Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

Programme for the responsible and safe management of spent fuel and radioactive waste

(National programme)

DRAFT of 6 January 2015

Content

Preface *3*

1 General principles of waste management policy *5*

2 Current inventory and prediction of radioactive waste *7*

2.1 Spent fuel and waste from reprocessing **7**

2.1.1 Current Inventory 7

2.1.2 Prediction 8

2.2 Other radioactive waste (waste with negligible heat-generation) **9**

2.2.1 Current inventory 9

2.2.2 Prediction 10

3 Radioactive waste management *11*

3.1 Management of the spent fuel and the waste from reprocessing **11**

3.1.1 Storage 11

3.1.2 Disposal 12

3.1.3 Research 13

3.2 Management of waste with negligible heat-generation **14**

3.2.1 Dismantling of nuclear facilities and installations 14

3.2.2 Conditioning and storage of waste 15

3.2.3 Konrad disposal facility 15

3.2.4 Asse II mine 16

3.2.5 Morsleben disposal facility for radioactive waste 17

4 Legal framework of nuclear waste management in Germany *18*

5 Public involvement *19*

5.1 National programme **19**

5.2 Site Selection Act **19**

5.3 Licensing procedure for waste management installations and facilities **20**

6 Cost and funding *21*

6.1 Costs to be borne by the public sector and their funding **21**

6.2 Costs to be borne by the private operators and their funding **22**

6.3 Costs of the disposal facilities **22**

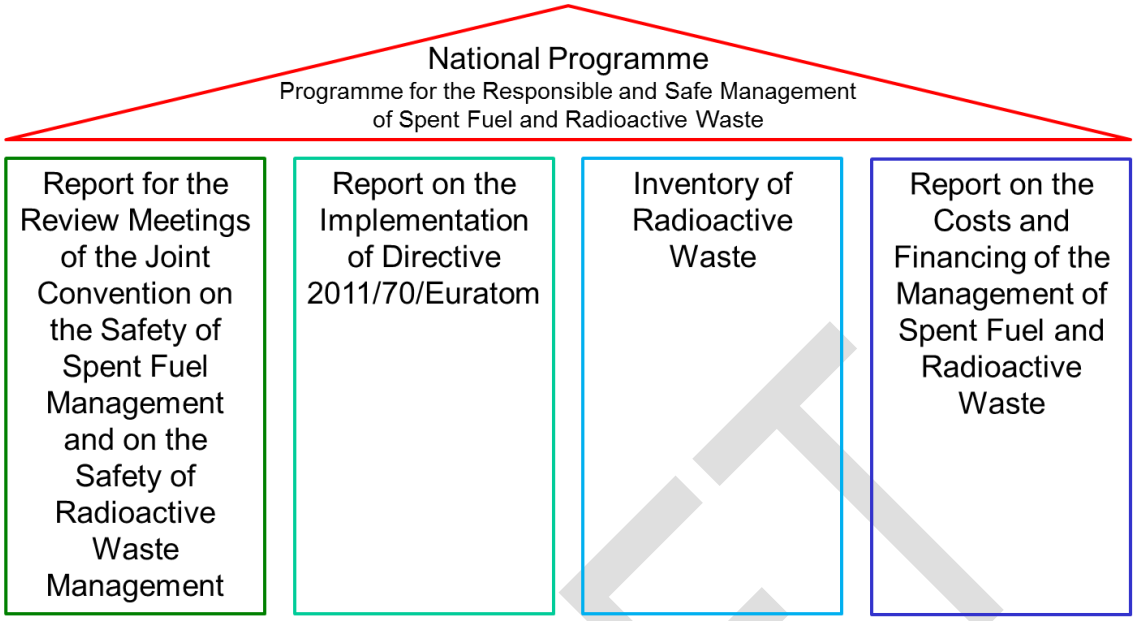
Preface

The Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste obliges the Member States of the European Union to prepare national programmes and to notify them to the Commission by 23 August 2015; any subsequent significant changes are also to be notified.

The German Federal Government's national programme is drafted under the leadership of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety and specifies the strategy for the responsible and safe management of spent fuel and radioactive waste. The national programme is subject to potential revision as major changes may ensue on the basis of the suggestions of the German parliament's *Commission on Storage of High-Level Radioactive Waste* pursuant to Section 3 of the Site Selection Act.

The Federal Government will meet its reporting obligation imposed by Directive 2011/70/Euratom by submitting several documents (Fig. 0.1). The national programme contains a programmatic overview of the German waste management policy. The current status of waste management is reported every three years in the *Report for the Review Meetings of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*. Progress in the implementation of the national programme will also be reported every three years (for the first time on 23 August 2015) within the framework of the *Report on the Implementation of Directive 2011/70/Euratom* to the European Commission. In this context, the *Inventory of Radioactive Waste (current inventory and prediction)* will be updated and submitted to the European Commission. This also applies to the *Report on the Costs and Financing of the Management of Spent Fuel and Radioactive Waste*.

Fig. 0.1: Concept of the Federal Government to fulfil its reporting obligation within the framework of Directive 2011/70/Euratom



1 General principles of waste management policy

The utilisation of nuclear fission for the commercial generation of electricity in the Federal Republic of Germany will be terminated in the year 2022 at the latest. The delivery of spent fuel from installations for the fission of nuclear fuels for the commercial generation of electricity (referred to in the following as nuclear power plants) to reprocessing plants has been banned since 1 July 2005.

According to the Atomic Energy Act (Atomgesetz – AtG), providing facilities for the safekeeping and disposal of radioactive waste is a federal task. The Federal Government plans to dispose of all types of radioactive waste at two sites in deep geological disposal facilities. To this end, the Konrad mine at Salzgitter is currently being converted into a disposal facility for radioactive waste with negligible heat generation. The site of a disposal facility especially for heat-generating radioactive waste will be determined by a selection procedure.

Against this background, the fundamental elements of the national programme are characterised by the following key points:

- The management of radioactive waste shall as a rule be carried out within German national responsibility. Disposal is to be on German national territory. Spent fuel from research, development and demonstration reactors may be shipped to a country where research reactor fuels are supplied or manufactured.
- Disposal facilities are to be established at two sites: the Konrad disposal facility for radioactive waste with negligible heat generation and a disposal facility according to the Site Selection Act especially for heat-generating radioactive waste.
    - The radioactive waste in the Asse II mine is to be retrieved and as a precaution considered in the planning of the disposal facility according to the Site Selection Act; an extension of the Konrad disposal facility for suitable waste is not precluded and is to be examined following its commissioning, if necessary.
    - Providing for the case that it will not be reutilised, the depleted uranium that has been generated and will be generated in Germany as a result of uranium enrichment, as a precaution, is to be considered in the planning of the disposal facility according to the Site Selection Act; an extension of the

Konrad disposal facility to include this radioactive material is not precluded and is to be examined following its commissioning, if necessary.

- The dismantling of all nuclear power plants as well as of other nuclear facilities and installations taken out of operation during the period under consideration is to be executed, subject to an available disposal facility, in due time so that the negligible heat-generating radioactive waste generated during this process can be emplaced in the Konrad disposal facility.

- The Konrad disposal facility is expected to become operational in the year 2022. The emplacement operation for the licensed waste volume of 303,000 m^3 is to not exceed 40 years.
- The site for the disposal facility especially for heat-generating radioactive waste is to be determined by the year 2031 according to the Site Selection Act. The disposal facility is to be commissioned around the year 2050.
- With the first partial license for the disposal facility for especially heat-generating radioactive waste, a receiving storage facility is also to be approved at the site for all spent fuel and waste from reprocessing, and therewith provide the precondition for the start of clearing the existing storage facilities.
- Until then, the spent fuel and waste from reprocessing is to be kept at the existing storage facilities.
- Emplacement of low-level and medium-level radioactive waste in the Morsleben disposal facility for radioactive waste has been concluded. The disposal facility is to be closed and safely sealed for the long term.

With regard to the management of radioactive waste, up to the delivery to a disposal facility or a Land collecting facility, the polluter-pays principle applies in terms of the obligation to act. So those handling radioactive material shall make provisions to ensure that residual radioactive material as well as disassembled or dismantled radioactive components are utilised without detrimental effects or are disposed of as radioactive waste in controlled manner (direct disposal).

Radioactive waste from industrial, medical and research applications initially has to be delivered to a Land collecting facility and has to be stored there. The Land collecting facilities will deliver the radioactive waste stored within their responsibility to a disposal facility.

2 Current inventory and prediction of radioactive waste

A detailed breakdown of the current inventory of radioactive waste can be found in the report *Inventory of Radioactive Waste*. This inventory is updated every three years.

2.1 Spent fuel and waste from reprocessing

2.1.1 Current Inventory

As at 31 December 2013, about 8 216 Mg HM[1)] have been generated in the form of spent fuel assemblies (FA) from the operation of nuclear power plants in the Federal Republic of Germany which have to be disposed of directly in the Federal Republic of Germany. Their current storage locations are shown in Tab. 2.1.

Tab. 2.1: Inventory of spent fuel from German nuclear power plants, stored in Germany, as at 31 December 2013

Storage location	Casks	Fuel assemblies	Mass
Nuclear power plant storage pools*		13 981 FA	4 292 Mg HM
Dry cask storage in on-site storage facilities	332	9 225 FA	3 249 Mg HM
Dry cask storage in the transport cask storage facilities at Ahaus, Gorleben and Rubenow	76	5 343 FA	675 Mg HM
	Total:	**28 549 FA**	**8 216 Mg HM**

*including the wet storage facility at the site of the Obrigheim nuclear power plant, which is being decommissioned, and the reactor core of the permanently closed down Brunsbüttel nuclear power plant

Vitrified high-level radioactive waste from the reprocessing of spent fuel in other European countries and in Germany is stored in 113 casks in the Gorleben transport cask storage facility and the transport cask storage facility "Zwischenlager Nord" at Rubenow.

The amount of spent fuel originating from research, development and demonstration reactors is stored in the wet storage facilities of the research reactors in Berlin, Garching and Mainz as well as in 479 casks (dry storage) in the Ahaus and Jülich

1) Megagrams of heavy metal (Mg HM) is the unit of the mass of heavy metal and hence a measure for the fuel content (uranium and plutonium) of a fuel assembly.

storage facilities and the "Zwischenlager Nord" and is clearly lower than the amount of fuel from nuclear power plants that has to be managed.

2.1.2 Prediction

In all, the assumption is that about 10 500 Mg HM in the form of spent fuel assemblies (including the amount that has already accumulated) will be generated in nuclear power plants and will have to be disposed of. Tab. 2.2 shows the amounts of vitrified high-level radioactive waste from reprocessing of spent fuel that has already been returned from France and from the United Kingdom and the amounts of waste still expected.

Tab. 2.2: Prediction (including current inventory) of the amounts of radioactive waste from reprocessing that has to be disposed of in the Federal Republic of Germany

	Canisters	**Casks**
Vitrified high-level radioactive waste from France	3024	108
Vitrified medium-level radioactive waste from France	140	5
Medium-level radioactive waste from France compacted under high pressure	4104	152
Vitrified high -level radioactive waste from the United Kingdom	565	21
Vitrified high-level radioactive waste from reprocessing in Karlsruhe	140	5
Total	**7973**	**291**

From the research, development and demonstration reactors, a waste volume in the range of 10 to 12 Mg HM is expected.

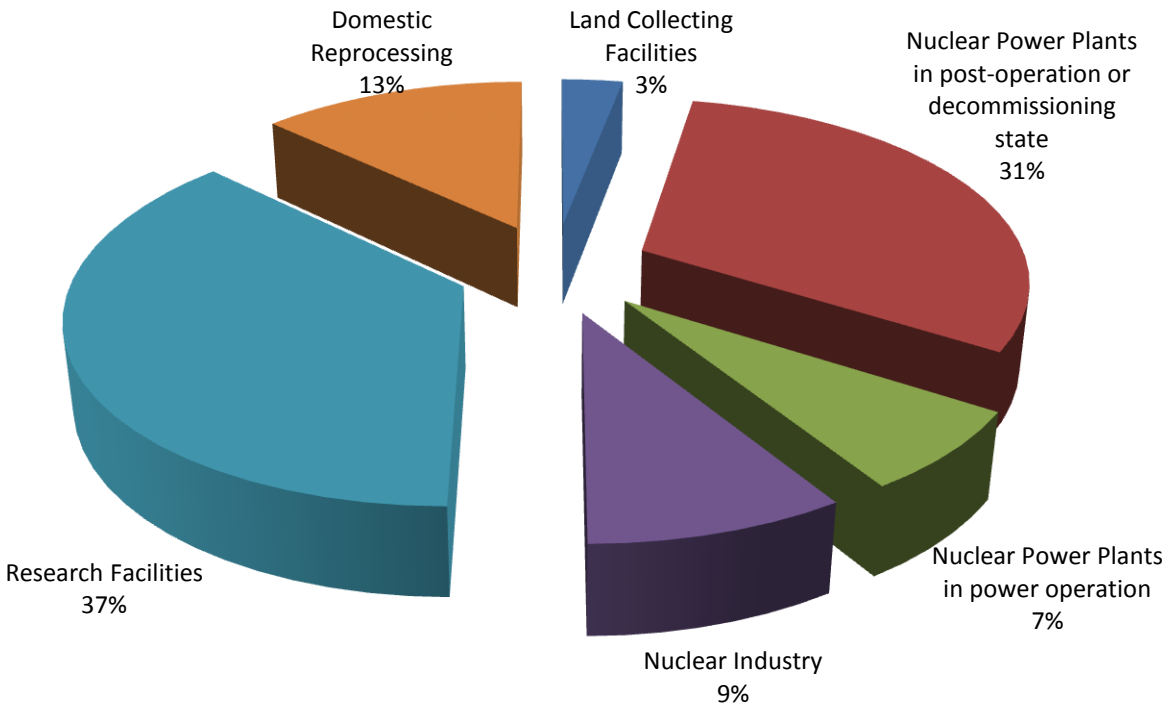
As regards the research reactor in Berlin, contracts exist governing the return shipment of spent fuel assemblies generated until the year 2016 to their country of origin.

2.2 Other radioactive waste (waste with negligible heat-generation)

2.2.1 Current inventory

The current inventory of other radioactive waste is shown in Tab. 2.3. The breakdown into groups of originators of the total conditioned radioactive waste volume of around 114 000 m³ existing as at 31 December 2013 is shown in Fig. 2.1.

Fig. 2.1: Breakdown of the current inventory of other conditioned radioactive waste by groups of waste originators as at 31 December 2013



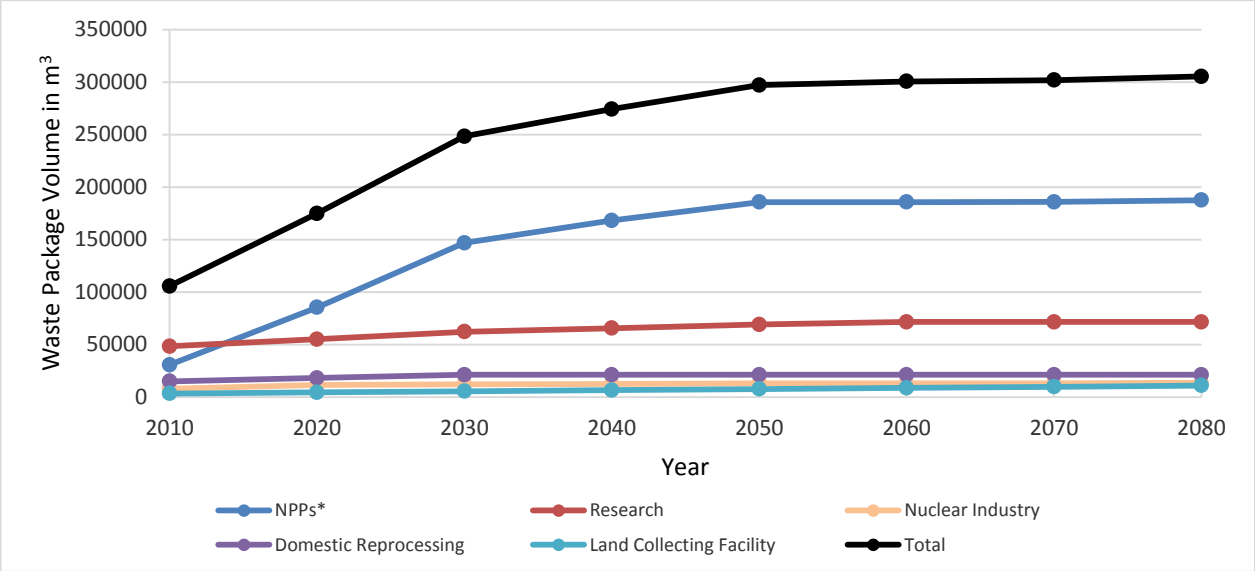
Tab. 2.3: Current inventory of other radioactive waste (as at 31 December 2013)

Processing condition	Amount
Primary waste and pre-treated waste	20 221 Mg
Conditioned waste products	16 634 m^3
Waste packages for disposal	97 438 m^3

2.2.2 Prediction

The time pattern of the cumulated amount of radioactive waste with negligible heat generation as it is expected by the waste originators and which according to the valid plan approval decision are to be emplaced in the Konrad disposal facility is shown in Fig. 2.2. After 2045, no larger amounts of waste from the decommissioning of nuclear power plants are expected any more.

Fig. 2.2: The time pattern of the cumulated amount of radioactive waste with negligible heat generation as it is expected by the waste originators and which according to the valid plan approval decision are to be emplaced in the Konrad disposal facility, shown as waste package volume until the year 2080



* this also includes the waste volumes of the federally-owned Energiewerke Nord GmbH

In the Asse II mine, around 47 000 m³ of low- and medium-level radioactive waste have been emplaced. According to current estimates, the retrieval will produce an accumulation of at least 90 000 Mg of unconditioned waste; after conditioning, this will result in a waste volume of approx. 175 000 to 220 000 m³ for later disposal.

In case that there will be no further reutilisation, the expected waste package volume of waste resulting from uranium enrichment is up to 100 000 m^3 of depleted uranium.

3 Radioactive waste management

3.1 Management of the spent fuel and the waste from reprocessing

3.1.1 Storage

Spent fuel and waste from reprocessing is stored in transport cask storage facilities. Apart from the on-site storage facilities at the nuclear power plant sites, there are the transport cask storage facilities at Gorleben and Ahaus and the "Zwischenlager Nord".

Presumably by the year 2027, all fuel assemblies used in the nuclear power plants will have been placed in a total of about 1,100 transport and storage casks and removed to transport cask storage facilities. The radioactive waste to be returned from reprocessing has also been placed in transport and storage casks. For this waste from reprocessing, a total of 291 transport and storage casks are needed according to a current prediction (see also Tab. 2.2).

Spent fuel from research, development and demonstration reactors is or has usually been returned to a country in which research reactor fuels are supplied or manufactured. Where this is or has not been possible, the spent fuel is to be stored in transport and storage casks in storage facilities until it can be emplaced in a disposal facility according to the Site Selection Act.

The dry storage of spent fuel and waste from reprocessing in transport and storage casks has proved to be effective. In Germany, there are sufficient storage capacities available for accommodating all spent fuel and radioactive waste from reprocessing.

According to the licences that have been granted, the storage periods for transport and storage casks are limited to 40 years. According to current findings it cannot be guaranteed that the storage facilities will be fully cleared during this period. Hence the technical prerequisites for a prolonged storage at the sites of the storage facilities are currently being examined.

3.1.2 Disposal

On 27 July 2013[2)], the Act on the search for and selection of a site for a disposal facility for heat-generating radioactive waste and for the amendment of other laws – the so-called Site Selection Act (Standortauswahlgesetz – StandAG) – entered into force. The aim of the site selection procedure according to the Site Selection Act is to find the site for a disposal facility especially for high-level radioactive waste. This disposal facility is to take in especially spent fuel and waste from reprocessing. In 2014, the German Bundestag and Bundesrat began the implementation of the Act by setting up the *Commission on Storage of High-Level Radioactive Waste*. The selection procedure for the site of this disposal facility is to be concluded by 2031. The planning of this disposal facility considers not only the spent fuel and waste from reprocessing but also the radioactive waste with negligible heat-generation that may not be suitable for emplacement in the Konrad disposal facility. This concerns radioactive waste that owing to its nuclide inventory and/or its chemical composition or the time of its generation is not suitable for emplacement in the Konrad disposal facility. Furthermore, this may concern retrieved radioactive waste from the Asse II mine as well as depleted uranium from uranium enrichment if this is not reutilised.

The Site Selection Act mentions rock salt, clay and crystalline rock as possible host rock types. Research and development activities regarding all three host rock types have already been carried out for many years. The available research results are considered in the exploration, assessment and designation of regions in Germany with potentially suitable host rock formations.

Once a disposal facility site according to the Site Selection Act has been determined, a receiving storage facility with a corresponding conditioning plant is to be constructed at the same site. This would create the conditions to commence the clearance of the existing storage facilities. The Federal Government plans to take the disposal facility into operation around the year 2050. The time needed for the actual emplacement depends on the disposal facility concept.

The fact that the Site Selection Act has entered into force means that the basis for the search for a disposal facility especially for heat-generating waste has been established. The selection steps, time marks, responsibilities and tasks of the organisations

[2)] Some of the regulations of this Act entered into force on 1 January 2014.

involved as well as the broad involvement of the general public in the selection process, all of which is stipulated in the act, form the basis for a transparent and comprehensible procedure.

3.1.3 Research

According to the Atomic Energy Act (§ 9a para. 3), the provision of disposal facilities for radioactive waste is a federal task. Hence, besides the provision of the scientific and technical basis for the realisation of a disposal facility, the Federal Government also has to make provisions for continuously furthering the state of the art in science and technology trough corresponding research and development and has to contribute substantially to building up, developing and maintaining the scientific and technical competence as well as to promoting young experts in this field. The guarantee of the provision of the requisite competence regarding mining and nuclear engineering is absolutely necessary at least until the decommissioning[3)] of the disposal facilities; hence suitable measures for maintaining competence have to be taken.

The respective current energy research programme of the Federal Government names the guideline for the future federal research and development sponsorship in the energy sector, thereby describing i.a. the research-political orientation of the activities in the field of research and development with respect to the sponsorship area of nuclear safety and waste management research. Corresponding research and development sponsorship concepts of the competent ministries put these general conditions in concrete terms and predetermine defined research focuses that are relevant for the sponsorship period. In this context, international co-operation plays an important role.

[3)] Decommissioning comprises all measures taken after the termination of emplacement, including the closure of the disposal facility, to establish a maintenance-free condition that ensures the long-term safety of the disposal facility.

3.2 Management of waste with negligible heat-generation

3.2.1 Dismantling of nuclear facilities and installations

Following the end of their operational use, nuclear facilities and installations (referred to in the following as installations) are to be dismantled and released from nuclear supervision. The aim is to re-establish the original condition of the so-called "greenfield" or to continue using the installations for conventional purposes.

The dismantling of all nuclear power plants as well as of other installations taken out of operation during the period under consideration is to be executed, subject to an available disposal facility, in due time so that the negligible heat-generating radioactive waste generated during this process can be emplaced in the Konrad disposal facility. By the timely commissioning of the Konrad disposal facility, the addition of further storage capacities after the commissioning of this disposal facility is to be avoided if possible, and this way the dismantling of the nuclear power plants is to be brought to a conclusion as soon as possible.

The plant operator has to present his chosen dismantling concept to the competent authority as part of his application for decommissioning. On the basis of the experience so far, the entire dismantling of a nuclear power plants is estimated to take on average a period of around 20 years per reactor unit. For each nuclear power plant, an average waste packet volume of around 5.000 m^3 of radioactive waste with negligible heat generation is expected.

As most dismantling projects follow the strategy of direct dismantling, it is assumed that all nuclear power plants will have been dismantled approximately by the year 2045. The radioactive waste with negligible heat generation generated during dismantling can thus be delivered to the Konrad disposal facility during its operating period.

The few plants that are currently still in safe enclosure (Lingen Nuclear Power Plant, Hamm-Uentrop Thorium High-Temperature Reactor, Research Reactor 2 (FR 2, Karlsruhe), Research Reactor Neuherberg) are to be dismantled in due time so that the radioactive waste with negligible heat generation generated can also be emplaced in the Konrad disposal facility during its operating period.

3.2.2 Conditioning and storage of waste

The radioactive waste that is delivered to the Konrad disposal facility has to comply with the waste acceptance requirements for disposal that apply to this disposal facility according to the plan approval. To this end, the radioactive waste has to be correspondingly conditioned and subjected to product control by the Federal Office for Radiation Protection (BfS) to verify compliance with the waste acceptance requirements for disposal. Product control comprises i.a. examinations of the radiological and material composition, type approval of waste containers, random sampling of waste packages, and the qualification of conditioning measures.

Until they are delivered to the Konrad disposal facility, the radioactive waste with negligible heat-generation remains in storage facilities, Land collecting facilities or a collecting facility of the armed forces, which have their own waste acceptance requirements for storage, respectively. Depending on the date of the commissioning of the Konrad disposal facility and the specific arrangements of the demand and delivery regime, it must be expected that even waste packages that have been conditioned to meet the waste acceptance requirements for disposal and have undergone product control will still have to be stored over longer periods of time. Insofar the capacities of the storage facilities have to be appropriately adapted. Already now, the nuclear power plant operators as well as the operators belonging to the public sector are planning additional storage capacities for the waste generated during the decommissioning of their installations.

3.2.3 Konrad disposal facility

The Konrad disposal facility, which is in the process of being constructed, has a plan approval to take in up to 303,000 m³ of radioactive waste with negligible heat-generation. Construction planning and work are underway.

Emplacement operation for the licensed waste volume of 303,000 m^3 is not to exceed 40 years.

The Konrad disposal facility is intended for the emplacement of low- and medium-level radioactive waste from the operation and dismantling of the nuclear power plants as well as from industrial, medical and research applications.

Following the commissioning of the Konrad disposal facility, it is to be examined if necessary whether an emplacement of further waste from the retrieval of radioactive waste from the Asse II mine and of depleted uranium from uranium enrichment that is not reutilised may be considered additional to the plan approval. What will also be investigated is whether the average amount of waste of 10,000 m^3 that is intended to be emplaced in a year may be increased so that the addition of further storage capacities after the commissioning of the disposal facility can be avoided if possible.

According to the plan approval concrete verification has to be provided prior to the approval of the final operational plan – i.e. towards the end of disposal facility operation – showing that the protection of third parties will be ensured according to the state of the art in science and technology also after the cessation of operation of the facility. After closure, no special official control and monitoring programme is intended. The plan approval demands that routine environmental measurements of the air, water and soil be carried out for the area of the disposal facility.

3.2.4 Asse II mine

The Asse II mine is a former potassium and rock salt mine. Between 1967 and 1978, about 47,000 m^3 of low-level and medium-level radioactive waste were emplaced in the Asse II mine.

The saline solutions entering into the underground structure of the mine and the stability problems caused in the mine by the extensive mine workings led to the decision to decommission the Asse II mine. With the entry into force of the Act to speed up the retrieval of radioactive Waste from and the closure of the Asse Mine (Lex Asse) on 25 April 2013, the retrieval was legally fixed as the option to be pursued for decommissioning. The aim is to retrieve the waste emplaced in the Asse II mine unless the execution of the retrieval should be unjustifiable for the public and/or the workers for radiological or other safety-relevant reasons.

According to current planning, retrieval cannot start prior to the year 2033; efforts are undertaken to allow an earlier start. The waste is to be conditioned on-site and stored until its disposal in a storage facility that is to be newly constructed.

3.2.5 Morsleben disposal facility for radioactive waste

Emplacement in the Morsleben disposal facility for radioactive waste, where around 37,000 m³ of low-level and medium-level radioactive waste was emplaced until 1998, has been concluded. The disposal facility is to be closed and safely sealed for the long term.

4 Legal framework of nuclear waste management in Germany

The legal basis of nuclear waste management in Germany is formed by the German Constitution, the German atomic energy and radiation protection law, the legal ordinances based on the latter, and the Site Selection Act. This legal framework regulates all areas of nuclear waste management with clear allocation of the corresponding responsibilities.

For the purpose of protection against the hazards posed by radioactive material and for the control of the utilisation of radioactive material, national atomic law generally makes the construction and operation of nuclear waste management installations as well as other facts and circumstances, such as the handling of radioactive material, subject to an official permit, usually a licence. Depending on the type of installation and activity, the licensing requirements are defined in different provisions of atomic energy and radiation protection law. The essential licences in the area of nuclear waste management are:

- § 6 (AtG) (storage of nuclear fuel),
- § 7 AtG (e.g. conditioning plant for spent fuel assemblies),
- § 9 AtG (treatment, processing or other uses of nuclear fuel outside the installations referred to in § 7 AtG),
- § 9b AtG (construction and operation of installations for the safe keeping and disposal of radioactive waste),
- § 4 AtG (nuclear fuel transport) and
- § 7 Radiation Protection Ordinance (handling of other radioactive material containing no or only little amounts of nuclear fuel).

The federal and Länder authorities dealing with affairs in the area of nuclear waste management have adequate measures for execution and sanctioning at their disposal, allowing them to control nuclear waste management and sanction any contraventions of granted permissions and nuclear and radiation protection regulations. The operation of a nuclear installation without a licence and the unlicensed handling of radioactive material are furthermore an offence under regulatory and criminal law.

The legal framework of nuclear waste management in Germany is explained in detail in the *Reports for the Review Meetings of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*.

5 Public involvement

5.1 National programme

As part of the drafting of the national programme and in case of essential future changes of this programme, a strategic environmental assessment according to the Environmental Impact Assessment Act has been/will be carried out. Here, the impacts of the national programme, including the alternatives considered, on the environment are assessed with public involvement.

5.2 Site Selection Act

In line with the fundamental objective of transparency in the area of nuclear waste management in Germany, the Site Selection Act sets boundary conditions for the information and involvement of the public.

This involvement takes the form of town hall meetings that are held in the local area of the project, i.e. in the regions and locations affected by the project. The results of the town hall meetings are to be taken into account in the respective decisions. In addition, debates with citizens in the affected regions/locations are to allow an open and pluralistic public dialogue. Special citizen's advice bureaus in the affected regions/locations are to ensure that the public has access to independent technical advice.

The Site Selection Act stipulates the involvement of the public regarding the proposals made by the project implementer – the Federal Office for Radiation Protection – prior to major decisions by the Federal Office for the Regulation of Nuclear Waste Management or any stipulations made by federal laws. In particular, this concerns the following steps:

- bases for decisions and recommendations for action given by the *Commission on Storage of High-Level Radioactive Waste* for the examination and assessment of the fundamental aspects of radioactive waste management that are relevant in connection with the selection procedure,
- proposal of site regions coming into consideration and selection of sites to be explored above ground,

- proposals for the site-specific exploration programmes and testing criteria,
- assessment of the results of the above-ground exploration and proposal of sites for underground exploration,
- proposals for the in-depth geological exploration programmes and testing criteria,
- results of the underground exploration and
- proposal of a site.

Besides the involvement of the public, the Site Selection Act also provides for the involvement of Länder authorities, communal head associations, local authorities and public agencies, depending on the procedural step and on whether and to what extent the former are affected.

The licensing procedure according to § 9b AtG, which follows the decision for a particular site, also contains participatory elements, albeit limited to citizens who are affected by the project (these are usually local residents) and authorities whose area of responsibility is affected by the project.

5.3 Licensing procedure for waste management installations and facilities

Within the framework of the licensing procedures for nuclear facilities and installations as well as within the framework of plan approval and licensing procedures for disposal facilities, the general public is involved by the respective competent federal or Länder authority to the extent that such involvement, especially for the execution of an environmental impact assessment, is required. The manner of public involvement in nuclear licensing procedures is regulated in the Nuclear Licensing Procedure ordinance (AtVfV).

Furthermore, pursuant to the legal regulations of the federal republic and the Länder concerning free access to environmental information, the nuclear authorities are obligated to pursue a policy of comprehensive and active information.

Information is also supplied at many sites of nuclear facilities and installations by the operators themselves.

6 Cost and funding

The plant operators are responsible for the decommissioning of nuclear facilities. The power utilities operating nuclear power plants as well as the producers of radioactive waste of the public sector and private operators of other nuclear installations are obligated as waste producers to bear all costs of the decommissioning (including dismantling) of their nuclear facilities and installations as well as of the disposal of the radioactive waste.

According to § 9a para. 3 AtG, the Länder have to establish Land collecting facilities for the storage of the radioactive waste generated on their territory. The waste producers are obligated to deliver radioactive waste to the corresponding facilities. According to §§ 21 ff. AtG, they have to bear the cost in line with the polluter-pays principle.

The costs of the individual steps of dismantling as well as of the conditioning, storage and disposal of spent fuel, waste from reprocessing and other radioactive waste are compiled in the *Report on the Cost and Funding of the Management of Spent Fuel and Radioactive Waste*.

6.1 Costs to be borne by the public sector and their funding

In the area of the public sector, there are twelve operators that are responsible for the dismantling of their facilities as well as for the conditioning and storage of their waste until the latter is delivered to a federal disposal facility. Moreover, there are eleven Land collecting facilities that are responsible for the conditioning and storage of the waste submitted to them until the latter is delivered to a federal disposal facility.

The funding of the decommissioning and waste management of the nuclear facilities and installations of the public sector is ensured by the federal republic and the Länder from public budgets. This also applies to the cost of disposal. Generally, the federal share of the cost is about 90% and the corresponding share of the Länder 10%. There are exceptions in this respect for the "Arbeitsgemeinschaft Versuchsreaktor GmbH (AVR)", where the federal share is 70%, for the "Technische Universität München (TUM)" and for VKTA - Radiation Protection, Analytic & Disposal Inc. (Verein für Kernverfahrenstechnik und Analytik - VKTA), which are 100%-financed from the budget of the respective Land, the Lubmin and Rheinsberg sites of the Energiewerke Nord GmbH, which in accordance with the German Unification Treaty are 100%-financed

from the federal budget, as well as the Institute for Transuranium Elements (ITU), which is 100%-financed from EU funds.

The Land collecting facilities charge fees from the waste producers for accepting radioactive waste. With this acceptance, the ownership of the waste is transferred to the respective collecting facility. From the fees thus collected, the Land collecting facilities pay over to the federal government a portion of the cost of later disposal with releasing effect.

The Thorium High-Temperature Reactor (THTR-300) is also a special case; for historical reasons, special arrangements for the funding of the orderly settlement of the project were made between the federation, the Land of North Rhine-Westphalia, the operating company "Hochtemperatur-Kernkraftwerk GmbH (HKG)" and its shareholders.

6.2 Costs to be borne by the private operators and their funding

The essential cost-relevant substeps of the decommissioning and waste management of nuclear facilities that have to be funded by the private companies, such as the power utilities operating the nuclear power plants, and by the nuclear fuel cycle industry, comprise the dismantling of the nuclear facilities as well as the management of spent fuel and radioactive waste including its disposal.

The private operators are obligated in terms of commercial law (especially § 249 German Commercial Code) and in terms of tax law to classify as a liability in their balances of accounts provisions for nuclear asset retirement in adequate amounts, i.e. for ensuring the financing in the future of the above-mentioned nuclear liabilities in connection with the decommissioning of the nuclear power plants and the management of their radioactive waste.

6.3 Costs of the disposal facilities

The cost of the planning, exploration, construction, the emplacement operation and the decommissioning of the Konrad disposal facility is distributed among the waste producers.

The cost of the closure of the Morsleben disposal facility as well as the cost of retrieving the radioactive waste from and closure of the Asse II mine is borne by the federation.

The cost of the search for and selection of a disposal facility especially for heat-generating radioactive waste and for the licensing, construction, operation and closure of such a disposal facility as well as the cost of operation to keep the Gorleben exploration mine open is distributed among the waste producers as stipulated by the Site Selection Act.