successively entering the operational stage. The storage hall for spent fuel and high level waste and the building for intermediate level

waste were commissioned in 2001. The conditioning facilities received operation permit in 2003. The incinerator started active test operation in 2004. The storage hall for low level waste has not yet been commissioned. The safety analysis report for the already commissioned storage parts was updated to the "as built" stage in 2003. Thus the safety assessment of ZZL is up to date.

- **ZWIBEZ**: This storage facility is located at Beznau NPP and obtained a construction licence and an operation licence in 1991, based on a safety analysis report submitted in 1988. It consists of a storage hall for spent fuel and high level radioactive waste from reprocessing, and a storage hall for low level operational waste from Beznau NPP. The ZWIBEZ facility is included, as a part of Beznau NPP, in its periodic safety review. In 2002, Beznau NPP submitted to HSK such a periodic safety review report. The examination by HSK was concluded in 2004 with a positive result.
- **PSI**: PSI is a federally funded research institute. It also acts as the National Collection Centre for radioactive waste from medicine, industry and research. At PSI this waste is sorted, conditioned and stored in the Federal Storage Facility (BZL). All radioactive waste management facilities at PSI are nuclear facilities with corresponding licences, and they are supervised by HSK. All safety relevant changes in facilities or operations require a licence or a permit from HSK. Several parts of these facilities have recently been upgraded. The pilot incinerator plant at PSI ceased operations at the end of 2002 and is to be decommissioned. The operation licence for the Federal Storage Facility (BZL) at PSI for radioactive waste from medicine, industry and research was re-issued in 2004, based on a new safety analysis report which was reviewed by the nuclear safety authorities. The day to day waste management operations at PSI are subject to inspections by HSK, where issues of safety and optimization are addressed. Thus the current safety status of the radioactive waste management facilities at PSI is verified to be in compliance with the legal requirements.
- **Research reactors in the decommissioning stage**: This concerns two reactors at PSI (see Section D.2.7). The first to enter decommissioning was the DIORIT reactor. Its dismantling was licensed in 1994. The decommissioning proceeded under regulatory supervision by HSK and is now almost complete. By the end of 2004 nearly all the active components had been removed. All operations took place in compliance with the applicable legislation. At the present time, part of the resulting conditioned radioactive waste is temporarily stored on site but will be brought to the Federal Storage Facility (BZL) where the remainder of the waste is already stored. The second reactor, SAPHIR, received the decommissioning licence in 2000. The dismantling work is ongoing. It takes place under the regulatory supervision of HSK and proceeds in compliance with the applicable legislation. The resulting radioactive waste is conditioned and stored in the same way as for the DIORIT reactor. Both decommissioning projects are due to be finished in 2007.

H.2.2 Past Facilities and Practices (Clause ii)

Each Contracting Party shall in due course take the appropriate steps to review the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention.

One experimental power reactor has been dismantled in Switzerland. This facility, at Lucens in the Canton of Vaud, was shut down in 1969 following an accident after a short period of operation, and was later decommissioned. The site was released from regulatory control in 1995 with the exception of a shed containing approximately 240 t of unconditioned, solid radioactive waste in six containers. In 2003, these waste containers were transported to ZZL for storage and conditioning of the waste in view of later disposal. The complete former site at Lucens was released from regulatory control in 2004. The site is, however, subject to the environmental radiation monitoring programme of the Federal Office of Public Health (BAG).

Radioactive waste from industrial facilities (primarily watch industry) that have been closed down in recent years are being transferred to the National Collection Centre at PSI and are dealt with in the same manner as all the other radioactive wastes from medicine, industry and research that are collected by the Centre.

There are no other past practices in Switzerland that would need intervention for reasons of radiation protection.

Conclusion

The Swiss Party complies with the obligations of Article 12.

H.3 Siting of Proposed Facilities (Article 13)

H.3.1 Safety, Impact and Information (Paragraph 1)

Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed radioactive waste management facility:

- ***(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime as well as that of a disposal facility after closure;***
- ***(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;***
- ***(iii) to make information on the safety of such a facility available to members of the public;***
- ***(iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.***

A radioactive waste management facility is a nuclear facility according to the Swiss nuclear energy legislation. The site of a nuclear facility is fixed by the general licence which is a prerequisite for further licences and has to be approved by Parliament (see Section E.2.3). The safety analysis report to be submitted with the general licence application has to include an evaluation of the site-related factors likely to affect the safety of the facility, as well as the likely safety impacts of the facility on individuals, society and the environment. Clauses (i) and (ii) are thus addressed.

The licensing procedure includes a public consultation. The documentation on the project, including the safety analysis report, the regulatory review report and the views and opinions of the cantons, is made available, and any person (also from foreign countries) can give input or raise objections. This fulfils the requirement of Clause (iii).

The Nuclear Energy Act specifically requires that the site canton as well as neighbouring cantons and countries shall be involved in the decision making regarding the general licence. Furthermore, bilateral agreements have been established with the neighbouring countries (France, Germany, Austria and Italy) with the aim of exchanging information on planned or operating nuclear facilities that are situated close to the common national borders. This fulfils the requirements of Clause (iv).

The site selection process leading to the application for a general licence is not defined in the legislation. The federal authorities are currently developing a procedure for the siting of disposal facilities. The procedure will focus mainly on safety related criteria, but socio-economical aspects are also taken into account. Cantons and neighboring countries will be involved in the elaboration of the site selection procedure.

H.3.2 Effects on other Contracting Parties (Paragraph 2)

In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 11.

For nuclear facilities in general, adequate protection beyond the national borders is effected in practice by the fact that the evaluation of impact is carried out irrespective of national borders. For disposal facilities, this requirement is explicitly stated by Principle 3 in the Guideline HSK-R-21. Some nuclear facilities in Switzerland are located close to the German border. In the frame of a bilateral agreement with Germany, German regulatory authorities review licence applications for such nuclear facilities and assess the potential radiological effects according to the German regulations.

Conclusion

The Swiss Party complies with the obligations of Article 13.

H.4 Design and Construction of Facilities (Article 14)

H.4.1 Limitation of Radiological Impacts (Clause i)

Each Contracting Party shall take the appropriate steps to ensure that the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases.

The procedure for the construction licence for a nuclear facility, including waste management facilities, requires the submission of a safety analysis report with the licence application. This safety analysis report, which is reviewed by the nuclear safety authorities, has to contain the necessary information to verify that the possible radiological impacts on individuals, society and the environment are limited. The evaluation of the radiological impacts must encompass normal operation as well as possible accidental situations.

H.4.2 Decommissioning (Clause ii)

Each Contracting Party shall take the appropriate steps to ensure that at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account.

The Nuclear Energy Act requires, for any nuclear facility, a decommissioning concept at the general licence stage and a more detailed decommissioning plan at the construction licence stage. Under the previous legislation, a similar requirement was applied when granting the general licence to ZWILAG for the Central Storage Facility (ZZL). Further details are given in Section F.6.

H.4.3 Closure of Disposal Facility (Clause iii)

Each Contracting Party shall take the appropriate steps to ensure that at the design stage, technical provisions for the closure of a disposal facility are prepared.

The Nuclear Energy Act requires, for a disposal facility, a concept for its closure at the stage of the general licence and a more detailed plan at the stage of the construction licence.

H.4.4 Technologies (Clause iv)

Each Contracting Party shall take the appropriate steps to ensure that the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis.

The Nuclear Energy Ordinance requires for any nuclear facility that during design, construction and operation, technologies, materials and organizational structures are employed that are supported by experience and proven to be of high quality. This requirement is therefore also considered in the regulatory review of licence applications and in the regulatory supervision during of the construction phase. During planning, construction and operation, HSK bases its assessments of nuclear facilities, including radioactive waste management projects, on evaluations taking into account the recent developments in science and technology.

Conclusion

The Swiss Party complies with the obligations of Article 14.

H.5 Assessment of Safety of Facilities (Article 15)

H.5.1 Safety Assessment (Clause i)

Each Contracting Party shall take the appropriate steps to ensure that before construction of a radioactive waste management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out.

A safety assessment report is part of the documentation required by the Swiss nuclear energy legislation for each licensing step of a nuclear facility, including radioactive waste management facilities. An Environmental Impact Assessment is required at the general licence and construction licence stage based on the Environmental Protection Act. HSK carries out comprehensive reviews of the safety assessments.

H.5.2 Post-Closure Safety Assessment (Clause ii)

Each Contracting Party shall take the appropriate steps to ensure that in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body.

For a disposal facility, a safety assessment addressing also the period after closure (long term safety) is required at each licensing step. An environmental assessment of non-radiological hazards is a requirement of the Environmental Protection Act.

H.5.3 Update of Safety Assessment (Clause iii)

Each Contracting Party shall take the appropriate steps to ensure that before the operation of a radioactive waste management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

The safety assessment has to be updated by the applicant and reviewed by HSK at each step of the licensing procedure (general licence, construction licence and operation licence). Furthermore, the Nuclear Energy Act (Article 22.e) requires periodic safety reviews during the lifetime of the NPPs, including their radioactive waste management facilities. The periodic safety reviews are examined by HSK.

Conclusion

The Swiss Party complies with the obligations of Article 15.

H.6 Operation of Facilities (Article 16)

H.6.1 Operation Licence (Clause i)

Each Contracting Party shall take the appropriate steps to ensure that the licence to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements.

The operation licence for a nuclear facility, including radioactive waste management facilities, is granted based, among other things, on a safety analysis report. HSK supervises the construction of the facility and makes sure that the facility is built in accordance with the construction licence. The Nuclear Energy Act specifically requires, for the operation licence of a disposal facility to be granted, that the findings gained during construction confirm the suitability of the site. The operation licence includes the obligation that active operation of the facility requires a corresponding permit from HSK. This permit is issued after the commissioning programme has demonstrated that the facility fulfils all safety and other

requirements. The regulatory process for the commissioning of nuclear facilities is specified in the Guideline HSK-R-30.

H.6.2 Defining and Revising Operational Limits and Conditions (Clause ii)

Each Contracting Party shall take the appropriate steps to ensure that operational limits and conditions, derived from tests, operational experience and the assessments as specified in Article 15 are defined and revised as necessary.

HSK supervises and inspects the commissioning and operation of each nuclear facility including radioactive waste management facilities. This includes the review and approval of operational conditions for the particular nuclear facility. The Nuclear Energy Ordinance determines for storage and disposal facilities that a storage permit issued by HSK is required for each type of waste package (defined in ISRAM, see Section D.1). According to the Nuclear Energy Ordinance any changes to operational limits and conditions require a permit by HSK. HSK has the competence to revise operational limits and conditions as necessary for reasons of safety.

H.6.3 Accordance with Established Procedures (Clause iii)

Each Contracting Party shall take the appropriate steps to ensure that operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure.

Operation, maintenance and monitoring of nuclear facilities, including radioactive waste management facilities, are specified in the operation licence. The corresponding procedures as described in the facility operation documents are reviewed by HSK. Their adequacy is a condition for issuing the permit to start operation. HSK is entrusted with the supervision of nuclear facilities and carries out inspections according to an annual inspection plan. HSK is empowered to enforce compliance with all requirements.

H.6.4 Engineering and Technical Support (Clause iv)

Each Contracting Party shall take the appropriate steps to ensure that engineering and technical support in all safety-related fields are available throughout the operating lifetime of a radioactive waste management facility.

According to the Nuclear Energy Act, the fulfilment of requirements regarding the staff and the organization is a prerequisite for the granting of the operation licence for a nuclear facility. The requirements concerning staff and organization are outlined in the Nuclear Energy Ordinance (Article 30) and more specifically elaborated in the Guidelines HSK-R-27 and HSK-R-37. They include the availability of engineering and technical support. HSK inspects and supervises the qualification of the personnel for nuclear facilities including

radioactive waste management facilities. HSK has the competence to intervene if it determines that a lack of technical or engineering support could impact on the safety of the facility.

H.6.5 Characterization and Segregation of Radioactive Waste (Clause v)

Each Contracting Party shall take the appropriate steps to ensure that procedures for characterization and segregation of radioactive waste are applied.

According to the Nuclear Energy Ordinance, conditioning of radioactive waste requires an approval from HSK. The approval depends, among other things, on the measures taken to ensure that the properties of the waste and its characterization are optimal in view of the further waste management steps. The former point includes that attention is paid to segregation where this is beneficial.

H.6.6 Reporting of Incidents (Clause vi)

Each Contracting Party shall take the appropriate steps to ensure that incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body.

The requirements regarding the regular reporting (monthly, quarterly and yearly) and the reporting of incidents are specified in the Nuclear Energy Ordinance and in the Regulatory Guidelines HSK-R-15, HSK-R-25 and HSK-R-29.

H.6.7 Collection and Analysis of Operating Experience (Clause vii)

Each Contracting Party shall take the appropriate steps to ensure that programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate.

The Nuclear Energy Act requires the operator of a nuclear facility, including radioactive waste management facilities, to conduct systematic safety evaluations of his facility and to observe and analyse operating experience gained in comparable facilities. The Nuclear Energy Ordinance further requires the operator to include in the safety evaluations the operating experience made and to determine the relevance for his facility of the operating experience made in comparable facilities.

H.6.8 Decommissioning Plans (Clause viii)

Each Contracting Party shall take the appropriate steps to ensure that decommissioning plans for a radioactive waste management facility other than a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.

The Nuclear Energy Act and the Nuclear Energy Ordinance require updating of decommissioning plans for nuclear facilities on a regular basis (10 years cycle) and, as necessary, taking account of changes made to the facilities, changes in the regulations and technological development. The Ordinance on the Decommissioning Fund requires a periodical update of the decommissioning cost estimate. The operators of the NPPs have elaborated detailed decommissioning studies for their facilities. These studies were revised in 2001 and reviewed and approved by HSK in 2002.

H.6.9 Closure of Disposal Facility (Clause ix)

Each Contracting Party shall take the appropriate steps to ensure that plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility and are reviewed by the regulatory body.

The Nuclear Energy Act and the Nuclear Energy Ordinance require updating of the plans for the closure of a disposal facility on a regular basis (10 years cycle) and, as necessary, taking account of changes made to the facilities, changes in the regulations and technological development.

Conclusion

The Swiss Party complies with the obligations of Article 16.

H.7 Institutional Measures after Closure (Article 17)

H.7.1 Keeping Records (Clause i)

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility records of the location, design and inventory of that facility required by the regulatory body are preserved.

The Nuclear Energy Act requires the Federal Council (federal government) to take the necessary steps to ensure that information on a closed disposal facility, including location, design and inventory is preserved. This includes the provision of permanent markers. The Nuclear Energy Ordinance requires the Canton to enter in the land register information on the protection area defined for the disposal facility (see Section H.7.2).

H.7.2 Institutional Controls (Clause ii)

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility active or passive institutional controls such as monitoring or access restrictions are carried out, if required.

The safe and permanent disposal of radioactive waste is required by the Nuclear Energy Act to be realized in such a way that the long-term safety does not rely on active surveillance and maintenance. However, continuing monitoring after closure of a disposal facility is allowed and foreseen. The Nuclear Energy Act establishes a protection area around a disposal facility. This is the underground area where intrusions may impair the long-term safety of the disposal facility. It includes all parts of the repository, the host rock parts relevant for the isolation and for the retention of released radionuclides. The protection area is defined provisionally in the general licence and definitively in the operation licence and is entered in the land register of the Canton. Future activities such as drillings, underground constructions or blastings, which may affect the protection area of a disposal facility, are subject to authorization. Since there are no disposal facilities to be closed in Switzerland in the near future, further details of the institutional controls after closure have not been decided yet. The Nuclear Energy Act allocates the corresponding decisions to the federal government.

H.7.3 Intervention Measures (Clause iii)

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility if, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary.

Switzerland has implemented a national monitoring programme of the radioactivity in the environment. This monitoring is performed by the Federal Office of Public Health (BAG). The environment of a closed disposal facility will be subject to the environmental radiation monitoring programme. The intervention measures to be taken in the case of increased environmental radiation are established by the radiation protection legislation and by the Ordinance on the Emergency Organization in Case of Increased Radioactivity. The responsibility for such potential intervention measures lies with the federal State.

Conclusion

The Swiss Party complies with the obligations of Article 17.

Section I Transboundary Movement (Article 27)

I.1 General Requirements (Paragraph 1)

Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.

I.1.1 Authorization by State of Destination (Clause i)

In so doing, a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination.

The import and export of radioactive material are subject to an authorization issued under the Nuclear Energy Act and the Nuclear Energy Ordinance (for nuclear material and radioactive waste) or the Radiological Protection Act and the Radiological Protection Ordinance (for other radioactive materials). As a general rule, export of radioactive waste for conditioning, storage or disposal abroad is prohibited. Exceptionally, a licence can be granted under restrictive conditions as listed in the Nuclear Energy Act, including the agreement of the state of destination and the obligation for the waste owner to take back the exported waste if necessary. Since sea dumping of radioactive waste ceased in the early 1980's, no radioactive waste has been exported from Switzerland for disposal purposes. Radioactive waste has been exported in the past for the purpose of treatment and conditioning, the conditioned waste being subsequently returned to Switzerland.

Export of spent fuel and radioactive waste for reprocessing, conditioning, storage or disposal, or for research purposes, is possible but subject to authorization.

1) A licence may be issued for the export of spent fuel elements for reprocessing purposes if the following conditions are met in full:

   - The state of destination has agreed to the import for the stated purposes within the framework of an international agreement and that state and Switzerland have agreed upon the return of the reprocessing waste.
   - There is in the state of destination a reprocessing facility fulfilling the requirements imposed by the internationally recognized state of science and technology.
   - The transit state has agreed to the transit.
   - There is a binding agreement between the exporter and the importer that the exporter agrees to take back, if necessary, the fuel which has not yet been reprocessed, and that this agreement has been approved by the authority designated by the Federal Council.
   - The state of destination must have ratified international conventions on the safety of nuclear facilities and on the treatment of spent fuel and radioactive waste.
   - Reprocessing must be controlled by an international organization.

- Contracts must be in place, ensuring the use of the full amount of separated plutonium for the production of MOX fuel.

2) In the case of export of radioactive waste for conditioning, the following conditions must be met in full:
   - The country of destination has consented to the import of radioactive waste for conditioning purposes in agreement under international law.
   - All countries concerned have given their consent to the transit of the radioactive waste in question.
   - The exporter has entered into a binding agreement with the importer of the radioactive waste that has been approved by the Federal Council or its designated authority and which stipulates that the exporter shall take back any waste that may result from conditioning or, if applicable, any radioactive waste that may not have been conditioned.
3) A licence for the export of radioactive waste for storage or disposal may be granted by way of exception if the conditions cited in the above paragraph 2) are met in full, and if the exporter has entered into a binding agreement with the importer of the radioactive waste that has been approved by the authority designated by the Federal Council and which stipulates that the exporter shall take back the consignment if necessary.

Authorizations were in the past regularly issued in the context of the reprocessing contracts between the Swiss utilities and COGEMA (France) and BNFL (UK) under the Atomic Act of 1959, which is no longer in force. In both cases there was and still is an agreement at government level between Switzerland and the country of reprocessing. Under the terms of these agreements Switzerland agrees to have the radioactive waste resulting from reprocessing returned to Switzerland in due course.

The Nuclear Energy Act introduces a 10-year moratorium on export of spent fuel for the purpose of reprocessing from 1 July 2006. The return of waste from reprocessing to Switzerland is not affected by this moratorium.

According to the Nuclear Energy Act, air transport within the Swiss airspace of plutonium containing nuclear materials is prohibited.

I.1.2 Movements through States of Transit (Clause ii)

In so doing, transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized.

Switzerland is a party to the European Agreement on the International Carriage of Dangerous Goods by Road (ADR) and by Rail (RID). Air transport is covered by the ICAO Dangerous Goods Regulations and transport on the Rhine river by the ADNR (Règlement pour le transport des matières dangereuses sur le Rhin). Licences for export are not issued unless the international obligations relevant to the modes of transport used are fulfilled.

I.1.3 Requirements for State of Destination (Clause iii)

In so doing, a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention.

The Radiological Protection Act prohibits the import of radioactive waste not originally arising from Switzerland for disposal purposes unless under an international agreement.

The import of radioactive waste originating from other countries can be exceptionally allowed if:

1) Switzerland has consented to the import of radioactive waste for disposal purposes in an agreement under international law;
2) Switzerland has a suitable nuclear facility that fulfils the latest international standards in science and technology;
3) all countries concerned give their consent to the transit of radioactive waste;
4) the importer and exporter of the radioactive waste consignment have signed a legally binding agreement that has been approved by the country of origin and stipulates that the exporter shall accept the consignment if it has to be returned.

Switzerland has the administrative and technical capacity, as well as the appropriate regulatory structure, so that it would be in a position to manage imported spent fuel or radioactive waste in a manner consistent with the Convention.

I.1.4 Meeting the Requirements for State of Destination (Clause iv)

In so doing, a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement.

According to the Nuclear Energy Act a licence is required for the export of spent fuel or radioactive waste. The conditions are explained in detail therein (see I.1.1). They ensure that the requirements of Article 27 Paragraph 1 Clause (iv) of the Convention are fulfilled.

I.1.5 Re-entry in Case of Non-Conformity (Clause v)

In so doing, a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

The Nuclear Energy Act requires explicitly a binding agreement between the exporter and the importer concerning the re-entry into Switzerland, if necessary, of radioactive waste to be exported for conditioning or disposal, as a condition for issuing the export licence.

The same applies for spent fuel for reprocessing or disposal.

I.2 Shipment South of Latitude 60 (Paragraph 2)

A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees south for storage or disposal.

Under current practice a licence for export and shipment of spent fuel or radioactive waste would not be issued, if the purpose of the export were storage or disposal at a latitude south of 60 degrees in the southern hemisphere. There are, however, no specific legal requirements in this respect.

Conclusion

Switzerland fulfils the requirements in Article 27 of the Convention, with the exception that shipments of spent fuel or radioactive waste to a destination south of latitude 60 degrees south are not explicitly prohibited. In practice however, no licence would be issued for such a transport.

Section J Disused Sealed Sources (Article 28)

J.1 Possession, Remanufacturing and Disposal (Paragraph 1)

Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.

Handling of radiation sources requires a licence according to the Radiological Protection Act. The Federal Office of Public Health (BAG) maintains and updates a list of the existing sealed radiation sources in the licence holder database. The possession of such sources is subject to certain obligations as detailed in the following paragraph. It is therefore in the interest of the owner to deliver disused sources as soon as possible to the National Collection Centre. The costs of this process are borne by the owner. In case of orphan sources, the regulatory agencies (BAG and Suva) organise the delivery to the National Collection Centre at PSI, and the Federal State takes over all expenses.

The use of sealed radiation sources is regulated by the Radiological Protection Act and the corresponding Ordinances. The radiation protection legislation requires minimization of radioactive waste. According to this requirement, disused sealed sources shall, as far as possible, be recycled for further use. If this is not possible, disused sealed sources are to be managed as radioactive waste. Non recyclable disused sealed sources must thus be delivered to the National Collection Centre for radioactive waste at PSI. PSI is responsible for the conditioning and storage of such sources and, eventually, for delivering them to a radioactive waste disposal facility.

J.2 Re-entry into Territory (Paragraph 2)

A Contracting Party shall allow for re-entry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.

There are no manufacturers of sealed radiation sources in Switzerland. Therefore, no authorization for re-entry into Swiss territory of disused sealed sources for the purpose of recycling has been applied for. However, Switzerland would allow re-entry into its territory of disused sealed sources if facilities authorized to manufacture and recycle such devices existed in Switzerland. The prerequisites for such an import are set forth in the Radiological Protection Ordinance.

Conclusion

The Swiss Party complies with the obligations of Article 28.

Section K Planned Activities to Improve Safety

As is shown in the present report, the safety of spent fuel management and the safety of radioactive waste management in Switzerland are in compliance with the obligations of the Convention. There is thus no imminent need for measures to improve safety in Switzerland. However, Switzerland strives for continuing improvement of safety. In this regard, the following three activities may be mentioned.

The new legislation on nuclear energy, which was put into force on 1 February 2005, requests several further ordinances which have still to be developed. Also the full set of Regulatory Guidelines issued by HSK must be checked against and adapted to the new legislation and complemented where necessary or useful. This work concerns first of all nuclear safety, but has also to be done in the field of spent fuel and radioactive waste management. Revision and completion of the set of HSK Regulatory Guidelines is expected to take several years.

A site selection procedure for disposal facilities taking account of stakeholder participation is currently being developed by the federal authorities. The cantons and the neighbouring countries will be involved in the elaboration of this site selection procedure. It is expected that the Federal Council will decide on the procedure in 2006. The procedure should then be implemented in order to determine the sites where the disposal facilities will be constructed. The site selection procedure will be carried out from scratch for the repository for low and intermediate level waste.

On the basis of the technical review by the competent authorities of the project “Opalinus Clay” submitted by Nagra and of the results of the public consultation which will take place in late 2005, the Federal Council will take a decision in 2006 regarding the demonstration of feasibility of the disposal of high level waste in Switzerland. At the same time, the Federal Council will define the subsequent steps in the site selection procedure mentioned above, in view of the disposal of high level and alpha-toxic waste.

Section L Annexes

L.1 List of Abbreviations

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ADNR	Regulations for the Carriage of Dangerous Goods in the Rhine
AGNEB	Interdepartmental Working Group on Radioactive Waste Management
ALARA	“As low as reasonably achievable”
ATA	Alpha-toxic waste
BAG	Federal Office of Public Health, Swiss regulatory body for non-nuclear practices
BFE	Federal Office of Energy
BWR	Boiling water reactor
BUWAL	Federal Office of the Environment, Forests and Landscape
BZL	Federal Storage Facility at PSI for all non-nuclear radioactive waste originating from medicine, industry and research
EOR	Emergency Organization in Case of Increased Radioactivity
FLAG	New Public Management System of the Federal Government
HAA	High level waste
HLW	High level waste
HSK	Swiss Federal Nuclear Safety Inspectorate, Swiss regulatory body
IAEA	International Atomic Energy Agency
ICAO	International Civil Aviation Organization
ICRP	International Commission on Radiation Protection
ISRAM	Information System for Radioactive Materials
KNE	Commission on Nuclear Waste Management
KSA	Swiss Federal Nuclear Safety Commission
LILW_LL	Low and intermediate level waste, long-lived
LILW_SL	Low and intermediate level waste, short-lived
MOX	Mixed oxide fuel
NAZ	National Emergency Operations Centre
Nagra	National Cooperative for the Disposal of Radioactive Waste
NPP	Nuclear power plant
OECD	Organization of Economic Co-operation and Development
PSI	Paul Scherrer Institute at Villigen and Würenlingen: PSI operates the National Collection Centre for non-nuclear radioactive waste, as well as the BZL
PWR	Pressurised water reactor
QM	Quality management
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SMA	Low and intermediate level waste

Suva	Swiss Accident Insurance Institute
UVEK	Federal Department for Environment, Transport, Energy and Communication
ZWIBEZ	Interim storage facility at Beznau NPP
ZWILAG	Company that owns and operates ZZL
ZZL	Central Storage Facility at Würenlingen

L.2 References to National Laws and Regulations

L.2.1 Legislation[1] (Acts and Ordinances)

Acts

- Nuclear Energy Act (Loi fédérale sur l'énergie nucléaire), RS 732.1, 21 March 2003.
- Environmental Protection Act (Loi fédérale sur la protection de l'environnement), RS 814.01, 7 October 1983.
- Water Protection Act (Loi fédérale sur la protection des eaux), RS 814.20, 24 January 1991.
- Radiological Protection Act (Loi sur la radioprotection), RS 814.50, 22 March 1991.

Ordinances

- Alert Ordinance (Ordonnance sur l'alarme), RS 520.12, 3 December 2003.
- Ordinance on the Decommissioning Fund (Ordonnance concernant le fonds pour la désaffectation d'installations nucléaires), RS 732.013, 5 December 1983.
- Ordinance on the Waste Management Fund (Ordonnance sur le fonds pour la gestion des déchets radioactifs provenant des centrales nucléaires), RS 732.014, 6 March 2000.
- Nuclear Energy Ordinance (Ordonnance sur l'énergie nucléaire), RS 732.11, 10 December 2004.
- Ordinance on the Emergency Organization in Case of Increased Radioactivity (Ordonnance relative à l'organisation d'intervention en cas d'augmentation de la radioactivité), RS 732.32, 26 June 1991.
- Emergency Protection Ordinance (Ordinance sur la protection en cas d'urgence au voisinage des installations nucléaires), RS 732.33, 28 November 1983.
- Radiological Protection Ordinance (Ordonnance sur la radioprotection), RS 814.501, 22 June 1994 (current issue: 1 February 2005).

[1] RS (Recueil Systématique) refers to the classification system of the Swiss legislation.

- Iodine Tablet Ordinance (Ordinance sur la distribution de comprimés d'iode à la population), RS 814.52, 1 July 1992.
- Ordinance on the Use of Unsealed Radiation Sources (Ordonnance sur l'utilisation des sources radioactives non scellées), RS 814.554, 21 November 1997.
- Ordinance on the Collection of Radioactive Waste (Ordonnance sur les déchets radioactifs soumis à l'obligation de livraison), RS 814.557, 3 September 2002.

L.2.2 List of the Inspectorate's (HSK) Regulatory Guidelines

The following table presents the Regulatory Guidelines currently in force in Switzerland. All Guidelines are originally written in German. Guidelines denoted /e are also available in English, whereas Guidelines provided with * are available in German only.

Status: 31.12.2004

Note: All guidelines are available on the HSK web site www.hsk.ch.

Guideline	Title of Guideline	Date of current issue
HSK-R-04/d *	Supervisory procedures governing the construction of nuclear power plants: Design of buildings (Aufsichtsverfahren beim Bau von Kernkraftwerken, Projektierung von Bauwerken)	December 1990
HSK-R-05/d *	Supervisory procedures governing the construction of nuclear power plants: Mechanical equipment (Aufsichtsverfahren beim Bau von Kernkraftwerken, mechanische Ausrüstungen)	October 1990
HSK-R-06/d *	Safety classification, interface between classes and construction regulations concerning equipment of light water reactor nuclear power plants (Sicherheitstechnische Klassierung, Klassengrenzen und Bauvorschriften für Ausrüstungen in Kernkraftwerken mit Leichtwasserreaktoren)	May 1985
HSK-R-07/d *	Guideline for radiation protection zones in nuclear installations and in the Paul Scherrer Institute (Richtlinie für den überwachten Bereich der Kernanlagen und des Paul Scherrer Institutes)	June 1995
HSK-R-08/d *	Safety of buildings for nuclear installations: Federal supervisory procedures for the construction (Sicherheit der Bauwerke für Kernanlagen, Prüfverfahren des Bundes für die Bauausführung)	May 1976
HSK-R-11/d *	Radiation protection objectives in the normal operation of nuclear installations (Strahlenschutzziele im Normalbetrieb von Kernanlagen)	May 2003
HSK-R-12/d	Determining and reporting the doses of occupationally radiation exposed personnel of nuclear installations and the Paul Scherrer Institute (Erfassung und Meldung der Dosen des strahlenexponierten Personals der Kernanlagen und des Paul Scherrer Institutes)	October 1997
HSK-R-13/d *	Clearance of materials and areas from controlled zones (Inaktivfreigabe von Materialien und Bereichen aus kontrollierten Zonen) (Freimessrichtlinie)	February 2002
HSK-R-14/d *	Requirements for the conditioning of radioactive waste (Anforderungen an die Konditionierung radioaktiver Abfälle)	March 2004
HSK-R-15/d *	Reporting guideline concerning the operation of nuclear power plants (Berichterstattung über den Betrieb von Kernkraftwerken)	November 2004
HSK-R-16/d *	Seismic plant instrumentation (Seismische Anlageninstrumentierung)	February 1980
HSK-R-17/d	Organisation von Kernkraftwerken	June 2002
HSK-R-17/e	Organization of nuclear power plants	June 2002

Guideline	Title of Guideline	Date of current issue
HSK-R-18/d *	Supervision of repairs, modifications and replacement of mechanical equipment in nuclear installations (Aufsichtsverfahren bei Reparaturen, Änderungen und Ersatz von mechanischen Ausrüstungen in Kernanlagen)	December 2000
HSK-R-21/d	Schutzziele für die Endlagerung radioaktiver Abfälle	November 1993
HSK-R-21/e	Protection Objectives for the Disposal of Radioactive Waste	November 1993
HSK-R-21/f	Objectifs de protection pour le stockage final des déchets radioactifs	November 2003
HSK-R-23/d *	Revisions, testing, replacement, repair and modification of electrical equipment in nuclear installations (Revisionen, Prüfungen, Ersatz, Reparaturen und Änderungen an elektrischen Ausrüstungen in Kernkraftwerken)	January 2003
HSK-R-25/d *	Reporting guideline concerning the operation of the nuclear installations of the Swiss Confederation and the cantons (Berichterstattung über den Betrieb der Kernanlagen des Bundes und der Kantone)	May 2005
HSK-R-27/d *	Selection, training and examination of NPP staff requiring a licence (Auswahl, Ausbildung und Prüfung des lizenzpflichtigen Betriebspersonals von Kernkraftwerken)	May 1992
HSK-R-29/d *	Requirements for the interim storage of radioactive waste (Anforderungen an die Zwischenlagerung radioaktiver Abfälle)	March 2004
HSK-R-30/d *	Supervisory procedures for construction and operation of nuclear installations (Aufsichtsverfahren beim Bau und Betrieb von Kernanlagen)	July 1992
HSK-R-31/d *	Supervisory procedures governing the construction and the backfitting of nuclear power plants: 1E classified electrical equipment (Aufsichtsverfahren beim Bau und dem Nachrüsten von Kernkraftwerken, 1E klassierte elektrische Ausrüstungen)	October 2003
HSK-R-32/d *	Guideline for meteorological measurement on sites of nuclear installations (Richtlinie für die meteorologischen Messungen an Standorten von Kernanlagen)	September 1993
HSK-R-35/d *	Supervisory procedures governing the construction of nuclear power plants: System engineering (Aufsichtsverfahren beim Bau und Änderungen von Kernkraftwerken, Systemtechnik)	May 1996
HSK-R-37/d *	Appreciation of education and training in radiation protection within the supervisory domain of HSK (Anerkennung von Strahlenschutz-Ausbildungen und -Fortbildungen im Aufsichtsbereich der HSK)	July 2001
HSK-R-39/d *	Registration of radiation sources and material testers on a nuclear installation site (Erfassung der Strahlenquellen und Werkstoffprüfer im Kernanlagenareal)	January 1990
HSK-R-40/d *	Filtered containment venting for light water reactors: design requirements (Gefilterte Druckentlastung für den Sicherheitsbehälter von Leichtwasserreaktoren, Anforderungen für die Auslegung)	March 1993
HSK-R-41/d *	Calculation of the radiation exposures in the vicinity of nuclear installations due to emissions of radioactive materials (Berechnung der Strahlenexposition in der Umgebung aufgrund von Emissionen radioaktiver Stoffe aus Kernanlagen)	July 1997

Guideline	Title of Guideline	Date of current issue
HSK-R-42/d *	Zuständigkeiten für die Entscheide über besondere Massnahmen bei einem schweren Unfall in einer Kernanlage	February 2000
HSK-R-42/e	Responsibility for decisions to implement particular measures to mitigate the consequences of a severe accident at a nuclear power plant	July 2003
HSK-R-45/d	Planung und Durchführung von Notfallübungen in den schweizerischen Kernanlagen	January 2004
HSK-R-45/e	Planning and execution of emergency exercises in Swiss nuclear installations	January 2004
HSK-R-46/d *	Requirements for the application of safety relevant computer based power system management in nuclear power plants (Anforderungen für die Anwendung von sicherheitsrelevanter rechnerbasierter Leittechnik in Kernkraftwerken)	April 2005
HSK-R-47/d *	Testing of radiation measuring instruments (Prüfung von Strahlenmessgeräten)	October 1999
HSK-R-48/d *	Periodic safety review of nuclear power plants (Periodische Sicherheitsüberprüfung von Kernkraftwerken)	November 2001
HSK-R-49/d *	Technical safety requirements for the securing of nuclear installations (Sicherheitstechnische Anforderungen an die Sicherung von Kernanlagen)	December 2003
HSK-R-50/d *	Safety requirements concerning fire prevention in nuclear power plants (Sicherheitstechnische Anforderungen an den Brandschutz in Kernanlagen)	March 2003
HSK-R-51/d *	Ageing surveillance of mechanical and electrical equipment as well as buildings in nuclear installations (Alterungsüberwachung für mechanische und elektrische Ausrüstungen sowie Bauwerke in Kernanlagen)	November 2004
HSK-R-52/d	Transport- und Lagerbehälter (T/L-Behälter) für die Zwischenlagerung	July 2003
HSK-R-52/e	Transport and storage casks (T/S Casks) for interim storage	November 2003
HSK-R-60/d *	Surveillance of fuel element production (Überprüfung der Brennelementherstellung)	March 2003
HSK-R-61/d *	Supervision of the use of fuel elements and control rods in light water reactors (Aufsicht beim Einsatz von Brennelementen und Steuerstäben in Leichtwasserreaktoren)	June 2004
HSK-R-100/d *	Nachweis ausreichender Vorsorge gegen Störfälle in Kernkraftwerken (Störfall-Richtlinie)	December 2004
HSK-R-101/d	Auslegungskriterien für Sicherheitssysteme von Kernkraftwerken mit Leichtwasser-Reaktoren	May 1987
HSK-R-101/e	Design Criteria for Safety Systems of Nuclear Power Plants with Light Water Reactors	May 1987
HSK-R-102/d	Auslegungskriterien für den Schutz von sicherheitsrelevanten Ausrüstungen in Kernkraftwerken gegen die Folgen von Flugzeugabsturz	December 1986
HSK-R-102/e	Design criteria for the protection of safety equipment in NPPs against the consequences of airplane crash	December 1986

Guideline	Title of Guideline	Date of current issue
HSK-R-103/d *	Plant internal measures against the consequences of severe accidents (Anlageinterne Massnahmen gegen die Folgen schwerer Unfälle)	November 1989

Impressum
Implementation of the obligations of the Joint Convention –
The second Swiss report in accordance with Article 32
September 2005

Publisher
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Obtainable from
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