



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

First report on the implementation of Directive 2011/70/EURATOM

(Member State Report)

**(Report under Article 14 (1) of Council Directive
2011/70/Euratom of 19 July 2011 establishing a Com-
munity framework for the responsible and safe man-
agement of spent fuel and radioactive waste)**

August 2015

In the event of discrepancies between this translation
and the original German version, the latter shall prevail.

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A. Preface

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 /RL 2011-70/ obliges Member States of the European Union (EU) to submit a report on the implementation of this Directive (Member State Report), for the first time by 23 August 2015, and to update it every three years.

The Member State Report was prepared under the leadership of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (Federal Environment Ministry – BMUB), taking into account the requirements of the European Nuclear Safety Regulators Group (ENSREG) /ENS 2014/.

The Member State Report takes a closer look at the organisational framework of the regulatory authority in Germany in the field of spent fuel and radioactive waste management, also giving special attention to the newly established regulatory authority, the Federal Office for the Regulation of Nuclear Waste Management. Furthermore, the principles of the national framework are described and the developments in the field of research are outlined.

A.1 Generation and inventory of different types of radioactive waste

The Atomic Energy Act stipulates that residual radioactive material generated during the handling of radioactive material as well as disassembled or dismantled radioactive components shall be utilised without detrimental effects or disposed of as radioactive waste in a controlled manner.

In the Federal Republic of Germany, a general distinction is made between two types of radioactive waste:

- spent fuel and waste from reprocessing, and
- radioactive waste with negligible heat generation.

Spent fuel has been generated and is being generated from the operation of installations for the fission of nuclear fuel for the commercial generation of electricity (hereinafter referred to as nuclear power plants) and from the operation of installations for fission of nuclear fuel not used for commercial generation of electricity. The delivery of spent fuel from nuclear power plants to reprocessing plants is no longer valid since 1 July 2005. The waste from reprocessing of spent fuel in other European countries is going to be returned to the Federal Republic of Germany and stored until its disposal.

Radioactive waste with negligible heat generation is mainly generated during the operation and during the dismantling of nuclear power plants. To a lesser extent, this type of radioactive waste is also generated by the application of ionising radiation in research, medical and industrial applications.

Between 1967 and the end of 1978, about 47,000 m³ of low and intermediate level waste had been emplaced in the Asse II mine. Since 1988, there has been a continu-

ous inflow of groundwater from the overburden into the mine. At the same time, the stability of the mine started to deteriorate successively due to the pressure of the overlying overburden and the decreasing load-carrying capacity of the mine workings. According to § 57b of the Atomic Energy Act (AtG), the Asse II mine must therefore be closed immediately. Closure is to take place after retrieval of the radioactive waste. The concept for the retrieval of the radioactive waste provides for recovering all the waste, to transport it above ground in transport containers, and to condition it there in order to dispose of it then. According to current estimates, there will be a waste volume of approx. 175,000 to 220,000 m³ for later disposal.

In the period from 1971 to 1998, a total of approx. 37,000m³ of solid and solidified waste and approx. 6,600 radiation sources with a total activity of around 10¹⁴ Bq had been disposed of in the Morsleben repository for radioactive waste (ERAM). Emplacement of low-level and intermediate-level radioactive waste in the Morsleben repository for radioactive waste has been concluded. This disposal facility is to be closed and safely sealed for the long term.

The inventory of spent fuel and radioactive waste, as well as a prediction of the amounts generated in the future can be found in the *Inventory of Radioactive Waste (Current inventory and forecast)* /BMUB 2015b/.

A.2 National framework

The Federal Republic of Germany is a federal state. The responsibilities for the legislative framework and the law enforcement are divided between the bodies of the Federal Government and the *Länder* according to the respective regulatory duties. Specifications are regulated by the provisions of the Basic Law of the Federal Republic of Germany.

According to the Basic Law of the Federal Republic of Germany (GG) /GG 2014/, the exclusive legislative competence for the use of nuclear energy for peaceful purposes lies with the Federal Government. The allocation of competencies and responsibilities between the Federal Government and the *Länder* is regulated by the Basic Law and the related legislation, in particular the "Act on the Peaceful Utilisation of Atomic Energy and the Protection against its Hazards (Atomic Energy Act)" /AtG 2013/. The competent department within the federal administration is the Federal Environment Ministry.

The enforcement of the Atomic Energy Act and subordinate ordinances, such as the Radiation Protection Ordinance (StrlSchV), is carried out by authorities of the Federal Government and the *Länder*, usually by the *Länder* on behalf of the Federal Government. Within the federal executive administration, the competent *Land* authorities are subject to supervision by the Federation as to legality and expediency of their actions. Further development of nuclear law is the responsibility of the Federal Government, the *Länder* are involved in this process.

In order to standardise actions and for communication between the Federal Government, represented by the Federal Environment Ministry, and the individual nuclear licensing and supervisory authorities of the Federal Government and the *Länder*, the

Länder Committee for Nuclear Energy has been established. For preparing decisions to be taken by its General Committee, the *Länder* Committee for Nuclear Energy avails itself of the Technical Committee for Legal Matters, as well as the Technical Committee for Nuclear Safety (FARS), the Technical Committee for Radiation Protection (FAS) and the Technical Committee for Nuclear Fuel Cycle Matters (FAVE).

A.3 Organisational framework of the regulatory authority

In order to protect against the hazards emanating from radioactive material and to control the use of this material, the Atomic Energy Act, as well as the Radiation Protection Ordinance in certain areas, require that the construction, operation and decommissioning of nuclear facilities and installations and the handling of radioactive material are subject to licensing (licensing includes in the German context licencing and plan approval procedures).

For waste processing (i.e. for pretreatment, treatment and conditioning), storage and disposal, the obligation to hold a licence for the handling of radioactive material in nuclear facilities is defined in different provisions of the regulatory framework. For the licensing and supervision of the various types of handling, different authorities may be responsible (see Figure A.3-1) (see Chapter C.2.1 for details on the responsibilities relating to licensing).

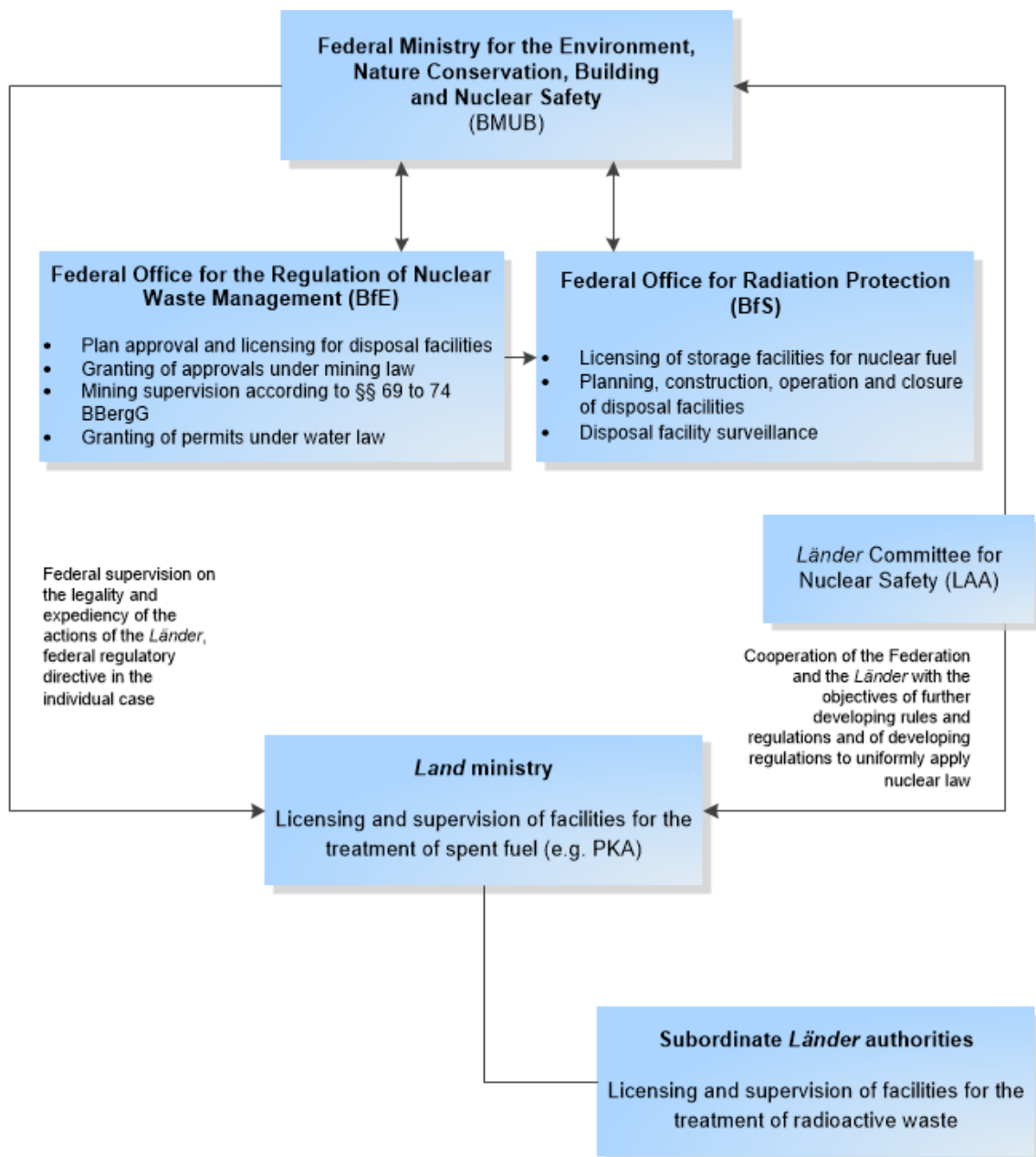


Figure A.3-1: Organisational framework of the regulatory authority in the Federal Republic of Germany in the field of spent fuel and radioactive waste management after entry into force of the provisions of the Site Selection Act

In the Federal Republic of Germany, the construction, operation and closure of disposal facilities for radioactive waste are a federal task. The current allocation is regulated as follows:

- As the operator, the Federal Office for Radiation Protection (BfS) is responsible for the construction, operation and closure of disposal facilities as well as for the Asse II mine and employs in this connection the services of the German service company for the construction and operation of waste repositories (Gesellschaft

zum Bau und Betrieb von Endlagern für Abfallstoffe mbH, DBE mbH) and the Asse GmbH as so-called administrative aid. Moreover, the Federal Office for Radiation Protection is project implementer in the site selection procedure for the planned disposal facility especially for heat-generating radioactive waste.

- The Federal Office for the Regulation of Nuclear Waste Management (BfE), established in 2014, is responsible for the licensing of a disposal facility especially for heat-generating radioactive waste based on the selection procedure according to the “Act on the search for and selection of a site for a repository for heat-generating radioactive waste and for the amendment of other laws (*Standortauswahlgesetz – StandAG*)” (Site Selection Act) /StandAG 2013/.

The Federal Office for the Regulation of Nuclear Waste Management will become the competent licensing (plan approval) authority for the Konrad repository after its commissioning and for the Morsleben repository for radioactive waste after licensing (plan approval) for closure; these responsibilities currently lie with the *Land* of Lower Saxony for the Konrad repository and with the *Land* of Saxony-Anhalt for the Morsleben repository for radioactive waste.

- For the Asse II mine, the supreme *Land* authority of Lower Saxony remains to be responsible as licensing authority.
- The regulatory supervision (legal and technical supervision) of the Federal Office for Radiation Protection and the Federal Office for the Regulation of Nuclear Waste Management is exercised by the Federal Environment Ministry to whose area of responsibility these authorities belong.

A.4 National radioactive waste management policy fundamentals

The national radioactive waste management policy is based on the following decisions /BMUB 2015a/:

- 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.
- According to the Atomic Energy Act, providing facilities for the safekeeping and disposal of radioactive waste is a federal task.
- The Federal Republic of Germany plans to emplace all types of radioactive waste in deep geological disposal facilities. To this end, the Konrad mine at Salzgitter is currently being converted into a disposal facility. The site of a disposal facility especially for heat-generating radioactive waste will be determined by a selection procedure specified in accordance with the Site Selection Act. The actual procedure for site selection is preceded by the work of the *Commission Storage of High-Level Radioactive Waste*. Task of this Commission is, in particular, to develop proposals for the basis of decision making (safety requirements, criteria) in the later site selection procedure and to review the Site Selection Act. In addition, the Commission also deals with the requirements in respect to the procedure for the selection process and to public participation.

The strategy for the management of all spent fuel and radioactive waste that has been and will be generated is outlined in the *Programme for the responsible and safe management of spent fuel and radioactive waste (National Programme)*. The National Programme is subject to potential revision as major changes may ensue on the basis of the recommendations of the German parliament's (*Bundestag*) *Commission on Storage of High-Level Radioactive Waste* pursuant to § 3 of the Site Selection Act.

A.5 Periodic self-assessment and peer-review

With regard to an international peer-review that meets the requirements of Directive 2011/70/Euratom, it is planned that an IRRS (Integrated Regulatory Review Service) mission and an ARTEMIS (IAEA Radioactive Waste Management Integrated Review Service) mission of the International Atomic Energy Agency (IAEA) are to be carried out in the Federal Republic of Germany in the years 2018 and 2019.

B. Summary

General principles, including funding

The management of radioactive waste shall, as a rule, be carried out within German national responsibility. Disposal is to be on German national territory. According to the applicable legal provisions, spent fuel from installations for fission of nuclear fuel not used for commercial generation of electricity may be shipped to a country where research reactor fuels are supplied or manufactured. The Federal Government plans to emplace all types of radioactive waste in deep geological disposal facilities with the aim to guarantee isolation from the biosphere in the long term, thus ensuring the safety of man and the environment without any need for maintenance.

The vitrified waste from reprocessing of spent fuel in other European countries is going to be returned to Germany and stored until its disposal. The processing and conditioning of radioactive waste generated in Germany may also take place abroad. The resulting radioactive waste is returned to the waste originators and disposed of in Germany.

Radioactive waste generation is kept to the minimum which is reasonably practicable both in terms of activity and volume of the radioactive waste by appropriate design measures and operating and decommissioning practices, including the recycling and reuse of materials. The minimisation principle also applies to spent fuel and radioactive waste management.

With regard to the interdependencies between the steps in radioactive waste generation and its management, storage shall take place in a way that already corresponds to conditioning to meet the disposal requirements or allows later handling for further conditioning (to meet the disposal requirements), as far as waste acceptance requirements have not been finally specified yet.

In Germany, passive safety features are principally given preference to active safety systems wherever possible when handling spent fuel and radioactive waste.

The responsibility for the safe management of spent fuel and radioactive waste which also includes funding remains with the waste originators until delivery to a disposal facility or a *Land* collecting facility.

For the licensing of facilities requirements are to be implemented and complied with that are graded according to the respective hazard potential which is determined, in particular, by the type of facility and the existing or planned type, quantity and radioactivity of the radioactive material in them. The decision-making process up to granting of a licence is in each case based on verifiable evidence-based documents.

National framework, competent regulatory authority

The strategy for a responsible and safe management of spent fuel and radioactive waste is outlined in the National Programme. This has not the quality of a legal norm, but is to be considered in all radioactive waste management planning and administrative procedures by the actors in the field of nuclear waste management.

The construction, operation and decommissioning of nuclear facilities as well as the handling of radioactive material are subject to licensing. In the Federal Republic of Germany as a federal state, the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, the Federal Office for Radiation Protection, the Federal Office for the Regulation of Nuclear Waste Management and the supervisory and regulatory authorities of the *Länder* are acting within the organisational framework of the regulatory authority. At the level of the supreme federal authorities, state-organisational separation is ensured by the competence of the Federal Environment Ministry for all decisions relating to nuclear safety and radiation protection and the competence for energy industry policy lying with the Federal Ministry for Economic Affairs and Energy. At the *Länder* level, the principle of separation is adhered to on the basis of the organisational provisions realised in the *Länder*. In the field of disposal, as the operator, the Federal Office for Radiation Protection is responsible for the construction, operation and closure of disposal facilities as well as for the Asse II mine. The Federal Office for the Regulation of Nuclear Waste Management is the regulatory authority in the site selection procedure and, in future, will also be the authority responsible for plan approval and licensing of disposal facilities.

As part of the licensing procedure for radioactive waste management facilities, requirements to be complied with relating to the documentation of the entire handling processes, including the proceeding for specific events, are defined. The competent supervising body examines the documents submitted by the licence holder. Furthermore, regular inspections and own measurements at the licence holders' are carried out. As regards the implementation of the regulatory framework, there are legal instruments through which the supervising body can urge the licence holder to comply with national safety requirements and the terms of the respective licence.

The competent regulatory authorities of the Federal Republic of Germany are given the legal powers and the necessary human and financial resources via the Atomic Energy Act and subordinate regulations.

Through the public participation within the framework of the Nuclear Licensing Procedure Ordinance (AtVfV) and the Environmental Impact Assessment Act (UVPG) as well as through informing the public in accordance with the legislation on freedom of information, in particular the Environmental Information Act (UIG), it is ensured that the public is adequately involved and that it has access to all the necessary information regarding the safety of planned facilities for the treatment of spent fuel and radioactive waste.

It is a fundamental task of the licence holder of a facility for nuclear waste management, but also of the authorities, to keep track of the state of the art in science and technology. The authorities of the Federal Government and the *Länder* responsible for

the development of the rules and regulations review the regulatory framework and perform updates where required.

Licence holder

According to § 7c paragraph 1 of the Atomic Energy Act, the responsibility for nuclear safety, including radiation protection, shall fall to the licence holder of the nuclear facility and this responsibility cannot be delegated. An extension of these obligations to other nuclear waste management facilities takes place with the implementation of Directive 2011/70/Euratom.

The operation of a facility or installation is monitored continuously so that safety-relevant disturbances of operation and incidents are reliably detected and the corrective measures specified in the operating manual can be taken.

A safety management system is set up to realise safety management. It includes all specifications, regulations and organisational tools for the handling of safety-relevant activities and processes. All its elements are derived and justified in a comprehensible manner. Interactions, interfaces and delimitations between different processes are designed and described in a comprehensible manner.

For the safe operation of nuclear facilities, the licence holder is also required to provide for and maintain adequate human resources.

Expertise and skills

The Federal government ensures that the requirements for the experts of all parties involved that are responsible for the safety of spent fuel and radioactive waste within the national framework with regard to education and training as well as to research and development cover the needs of the National Programme.

The Federal government makes a substantial contribution to building up, developing and maintaining the scientific and technical competence as well as to promoting young experts in the field of radioactive waste management and disposal. Moreover, it continuously updates the state of the art in science and technology through corresponding research and development in addition to providing the scientific and technical basis for the realisation of a disposal facility.

Transparency

Information is made available to the general public in accordance with national legislation and international obligations.

The Federal Environment Ministry involves the public in all matters relating to the development of the national and international rules and regulations. In addition to the site-specific monitoring of the vicinity of nuclear power plants, the general environmental radioactivity is recorded by extensive measurements in the entire territory of the Federal Republic of Germany, i.e. also in the vicinity of waste management facilities, by means of the Integrated Measurement and Information System for the Monitoring of Environmental Radiation (IMIS) in accordance with the Precautionary Radiation Protection Act. The data is published by the Federal Environment Ministry.

Events in radioactive waste management facilities for which reporting is mandatory are classified by the licence holders of these facilities according to the International Nuclear Event Scale (INES) of the International Atomic Energy Agency. The licence holders inform the public about all reportable events in their facilities. Own staff will be informed internally about these events.

On principle, the public also has the option to access environmental information according to the Environmental Information Act (UIG). In parallel with the wide range of information provided to the public, the public is involved within the framework of the licensing procedure for radioactive waste management facilities. By this, the public is given the opportunity to bring in their interests directly into the procedure.

With regard to the site selection procedure for the planned disposal facility especially for heat-generating radioactive waste, the currently defined participation procedure is being assessed as part of the work of the *Commission on Storage of High-Level Radioactive Waste*.

National programmes

The Federal Government will meet its reporting obligation imposed by Directive 2011/70/Euratom by submitting several documents. The National Programme contains a programmatic overview of the German radioactive waste management policy. The current status of radioactive 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 by 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*.

The national strategy for spent fuel and radioactive waste management is completed by or based on decisions that have been taken by the legislator and are reflected in the relevant regulations, such as the Atomic Energy Act.

C. Reporting

C.1 Article 4 – General principles

Article 4.1

Member States shall establish and maintain national policies on spent fuel and radioactive waste management. Without prejudice to Article 2(3), each Member State shall have ultimate responsibility for management of the spent fuel and radioactive waste generated in it.

Article 4.2

Where radioactive waste or spent fuel is shipped for processing or reprocessing to a Member State or a third country, the ultimate responsibility for the safe and responsible disposal of those materials, including any waste as a by-product, shall remain with the Member State or third country from which the radioactive material was shipped.

Article 4.3

National policies shall be based on all of the following principles:

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

Article 4.4

Radioactive waste shall be disposed of in the Member State in which it was generated, unless at the time of shipment an agreement, taking into account the criteria established by the Commission in accordance with Article 16(2) of Directive 2006/117/Euratom, has entered into force between the Member State concerned and another Member State or a third country to use a disposal facility in one of them.

Prior to a shipment to a third country, the exporting Member State shall inform the Commission of the content of any such agreement and take reasonable measures to be assured that:

- a) the country of destination has concluded an agreement with the Community covering spent fuel and radioactive waste management or is a party to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management ('the Joint Convention');
- b) the country of destination has radioactive waste management and disposal programmes with objectives representing a high level of safety equivalent to those established by this Directive; and
- c) the disposal facility in the country of destination is authorised for the radioactive waste to be shipped, is operating prior to the shipment, and is managed in accordance with the requirements set down in the radioactive waste management and disposal programme of that country of destination.

The ultimate responsibility for the management of spent fuel and radioactive waste lies with the Federal Republic of Germany.

In Germany, the responsible and safe management of spent fuel and radioactive waste is mainly based on the following principles:

- The management of radioactive waste shall, as a rule, be carried out within German national responsibility. Disposal is to be on German national territory. According to the applicable legal provisions, spent fuel from installations for fission of nuclear fuel not used for commercial generation of electricity may be shipped to a country where research reactor fuels are supplied or manufactured. All types of radioactive waste are to be disposed of in deep geological formations.
- The vitrified waste from reprocessing of spent fuel in other European countries is going to be returned to Germany and stored until its disposal.
The processing and conditioning of radioactive waste generated in Germany may also take place abroad. The resulting radioactive waste is returned to the waste originators and disposed of in Germany.
- For spent fuel and radioactive waste management, the polluter-pays principle applies until delivery to a disposal facility or a *Land* collecting facility in terms of the obligation to act. So, those who construct, operate, otherwise own, essentially modify, decommission or remove facilities in which nuclear fuel is handled and those who handle radioactive material outside such facilities, or operate facilities for the production of ionising radiation, have to ensure that generated residual radioactive material as well as disassembled or dismantled radioactive components are utilised without detrimental effects or are disposed of as radioactive waste in a controlled manner. This also includes bearing the costs (see Chapter C.6 for more details).
- The radioactive waste from operation and dismantling of the nuclear power plants and other nuclear facilities is to be stored until delivery to a disposal facility. Radioactive waste from industrial, medical and research applications initially has to be delivered to the collecting facility of the respective *Land* (*Land* collecting facility) and stored there. The *Land* collecting facilities deliver the radioactive waste stored in them to a disposal facility (see Figure C.1-1).

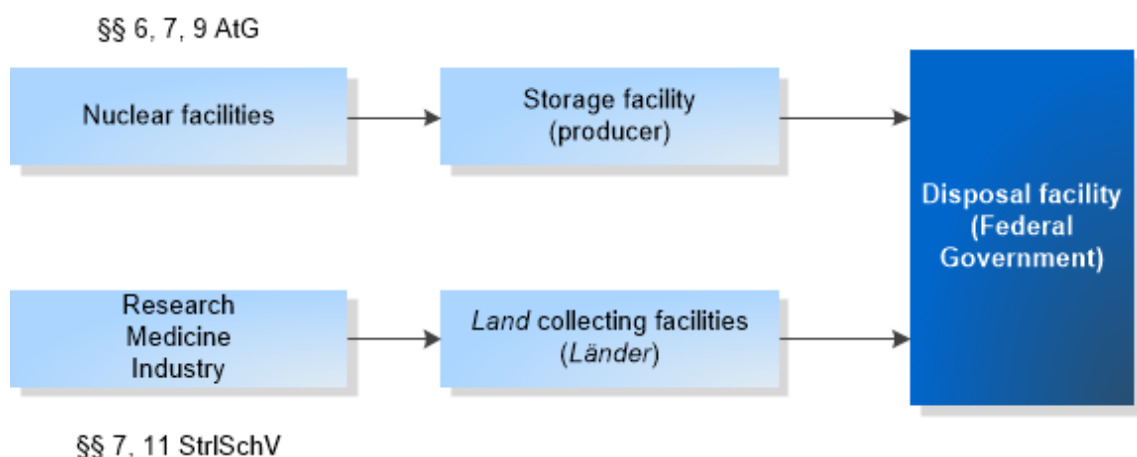


Figure C.1-1: Obligation to deliver radioactive waste and responsibilities

The National Programme contains a programmatic overview of the radioactive waste management planning of the Federal Republic of Germany. The decisions of the national policy (see also Chapter □) are based on the following principles:

Minimisation principle

According to § 6 paragraph 1 and 2 of the Radiation Protection Ordinance /StrlSchV 2014/, any unnecessary radiation exposure or contamination of man and the environment shall be avoided and any radiation exposure or contamination shall be minimised, even if below the respective limit, by taking into consideration the state of the art in science and technology and by taking into account all circumstances of the individual case (minimisation principle). Accordingly, radioactive waste generation shall be kept to the minimum which is reasonably practicable both in terms of activity and volume of the radioactive waste. This is achieved by appropriate design measures and operating and decommissioning practices, including the recycling and reuse of materials. The minimisation principle also applies to spent fuel and radioactive waste management.

Interdependencies between all steps in spent fuel and radioactive waste generation and management

Storage is the temporary holding of spent fuel and radioactive waste with the aim of subsequent disposal.

Storage takes place in a way that already corresponds to conditioning to meet the disposal requirements or allows later handling for further conditioning (to meet the disposal requirements), as far as waste acceptance requirements have not been finally specified yet. This is the case for spent fuel and radioactive waste intended for emplacement in the disposal facility according to the Site Selection Act since the disposal facility concept depends on the site which is to be determined by law not before termination of the selection procedure according to the Site Selection Act.

The waste acceptance requirements for the Konrad repository, licensed for radioactive waste with negligible heat generation, have been in place since 22 May 2002. For storage, the waste products and waste containers must be chemically/mechanically sufficiently stable over the period of storage until their disposal. This can be achieved by the generation of waste products conditioned to meet the disposal requirements. According to § 72 of the Radiation Protection Ordinance and the guideline on the control of residual radioactive material and radioactive waste, the waste originators have to submit a management concept for all radioactive waste generated to the competent *Land* authority containing details on the technical and organisational provisions for collection and registration as well as on the whereabouts. Modifications to this concept are to be updated and submitted to the competent supervisory authority /BMUB 2014a/.

Aspects of passive safety

For the storage of spent fuel and radioactive waste, the guidelines developed by the Nuclear Waste Management Commission (ESK) /ESK 2013a, ESK 2013b/ are to be referred to. These define the requirements for safe storage, taking into account the interdependencies between the individual radioactive waste management steps.

In Germany, passive safety features are principally given preference to active safety systems wherever possible when handling spent fuel and radioactive waste. Accordingly, the technical design and the operation of the storage facility must avoid unnecessary radiation exposure or contamination of man and the environment. In the case of spent fuel, the main passive safety features are ensured with regard to the main safety functions

- safe enclosure of the radioactive inventory,
- adequate shielding of radioactive radiation,
- ensured maintenance of subcriticality, and
- safe removal of the decay heat

by the casks that are made of cast iron or forged steel with a double-lid closure system. Compliance with the resulting requirements is to be demonstrated for the licensed operating period and, if required, beyond this period.

The Federal Government plans to emplace all types of radioactive waste in deep geological disposal facilities with the aim to guarantee isolation from the biosphere in the long term, thus ensuring the safety of man and the environment without any need for maintenance and control.

Graded approach and evidence-based and documented decision-making process

Facilities for waste processing, storage and disposal are subject to licensing under the Atomic Energy Act and the Radiation Protection Ordinance. Requirements are to be implemented and complied with that are graded according to the respective hazard potential which is determined, in particular, by the type of facility and the existing or planned type, quantity and radioactivity of the radioactive material in them. This applies, e.g., to the protection against safety-relevant events, to the limitation of radiation exposure as a result of incidents, or to measures to protect against disruptive action or other interference by third parties.

The actual details and procedure of, for example, licensing in accordance with § 7 of the Atomic Energy Act are regulated in more detail in the Nuclear Licensing Procedure Ordinance. The decision-making process up to granting of a licence is in each case based on verifiable evidence-based documents. The basis for the decision on the licence application is that the applicant submits all necessary licensing documents to the competent authority. During the decision-making process, the competent authority specifies within the licence in writing, in which way it reviewed the information and documents of the applicant and which legal provisions have been taken into account for it. In addition, it is to be specified in the licensing notice what type of facility will be licensed and what conditions must be fulfilled. A licence may eventually only be granted if the licensing requirements stated in the Atomic Energy Act or in other legal provisions have demonstrably been fulfilled.

For review of the information and documents submitted, the licensing authority may appoint independent technical experts, but the responsibility for the licensing decision remains with the authority.

The requirements for licensing are also assessment criteria for the competent supervising body during operation.

The licensing procedure ensures that up to granting of the licence, all decisions are evidence-based and documented. More information on the course of the individual licensing procedures can be found in the *Report for the Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*.

Another example of the evidence-based and documented processes in the management of radioactive waste in the Federal Republic of Germany are the regulations on product control for the radioactive waste to be emplaced in the Konrad repository. Only radioactive waste may be disposed of in the Konrad repository which demonstrably meets the waste acceptance requirements for disposal. The task of the product control is to ensure compliance with the waste acceptance requirements for disposal. Within the scope of its responsibility for the operation of the disposal facility, the Federal Office for Radiation Protection ensures that the waste acceptance requirements for disposal are met by examining waste packages and by qualification and accompanying control of conditioning measures. Product control comprises regulations on quality assurance in the registration and conditioning of radioactive waste and in the production of waste containers, including the registration and documentation of the characteristics of the waste packages that are relevant for disposal. Those involved in product control are the supervisory authorities, the Federal Office for Radiation Protection, the appointed technical experts, the waste originators and the service companies acting on their behalf, as well as the operators of the storage facilities and *Land* collecting facilities. Type and extent of product control measures are determined depending on the conditioning technique, the waste characteristics and the waste acceptance requirements for disposal. The measures required in order to guarantee the safety of a disposal facility are laid down in the respective licence (in the German context plan approval or licence).

Management of all types of spent fuel and radioactive waste

The Federal Government plans to emplace all types of radioactive waste in deep geological disposal facilities. For radioactive waste with negligible heat generation, the Konrad mine in Salzgitter is currently being converted into a disposal facility.

The site of a disposal facility especially for heat-generating radioactive waste will be determined by a selection procedure. This selection procedure is to be concluded by 2031. The plannings for this disposal facility consider next to the spent fuel and waste from reprocessing, the radioactive waste with negligible heat generation that may not be suitable for emplacement in the Konrad repository. 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 repository.

Furthermore, it is intended to also consider the radioactive waste to be retrieved from the Asse II mine in the site selection for this disposal facility. The same applies to the depleted uranium that has been generated and will be generated from uranium enrichment if it should not be reutilised. A final decision on the site of the disposal facility for this waste – also considering all technical, economic and political aspects – cannot

be made until the criteria for emplacement in the disposal facility have been established in accordance with the Site Selection Act and until there will be sufficient information as regards quantity and nature of the waste to be retrieved from the Asse II mine and the date when it will be retrieved.

After end of use, devices are returned to the manufacturer by the operator together with the radiation source remaining in the device. The manufacturer may check further use of the sources or returns them to the source manufacturer for further utilisation. The sources that cannot be used again are delivered to the *Land* collecting facilities. There they are stored until delivery to a repository. According to the waste acceptance requirements for the disposal of waste packages, there are no special requirements with regard to the processing, packaging and labelling of sealed sources. In the *Länder* collecting facilities, disused sources are usually conditioned and documented together with other radioactive waste.

Emplacement of low-level and intermediate-level radioactive waste in the Morsleben repository for radioactive waste has been concluded. This disposal facility is to be closed and safely sealed for the long term.

C.2 Article 5 – National framework

Article 5.1

Member States shall establish and maintain a national legislative, regulatory and organisational framework ('national framework') for spent fuel and radioactive waste management that allocates responsibility and provides for coordination between relevant competent bodies. The national framework shall provide for all of the following:

- a) a national programme for the implementation of spent fuel and radioactive waste management policy;
- b) national arrangements for the safety of spent fuel and radioactive waste management. The determination of how those arrangements are to be adopted and through which instrument they are to be applied rests within the competence of the Member States;
- c) a system of licensing of spent fuel and radioactive waste management activities, facilities or both, including the prohibition of spent fuel or radioactive waste management activities, of the operation of a spent fuel or radioactive waste management facility without a licence or both and, if appropriate, prescribing conditions for further management of the activity, facility or both;
- d) a system of appropriate control, a management system, regulatory inspections, documentation and reporting obligations for radioactive waste and spent fuel management activities, facilities or both, including appropriate measures for the post-closure periods of disposal facilities;
- e) enforcement actions, including the suspension of activities and the modification, expiration or revocation of a licence together with requirements, if appropriate, for alternative solutions that lead to improved safety;
- f) the allocation of responsibility to the bodies involved in the different steps of spent fuel and radioactive waste management; in particular, the national framework shall give primary responsibility for the spent fuel and radioactive waste to their generators or, under specific circumstances, to a licence holder to whom this responsibility has been entrusted by competent bodies;
- g) national requirements for public information and participation;
- h) the financing scheme(s) for spent fuel and radioactive waste management in accordance with Article 9.

Article 5.2

Member States shall ensure that the national framework is improved where appropriate, taking into account operating experience, insights gained from the decision-making process referred to in Article 4(3)(f), and the development of relevant technology and research.

C.2.1 General overview

The Basic Law contains provisions on the legislative and administrative competencies of the Federal Government and the *Länder* with regard to the use of nuclear energy. For the use of nuclear energy, the exclusive legislative competence lies with the Federal Government. The execution of the Atomic Energy Act and associated ordinances is performed by authorities of the Federal Government and the *Länder*. The competent *Land* authorities are subject to supervision by the Federation as to legality and expediency of their actions.

The Atomic Energy Act includes the general national provisions for protective and precautionary measures, radiation protection and the management of spent fuel and radioactive waste. Besides its purpose and general provisions, the Atomic Energy Act also comprises supervisory provisions, the authorisation to intervene, liability regulations, general regulations on administrative responsibilities, and regulations on administrative

finances. Figure C.2-1: schematically shows the hierarchy of the national regulations, the authority or institution adopting the regulation as well as its legal effect.

In detail, the legal framework for radioactive waste management in Germany is comprehensively presented in the *Report for the Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*.

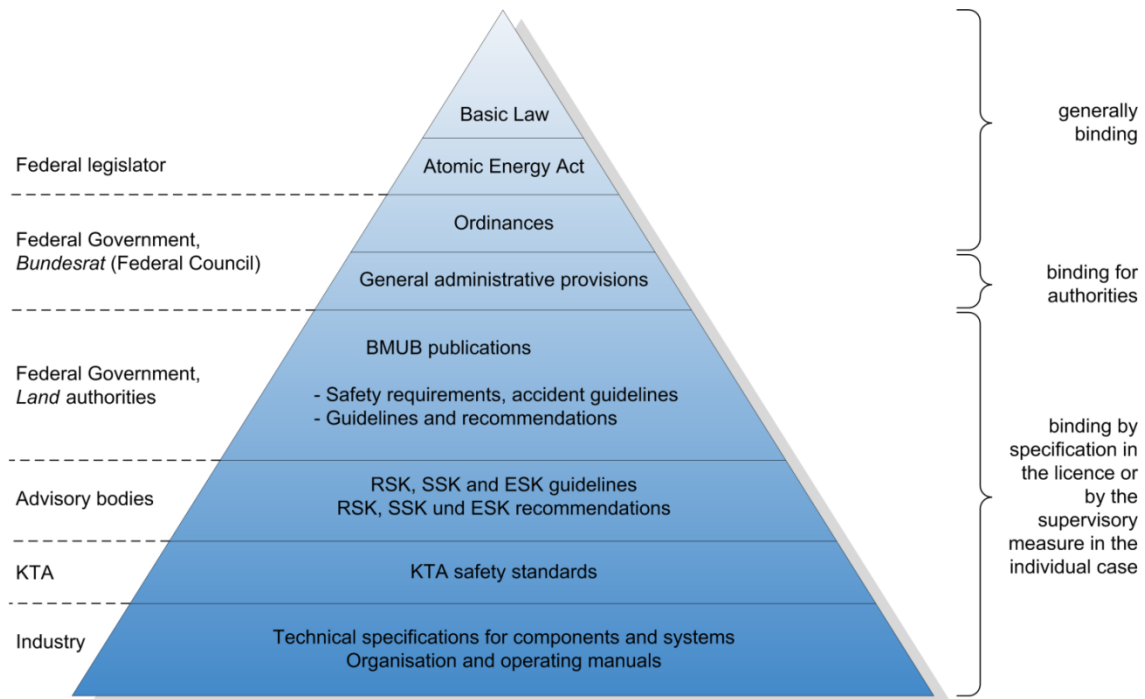


Figure C.2-1: Regulatory pyramid (hierarchy of the national regulations and the authority or institution adopting the regulation as well as its legal effect)

In the hierarchy of legislation, the international treaties concluded by the Federal Republic of Germany in accordance with Article 59 paragraph 2 sentence 1 of the Basic Law are on the same level as formal federal law. The Federal Republic of Germany has ratified the following international treaties in the fields of radioactive waste management, nuclear safety, radiation protection, liability and national implementing provisions or is in the ratification process:

- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management – Joint Convention of 5 September 1997,
- Convention on Nuclear Safety of 17 June 1994,
- Convention on Third Party Liability in the Field of Nuclear Energy – the Paris Convention of 29 July 1960, supplemented by the Protocols of 28 January 1964, of 16 November 1982, of 12 February 1982 (ratified) and of 12 February 2004 (not yet ratified),

- Convention Supplementary to the Paris Convention of 29 July 1960 – Brussels Supplementary Convention of 31 January 1963, supplemented by the Protocols of 28 January 1964, of 16 November 1982 (ratified) and supplemented by the Protocol of 2004 (not yet ratified),
- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention – Joint Protocol (INFCIRC/402) of 21 September 1988, in force since 27 April 1992,
- London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter of 1972,
- The convention revised and adopted in amended form in 1996 (“London Protocol”), which prohibits waste dumping at sea with a few exceptions, has also been ratified by the Federal Republic of Germany in October 1998,
- OSPAR Convention (Oslo Paris Convention) for the protection of the North Sea and the North-East Atlantic of 1992, entry into force in early 1998.

The organisational framework of the regulatory authority being responsible, inter alia, for the implementation of the regulatory framework in the field of spent fuel and radioactive waste management has already been described in Chapter A.3 (see also Figure A.3-1).

The responsibilities relating to the licensing of nuclear waste management facilities are summarised in Table C.2-1. It shows that for licensing and supervision of the different facility types and activities, in some cases different authorities are responsible. A uniform application of the legal requirements and harmonised licensing practices are ensured by supervision of legality and expediency by the Federal Environment Ministry described more detailed in Chapter A.3.

Table C.2-1: Responsibilities relating to the licensing and supervision in the field of radioactive waste management in the Federal Republic of Germany

	Radioactive waste management	Legal basis	Licence	Supervision
Spent fuel and waste from re-processing	Processing	§ 7 of the Atomic Energy Act	<i>Land</i> authority	<i>Land</i> authority
	Storage	§ 6 of the Atomic Energy Act	Federal Office for Radiation Protection	<i>Land</i> authority
	Disposal	§ 9b paragraph 1a of the Atomic Energy Act	Federal Office for the Regulation of Nuclear Waste Management	BfS Repository Surveillance ¹⁾
Radioactive waste with negligible heat generation	Processing	§ 7 of the Radiation Protection Ordinance ²⁾	<i>Land</i> authority	<i>Land</i> authority
	Storage			
	Disposal	§ 9b paragraph 1 of the Atomic Energy Act	Federal Office for the Regulation of Nuclear Waste Management ³⁾	BfS Repository Surveillance ¹⁾

¹⁾ There is no supervision under nuclear law as defined in § 19 of the Atomic Energy Act for federal facilities for the disposal of radioactive waste; surveillance of such a facility takes place within the Federal Office for Radiation Protection by the organisational unit for repository surveillance. The Federal Environment Ministry exercises comprehensive legal and technical supervision of the Federal Office for Radiation Protection and the Federal Office for the Regulation of Nuclear Waste Management.

²⁾ if not already included in a licence pursuant to §§ 6, 7, 9 or 9b of the Atomic Energy Act

³⁾ for the Konrad repository and the Morsleben repository for radioactive waste, *Land* authority still competent as a transitional provision

The interaction between the various authorities and organisations involved in the nuclear licensing procedure for a disposal facility and the participation of the general public is shown in Figure C.2-2. Figure C.2-3 gives an overview of the parties involved in supervision and surveillance of a disposal facility.

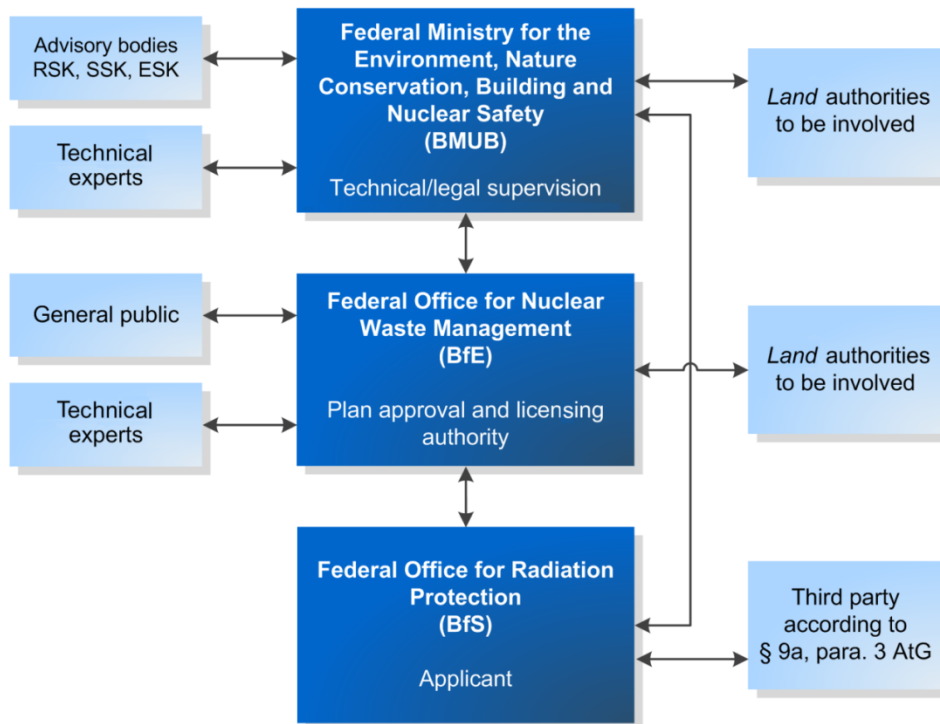


Figure C.2-2: Parties involved in the nuclear licensing procedure for a disposal facility

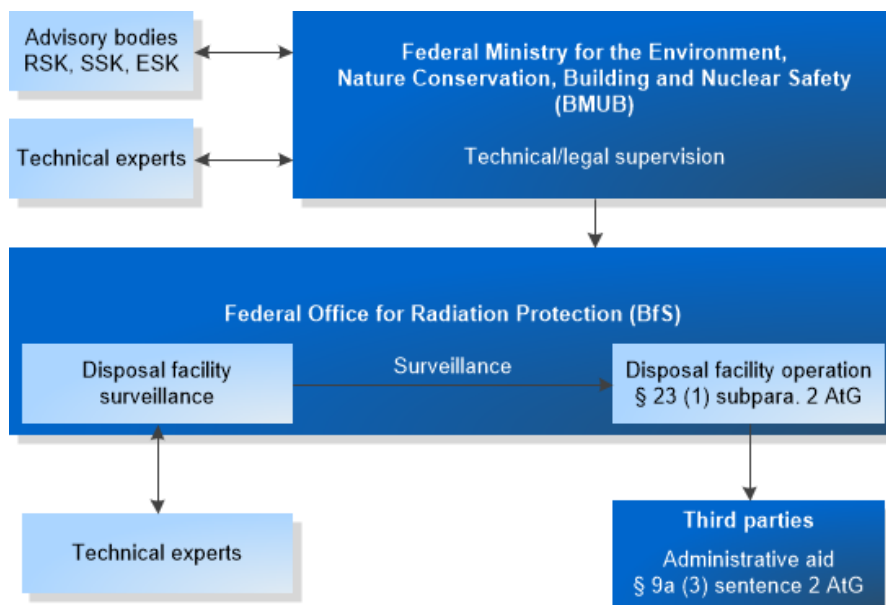


Figure C.2-3: Parties involved in supervision and surveillance of a disposal facility

In order to standardise actions and for communication between the Federal Government, represented by the Federal Environment Ministry, and the individual nuclear licensing and supervisory authorities of the Federal Government and the *Länder*, the

Länder Committee for Nuclear Energy has been established. For preparing decisions to be taken by its General Committee, the *Länder* Committee for Nuclear Energy avails itself of the Technical Committee for Legal Matters, as well as the Technical Committee for Nuclear Safety (FARS), the Technical Committee for Radiation Protection (FAS) and the Technical Committee for Nuclear Fuel Cycle Matters (FAVE) (see Figure C.2-4).

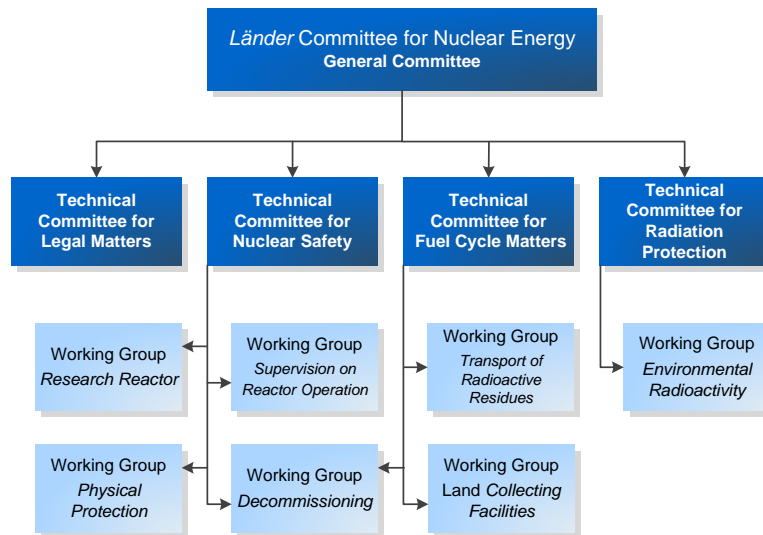


Figure C.2-4: *Länder* Committee for Nuclear Energy

More details on the organisational framework of the regulatory authority in the field of spent fuel and radioactive waste management are given in *the Report for the Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*.

The strategy for a responsible and safe management of spent fuel and radioactive waste is outlined in the National Programme. This has not the quality of a legal norm, but is to be considered in all radioactive waste management planning and administrative procedures by the actors in the field of nuclear waste management.

C.2.2 Special aspects

C.2.2.1 Licensing process

Information and details on the licensing process are contained in Chapter C.2.1.

Licensing of facilities for waste management is usually granted without any limitation in time as regards the validity of the licence. However, there is a limited validity for storage facilities for spent fuel and heat-generating waste. Any possibly necessary extensions of this period are subject to licensing. If after expiry of the licensed storage peri-

od, a disposal facility that is ready to receive the waste is not available yet, safety assessments of the extension of the storage period and the subsequent transports will be of particular importance. According to § 6 paragraph 5 of the Atomic Energy Act, licences for storage facilities at sites of nuclear power plants (on-site storage facilities) may only be renewed on imperative grounds and after prior referral to the German *Bundestag*.

If a licence that has been revoked by the competent authority is to enter into force again, then the former holder of the licence must submit a completely new application and will be subject to a new licensing procedure.

C.2.2.2 System of appropriate controls and reporting obligations

As part of the procedure for granting a licence for waste management facilities, requirements to be complied with relating to the documentation of the entire handling processes, including the proceeding for specific events, are defined. The competent supervising body examines the documents submitted by the licence holder, such as those for the regular reporting according to §§ 72 and 73 of the Radiation Protection Ordinance. Furthermore, regular inspections and own measurements are carried out at the licence holders'. These tasks may also be carried out on behalf of the competent authorities by third parties, e.g. by independent technical experts. In principle, the handling processes in the waste management facilities are continuously reviewed by the operators themselves. In addition to continuous controls of operations, the Atomic Energy Act stipulates that for nuclear facilities, also comprehensive safety reviews must be conducted and evaluated periodically every ten years. An extension of these obligations to other nuclear waste management facilities takes place with the implementation of Directive 2011/70/Euratom. Any deficiencies identified are to be remedied immediately to restore the licensed condition.

A uniform application of the legal requirements and harmonised licensing practices are ensured by legality and expediency supervision by the Federal Environment Ministry. In its superordinate function, the Federal Environment Ministry also ensures that lessons learned from the processing of radioactive waste and from disposal will already be taken into account for waste generation. The interdependencies between the individual steps of radioactive waste management are therefore taken into account in terms of technical as well as financial and regulatory aspects.

C.2.2.3 Enforcement actions

As regards the implementation of the regulatory framework, there are legal instruments through which the supervising body can urge the licence holder to comply with national safety requirements and the terms of the respective licence. Moreover, for nuclear facilities, § 327 of the Criminal Code (StGB) stipulates that whoever operates, possesses, substantially modifies or decommissions such a facility without the required permit shall be punished. Under certain conditions, regulated in § 17 and § 9b paragraph 3 of the Atomic Energy Act, the competent nuclear licensing authority may impose obligations

subsequently in order to ensure safety. If the nuclear facility poses a major hazard to workers or the general public and if this hazard cannot be eliminated within a reasonable period of time by means of appropriate measures, then the authority must revoke the licence granted. Revocation is also possible if prerequisites for the licence cease to apply at a later date, or if the licence holder violates legal provisions or decisions by the authorities.

The Atomic Energy Act, the Criminal Code and the nuclear statutory ordinances provide sanctions to prosecute violations.

C.2.2.4 Allocation of responsibilities for spent fuel and radioactive waste management (including funding)

Further information on the national regulatory framework and on the parties involved in the licensing and supervisory procedures can be found in Chapter C.2.1.

The responsibility for the safe management of spent fuel and radioactive waste remains with the waste originator until delivery to a disposal facility or a *Land* collecting facility (see Chapter C.1). The polluter-pays principle also applies to the funding of spent fuel and radioactive waste management. The necessary expenses of planning and construction of the disposal facilities are initially financed by the waste originators by means of prepayments or contributions. The site selection process is funded through cost allocations to the waste originators according to §§ 21 et seq. of the Site Selection Act. The use of *Land* collecting facilities is funded by costs (fees and expenses) or charges that are payable by the party delivering radioactive waste (see also Chapter C.6).

C.2.2.5 Public information and participation

Through public participation within the framework of the Nuclear Licensing Procedure Ordinance (AtVfV) and the Environmental Impact Assessment Act (UVPG) as well as informing the public in accordance with the legislation on freedom of information, in particular the Environmental Information Act (UIG), it is ensured that the public is adequately involved and that it has access to all the necessary information regarding the safety of planned facilities for the treatment of spent fuel and radioactive waste.

Further provisions relating to the information and participation of the public are regulated in the Site Selection Act.

In-depth information on public participation can be found in Chapter C.7 and in the *Report for the Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*.

C.2.2.6 Update and improvement of the regulatory framework and the national framework

It is a fundamental task of the licence holder of a facility for nuclear waste management, but also of the authorities, to keep track of the state of the art in science and technology. The authorities responsible for the development of the rules and regulations of the Federal Government and the *Länder* review the regulatory framework and perform updates where required.

Accordingly, the Federal Environment Ministry keeps track of the state of the art in science and technology at the international level by participating in international committees, by evaluating the results of studies carried out by relevant international, multi- and bilateral bodies and institutions, from the results of the research programmes funded by the Federal Environment Ministry and from other international specialist contacts and the international specialist literature. The Federal Environment Ministry is supported in this by the Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH. Moreover, international rules and regulations are additional sources of knowledge when determining the state of the art in science and technology. In order to identify any need for amendments to the national regulatory framework, a systematic evaluation of the state of the art in science and technology and of international rules and regulations is carried out on a continual basis.

Moreover, the Federal Environment Ministry seeks information on safety-related and generic issues as well as on operating experience in all types of nuclear facilities by consulting its advisory bodies the Reactor Safety Commission (RSK), the Nuclear Waste Management Commission (ESK) and the Commission on Radiological Protection (SSK). The statements made by these commissions have an impact on the updating of the national rules and regulations.

The supervisory authorities review the safety assessments for nuclear facilities, evaluate the results thereof and initiate measure to enhance safety where required. Safety assessments must also be submitted to the licensing and supervisory authority as part of applications for modification licences, e.g. for a nuclear facility or its operation pursuant to § 7 of the Atomic Energy Act or after licensing of modifications being subject to approval within the framework of supervision pursuant to § 19 of the Atomic Energy Act. An extension of these obligations to other nuclear waste management facilities and installations takes place with the implementation of Directive 2011/70/Euratom.

All this ensures that the lessons learned from operation, but also the state of the art in science and technology, will lead to the adjustment of the rules and regulations and also of the national framework.

C.3 Article 6 – Competent regulatory authorities

Article 6.1

Each Member State shall establish and maintain a competent regulatory authority in the field of safety of spent fuel and radioactive waste management.

Article 6.2

Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organisation concerned with the promotion or utilisation of nuclear energy or radioactive material, including electricity production and radioisotope applications, or with the management of spent fuel and radioactive waste, in order to ensure effective independence from undue influence on its regulatory function.

Article 6.3

Member States shall ensure that the competent regulatory authority is given the legal powers and human and financial resources necessary to fulfil its obligations in connection with the national framework as described in Article 5(1)(b), (c), (d) and (e).

More details on the organisational framework of the regulatory authority in the Federal Republic of Germany are given in Chapters A.3 and C.2.1.

In the field of nuclear energy and nuclear waste management, there are basically two different types of administration. This is, on the one hand, the direct federal administration, as it is applied for facilities for disposal that are to be established by the Federal Government according to § 9b of the Atomic Energy Act. On the other hand, there is the administration by the *Länder* on behalf of the Federal Government which in the field of nuclear waste management mainly comprises the storage of radioactive waste and to which the following principles apply:

1. Where the *Länder* execute federal laws on federal commission, establishment of the authorities shall remain the concern of the *Länder*, except insofar as federal laws enacted with the consent of the *Bundesrat* otherwise provide.
2. The Federal Government, with the consent of the *Bundesrat*, may issue general administrative provisions. It may provide for the uniform training of civil servants and other public employees.
3. The *Land* authorities shall be subject to instructions from the competent highest federal authorities. Implementation of the instructions shall be ensured by the supreme *Land* authorities.
4. Federal supervision shall extend to the legality and expediency of execution.

The competent supervisory and licensing authorities report to the Federal Government on law enforcement upon demand. The Federal Government has the right to require the submission of reports and documents and may issue binding directives to the *Land* authority in the individual case. The Federal Government may assume the competence for the subject matter, i.e. the decision in the case, by exercising its right to issue directives. The competence to execute the duties, i.e. the execution of the decision towards the applicant or licensee, remains with the competent *Land* authority.

C.3.1 Principle of separation

In legal terms, it is generally true that the bodies competent for licensing and supervision both at the federal and at the *Länder* level are state administrative bodies. The Constitution provides that these bodies are bound in their actions by law and justice (Article 20 (3) of the Basic Law).

At the level of the supreme federal authorities, state-organisational separation is ensured by the competence of the Federal Environment Ministry for all decisions relating to nuclear safety and radiation protection and the competence for energy industry policy lying with the Federal Ministry for Economic Affairs and Energy.

At the *Länder* level, the principle of separation is adhered to on the basis of the organisational provisions realised in the *Länder*. The unbiased, safety-oriented decision-making is additionally strengthened in terms of state organisation law through the legality and expediency supervision of the administrative action of the *Land* authorities by the Federal Environment Ministry, having exclusive competence for issues of nuclear safety and radiation protection at the federal level. This ensures within the democratically legitimised supervision established at the governmental level that the assertion of safety-relevant interests by the regulatory authorities will take place independently of economic or other extraneous influences and interests. This also applies to the regulatory framework accordingly. All groups that contribute to the safety of nuclear facilities are involved in the review and, where required, updating of the regulatory framework. Safety-related interests have priority over economic interests.

In the field of disposal, as the operator, the Federal Office for Radiation Protection is responsible for the construction, operation and closure of disposal facilities and for the Asse II mine. For these tasks, the Federal Office for Radiation Protection employs the services of the German service company for the construction and operation of waste repositories (Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mbH, DBE mbH) and the Asse GmbH as administrative aid. The Federal Office for the Regulation of Nuclear Waste Management is the regulatory authority in the site selection procedure and, in future, will also be the authority responsible for plan approval and licensing for disposal facilities. For the current projects concerning disposal facilities, there are transitional provisions in place. Accordingly, the Federal Office for the Regulation of Nuclear Waste Management will be the competent licensing (plan approval) authority only after commissioning of the Konrad repository; the same applies to the Morsleben repository after having been granted the licence (plan approval) for closure. Currently, these tasks are still the responsibility of the *Länder* of Lower Saxony and Saxony-Anhalt. For the Asse II mine, the supreme *Land* authority of Lower Saxony remains to be responsible as licensing authority.

In addition, there are federal authorities being responsible for specific issues of nuclear safety and radiation protection as well as for spent fuel and radioactive waste management. So, for example, the Federal Office of Economics and Export Control (BAFA, within the area of responsibility of the Federal Ministry for Economic Affairs and Energy) is responsible for the import and export of radioactive materials as defined in § 3 of the Atomic Energy Act.

All licensing decisions are made in an evidence-based and documented administrative procedure therefore all decisions in this area are also independent and safety-oriented.

C.3.2 Human and financial resources of the licensing authorities

The responsibility for the organisation, staffing and financial resources of the nuclear authorities of the Federal Government lies with the Federal Environment Ministry. The rights and obligations of the Federal Government and the *Länder* are sketched out by the Basic Law.

The staff of the Federal Environment Ministry, the two federal offices and the competent supreme *Land* authorities consists of civil servants appointed for life and public service employees. The legal civil servants or public service employees are required to have qualified at university and to have passed the corresponding examinations. The scientific-technical civil servants are required to have completed a corresponding course at a university or a university of applied sciences. Furthermore, there are high demands on the reliability and impartiality of authority staff. § 12 paragraph 1 (12) stipulates the requirements to be established with regard to the training, professional knowledge and skills, reliability and impartiality also for the case of consultation of persons and organisations as authorised technical experts by the competent authorities (§ 20 of the Atomic Energy Act).

The staffing needs of the Federal Environment Ministry and the two federal offices are regularly checked by means of a review of the public functions and tasks and adjusted where required. The staff appointment schemes of the authorities on which the staffing is based are part of the federal budget that is drawn up by the Federal Government and adopted by the budgetary legislator (*Bundestag*). For staffing of the authorities competent for reactor safety and radiation protection of the *Länder*, these are responsible.

In nuclear authorisation and supervisory procedures, the *Land* authorities consult, as a rule, authorised technical experts (see § 20 of the Atomic Energy Act). In performing its function of federal supervision, the Federal Environment Ministry is supported as regards scientific and technical issues by the Federal Office for Radiation Protection, the Federal Office for the Regulation of Nuclear Waste Management, by advisory bodies (especially the Nuclear Waste Management Commission), the Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH as technical expert organisation of the Federal Government and, where required, also by other technical experts.

The costs arising from authorisation and supervision of nuclear facilities are basically refinanced in accordance with § 21 of the Atomic Energy Act (costs for decisions on applications, including review of the results of safety reviews) as well as in accordance with § 21a of the Atomic Energy Act (costs for the use of facilities pursuant to § 9a paragraph. 3 of the Atomic Energy Act). Technical experts' fees are also reimbursed by the applicant or the licence holder as expenses.

In summary, the competent regulatory authorities of the Federal Republic of Germany are given the legal powers and the necessary human and financial resources via the Atomic Energy Act and subordinate regulations.

C.4 Article 7 – Licence holder

Article 7.1

Member States shall ensure that the prime responsibility for the safety of spent fuel and radioactive waste management facilities and/or activities rest with the licence holder. That responsibility can not be delegated.

Article 7.2

Member States shall ensure that the national framework in place require licence holders, under the regulatory control of the competent regulatory authority, to regularly assess, verify and continuously improve, as far as is reasonably achievable, the safety of the radioactive waste and spent fuel management facility or activity in a systematic and verifiable manner. This shall be achieved through an appropriate safety assessment, other arguments and evidence.

Article 7.3

As part of the licensing of a facility or activity the safety demonstration shall cover the development and operation of an activity and the development, operation and decommissioning of a facility or closure of a disposal facility as well as the post-closure phase of a disposal facility. The extent of the safety demonstration shall be commensurate with the complexity of the operation and the magnitude of the hazards associated with the radioactive waste and spent fuel, and the facility or activity. The licensing process shall contribute to safety in the facility or activity during normal operating conditions, anticipated operational occurrences and design basis accidents. It shall provide the required assurance of safety in the facility or activity. Measures shall be in place to prevent accidents and mitigate the consequences of accidents, including verification of physical barriers and the licence holder's administrative protection procedures that would have to fail before workers and the general public would be significantly affected by ionising radiation. That approach shall identify and reduce uncertainties.

Article 7.4

Member States shall ensure that the national framework require licence holders to establish and implement integrated management systems, including quality assurance, which give due priority for overall management of spent fuel and radioactive waste to safety and are regularly verified by the competent regulatory authority.

Article 7.5

Member States shall ensure that the national framework require licence holders to provide for and maintain adequate financial and human resources to fulfil their obligations with respect to the safety of spent fuel and radioactive waste management as laid down in paragraphs 1 to 4.

C.4.1 General requirements relating to the holder of an authorisation

According to § 7c paragraph 1 of the Atomic Energy Act, the responsibility for nuclear safety, including radiation protection, shall fall to the holder of the licence of the nuclear facility and this responsibility cannot be delegated. An extension of these obligations to other nuclear waste management facilities takes place with the implementation of Directive 2011/70/Euratom.

A Licence may only be granted if the applicant meets all the statutory licence conditions according to § 6, 7, 9 and 9b of the Atomic Energy Act and § 9 of the Radiation Protection Ordinance, respectively. The licence conditions stipulate, among other things, that a sufficient level of safety has already been demonstrated within the licensing procedure and operation, and that construction and operation have to be such that the necessary precautions against damage have been taken in line with the state of the art in science and technology.

According to § 31 of the Radiation Protection Ordinance, the licence holder shall be radiation protection supervisor. The duties include, among other things, to provide appropriate installations and equipment as well as to ensure appropriate control of the operating procedures with sufficient and adequate staff and protection against safety-relevant events. Furthermore, it is required according to the Nuclear Safety Commissioner and Reporting Ordinance (AtSMV) to appoint a nuclear safety officer if nuclear fuel is to be handled. Rights and duties of the nuclear safety officer are set out in § 4 and 5 of the Nuclear Safety Commissioner and Reporting Ordinance. It is his responsibility to supervise nuclear safety issues in all areas of operation, and in doing so, he must act independently of the corporate interests of cost-effective operation. He should be involved in all activities concerning modifications, should assess any reportable events and the evaluation of operating data, and has the right to report directly and at any time to the plant manager. Both the radiation protection officer and the nuclear safety officer perform their tasks independently from the company hierarchy. Further responsibilities and qualifications are set out in the guidelines on technical qualification.

The operation of a facility is monitored continuously so that safety-relevant disturbances of operation and incidents are reliably detected and the corrective measures specified in the operating manual are taken. In addition, the proper condition of the safety-relevant devices of a facility is ensured by recurrent tests. Their frequency depends on the safety significance of the component to be tested. The recurrent tests are defined in a testing manual. The results of the recurrent tests are to be documented and are available for long-term monitoring.

C.4.2 Periodic safety review

Guidelines have been developed for the performance of periodic safety reviews (PSR) for storage facilities for spent fuel and heat-generating waste in casks. For the storage of radioactive waste with negligible heat generation, these requirements have been defined in the corresponding guidelines of the Nuclear Waste Management Commission. The overall objective of the periodic safety review of storage facilities is to review the safety levels of nuclear facilities regularly according to the state of the art in science and technology, to assess deficiencies defined and, if required, derive proposals for remedy. The results and measures derived from it are documented by the licence holder and submitted to the nuclear supervisory authority. If required, the supervisory authority defines necessary measures for the further operation of the reviewed storage facility and supervises their timely and proper implementation.

In the case of storage facilities a quality assurance concept for the construction and operation of the storage facility that is graded according to safety requirements is already developed during planning and design of the storage facility in accordance with the guidelines of the Nuclear Waste Management Commission on storage. For this purpose it is expedient to assign all systems, parts and components to specified quality classes according to their safety-related or radiological significance.

The periodic safety reviews will be conducted every ten years after the start of operation (emplacement of the first cask). Furthermore, for the management of long-term and ageing effects during the period of use of the storage facility applied for, a monitor-

ing concept is presented. Part of the monitoring concept is also the obligation to report on the condition of the storage building and of the components required for storage at intervals of ten years.

An extension of the obligation to conduct periodic safety reviews to other nuclear waste management facilities, in particular to the operation of disposal facilities, takes place with the implementation of Directive 2011/70/Euratom.

C.4.3 Safety demonstrations

Safety demonstrations are already furnished within the licensing procedure. As a consequence of the events in Japan in March 2011, the Nuclear Waste Management Commission has conducted a stress test for facilities for spent fuel and radioactive waste management in the Federal Republic of Germany. The investigations and reviews have shown that the storage facilities for spent fuel and radioactive waste with negligible heat generation fulfil the highest stress level and achieve the highest degree of protection in almost all load cases. Furthermore, the stress test did not reveal any deficiencies in design requirements of the facilities considered.

With regard to the disposal especially of heat-generating waste, a comprehensive safety case will be prepared for all operating states of the disposal facility. In this respect, facility-specific safety analyses are carried out for the emplacement operation, including sealing, and for long-term safety, taking into account defined design basis accidents, to verify the protection of operating staff, the general public and the environment as required by the Radiation Protection Ordinance. This includes an analysis and representation of the robustness of the disposal facility system. With the aim to permanently protect man and the environment and to avoid undue burdens and obligations for future generations, Chapter 4.6 of the Safety Requirements Governing the Final Disposal of Heat-Generating Radioactive Waste stipulates that the disposal facility shall be constructed and operated in such a way that no intervention or maintenance work is required during the post-closure phase to ensure the reliable long-term containment of the radioactive waste in the containment-providing rock zone.

The site-specific safety analysis and the safety assessment comprise all information, analyses and arguments verifying the long-term safety of the disposal facility, and explain why confidence is placed on this assessment. During emplacement operation, a safety review shall also be conducted every ten years, taking into consideration the state of the art in science and technology and enhancing safety where required.

The safety requirements for a disposal facility especially for heat-generating radioactive waste are currently subject to potential revision as major changes may ensue on the basis of the recommendations of the German *Bundestag Commission Storage of High-Level Radioactive Waste* pursuant to § 3 of the Site Selection Act.

C.4.4 Management systems

The management system identifies those processes that are necessary to achieve the organisational goals, including the provision of means necessary for compliance with all requirements and for task performance. Safety management is designed in such a way that a high level of confidence in the quality of the organisation and in the compliance with all safety requirements and existing limits, reference levels and criteria is justified. It ensures that the safety standards of the licence holder can be assessed on a continual basis in the light of advancing information.

A safety management system is set up to realise the safety management. It includes all specifications, regulations and organisational tools for the handling of safety-relevant activities and processes. All its elements are derived and justified in a comprehensible manner. Interactions, interfaces and delimitations between different processes are designed and described in a comprehensible manner. The documentation of the management system includes, for example for storage facilities for spent fuel and heat-generating waste heat, the following /ESK 2013b/:

- the company's safety policy,
- a description of the management system,
- a description of the roles and responsibilities, their assignment, the decision-making structures and the interaction with the management, the performers and those who have to assess the performance,
- a description of the cooperation with relevant external organisations, and
- a description of the processes, including information regarding preparation, independent review, performance and documentation of the work. In addition, the measures for assessment and, if applicable, improvement of the processes and activities are to be described.

The safety management system, that is generally part of an integrated management system, gives highest priority to ensuring and continuously improving safety over other management objectives and supports the development and maintenance of a high safety culture.

C.4.5 Human and financial resources

For the safe operation of nuclear facilities, the licence holder is also required to provide for and maintain adequate human resources. This staff must have the necessary competence for the tasks to be performed. All licence applications for construction, operation, decommissioning or a major modification shall be accompanied by the proof of the qualification of the responsible persons as well as of the necessary knowledge of the staff otherwise engaged during operation of the facility. The measures of the operator to ensure adequate staffing are reviewed by the supervisory body on the basis of the reports submitted.

The public vocational training system in the Federal Republic of Germany provides good conditions for the operators of nuclear facilities that they can recruit skilled workers, foremen, technicians, engineers and scientists who received, within their school education and vocational training, technical basic training complying with the professional requirements which is documented by a state-approved certificate. As a result of the freedom of movement within the European Union, there has been an additional increase in the potential of appropriately trained applicants. The operators of nuclear facilities – both state-owned and privately owned – for their part try to recruit qualified employees.

Furthermore, the operator is obliged to provide education and further training of his personnel pursuant to § 7 paragraph 2 subparagraph 3 of the Atomic Energy Act.

When using external personnel, the applicant has to ensure that the necessary knowledge is available, where required, by persons in support of them. This also applies to the case that knowledge is communicated by the contractor. Acceptable proof is presented to the supervisory body upon request.

The maintenance of competence for and the know-how transfer within specialist positions takes place through training programmes as well as a long-term "parallel recruitment". Here, the young staff accompanies the experienced staff at the specialist position assigned to them up to three years depending on the tasks. Further, continuous promotion of junior staff takes place by intensive cooperation of the plant operators with the universities and the nuclear research institutions which comprises the promotion of professorships in the field of nuclear engineering, funding of doctoral studies as well as internships and courses for students.

For compliance with the obligations relating to spent fuel or radioactive waste management safety of the nuclear facility, the respective operator has to provide for and keep available adequate financial resources. According to § 7c of the Atomic Energy Act this has already been regulated by law for nuclear facilities. An extension of this obligation to other nuclear waste management facilities takes place with the implementation of Directive 2011/70/Euratom. This obligation ensures that the party obliged must ensure that adequate financial resources are available when required for the fulfilment of the standardised obligations with regard to the safe management of radioactive waste. Proof of adequate financial resources must be provided in the light of the respective licence. Thus, financial resources must not be withdrawn as far as this would adversely affect safety-related interests.

C.5 Article 8 – Expertise and skills

Article 8

Member States shall ensure that the national framework require all parties to make arrangements for education and training for their staff, as well as research and development activities to cover the needs of the national programme for spent fuel and radioactive waste management in order to obtain, maintain and to further develop necessary expertise and skills.

C.5.1 Education and training of staff

For requirements relating to human resources and education and training of staff at the licence holders' see also Chapter C.4.5.

The Federal Government ensures that the requirements for the experts of all parties involved that are responsible for the safety of spent fuel and radioactive waste within the national framework with regard to education and training as well as to research and development cover the needs of the National Programme.

Proof of expertise and skills are furnished on the basis of the relevant guidelines on technical qualification. For the experts to be involved, the related specifications comprise, e.g., the function-related initial qualification, education and training requirements, performance of training, the acquisition of practical experience and, depending on the intended area of work, the examinations required. The technical qualification is to be renewed by attending courses at specified intervals.

Besides in-house education and training courses offered for authority staff by the supervisory bodies and the Federal Academy for Public Administration (BAköV), in principle, the same training opportunities are available to this staff as to the operating staff of nuclear waste management facilities. These are, in addition to the courses at the KWS PowerTech Training Center Essen and its simulator courses, all education and training activities of the TÜV Akademie and the Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH.

In addition to the education and training programmes of the Federal Republic of Germany, the education and training opportunities offered by the European Nuclear Safety Training and Tutoring Institute (ENSTTI), a joint initiative of the four European expert organisations Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH (Federal Republic of Germany), Institut de Radioprotection et de Sûreté Nucléaire (IRSN – France), Nuclear Research Institute Rez plc (UJV – Czech Republic) and Lietuvos Energetikos Institutas (LEI – Lithuania), are available to all staff of the authorities and technical expert organisations.

C.5.2 Research and development

The Federal Government makes a substantial contribution to building up, developing and maintaining the scientific and technical competence as well as to promoting young experts in the field of waste management and disposal. Moreover, it continuously updates the state of the art in science and technology through corresponding research

and development in addition to providing the scientific and technical basis for the realisation of a disposal facility.

The respective current energy research programme of the Federal Government provides the guideline of the Federal Republic of Germany on research and development, thereby describing i.a. the priorities of research policy with respect to the funding area of nuclear safety and disposal research. With these programmes on research and development, the Federal Government ensures the needs of the National Programme.

Corresponding research and development sponsorship concepts of the competent ministries (the Federal Ministry of Education and Research (BMBF) and the Federal Ministry for Economic Affairs and Energy (BMWi)), put these general conditions in concrete terms and set out defined research focuses, including the promotion of young experts. Currently, the 6th Energy Research Programme is being conducted.

E.g. technical and scientific questions of fundamental safety significance are investigated by independent third parties on behalf of the Federal Environment Ministry by means of the departmental research plan. In addition, these funds can be used to commission expert opinions and studies from universities, research institutes and technical expert organisations with a view to clarifying specific issues relating to nuclear safety, radiation protection or the nuclear fuel cycle. The research framework is defined by the departmental research plan of the Federal Environment Ministry (previously the environmental research plan referred to as “UFOPLAN”) and published annually.

Details on the focuses of research in connection with the safe and orderly management of spent fuel and radioactive waste are presented in Chapter 15.2 on nuclear waste management and Chapter 15.3 on decommissioning of nuclear facilities of the BMUB departmental research plan.

Further details on the implementation of the energy research programme are contained in the funding concept for research on radioactive waste management (2015 – 2018) of the Federal Ministry for Economic Affairs and Energy. The objective of this site-independent, fundamental research project funding is to provide the scientific and technical basis for the realisation of a disposal facility especially for heat-generating radioactive waste. This is to provide the necessary tools and methodical basis to the future constructors and operators for the construction of the disposal facility. The projects in the field of nuclear waste management research funded in this way make a substantial contribution to building up, developing and maintaining the scientific and technical competence as well as to promoting young experts in the field of nuclear waste management in Germany.

International cooperation is an important component in the context of research and development activities and thus constitutes a central part of the programmes. In this regard, the scientific objectives are the improvement of system comprehension of disposal concepts, the improvement and further development of methodological approaches, and the development and testing of technical equipment and procedures. As regards the scientific cooperation, in particular, the cooperation in the European underground laboratories plays a central role. The cooperation between German research institutions and international partners has a long tradition and is based on bilateral

agreements with disposal facility organisations or on agreements with state institutions, e.g. also for scientific and technical cooperation. In addition, contributions are made for the participation of German research institutions in OECD/NEA activities. Furthermore, co-financing of EU research projects takes place.

The participation in international activities to further develop the regulatory requirements and to evaluate experiences, e.g. via the Western European Nuclear Regulators Association (WENRA), contributes to further developing the technical and scientific basis with focusses especially on the assessment of the state of the art in science and technology and long-term safety of disposal facility sites, the expediency supervision by the Federal Government as to the enforcement of the Atomic Energy Act by the *Länder*, and the technical supervision of the Federal Office for Radiation Protection and the Federal Office for the Regulation of Nuclear Waste Management.

C.6 Article 9 – Financial resources

Article 9

Member States shall ensure that the national framework require that adequate financial resources be available when needed for the implementation of national programmes referred to in Article 11, especially for the management of spent fuel and radioactive waste, taking due account of the responsibility of spent fuel and radioactive waste generators.

Regarding the obligation to finance the management of spent fuel and radioactive waste, i.e. waste processing, storage and disposal in a disposal facility provided by the Federal Government, the polluter-pays principle applies. Accordingly, the waste producers bear the cost responsibility and thus have to bear all the costs of waste management. Exceptions relate to facilities for which the Federal Government or the *Länder* have to bear the costs, such as special dismantling projects, the Morsleben repository for radioactive waste and the Asse II mine.

Financing of the decommissioning (incl. dismantling) of the nuclear installations, and management of radioactive waste in the public sector is ensured by the Federal Government and the *Länder* from the public budgets.

§ 9a paragraph 1 of the Atomic Energy stipulates that operators of nuclear power plants or other nuclear facilities shall utilise generated residual radioactive material as well as disassembled or dismantled radioactive components without detrimental effects or dispose of them as radioactive waste in a controlled manner. Thus, private operators have financial obligations whose exact amount and exact date are not yet known at present. They are therefore required under commercial law (in particular § 249 of the German Commercial Code) and under tax law to classify as a liability in their balances of accounts provisions in adequate amounts. In view of their obligation to make appropriate provisions, they are also responsible for the cost calculations and cost estimates required for it. For calculating the costs for disposal, they are dependent on cost estimates by the competent authority of the Federal Government.

The costs for the disposal facility projects are demanded from the waste producers by the Federal Government for each phase (site selection procedure for the planned disposal facility especially for heat-generating radioactive waste, planning and construction, and operation and closure of all disposal facilities) in accordance with the statutory requirements, depending on the actual financial needs.

For the phase after completion of the site selection procedure until commissioning of the disposal facility especially for heat-generating radioactive waste, planning and construction will be funded by contributions from the waste originators. The site selection procedure is funded through the waste originators by annual cost allocations as defined in §§ 21 et seq. of the Site Selection Act. Until the collection of contributions, which will be made upon completion of the construction and adoption of a regulation on contributions, the costs of the disposal facility are funded through annual prepayments on contributions. As defined in the "Ordinance Concerning Prepayments for the Erection of Federal Facilities for the Safekeeping and Disposal of Radioactive Waste (Repository Prepayment Ordinance – EndlagerVIV) /EndlagerVIV 2004/, these prepayments are levied to cover the necessary expenses for the planning, the acquisition of real estate

and rights, the facility-specific research and development, the maintenance of land and facilities, and the construction, extension and renewal of these facilities. The prepayments levied will be taken into account for contributions pursuant to § 21b paragraph 1 of the Site Selection Act. According to § 21b paragraph 2 of the Site Selection Act, these shall be made by those who stand to benefit from the opportunity of utilising facilities for the disposal of radioactive waste pursuant to § 9a paragraph 3 of the Atomic Energy Act. For the operation of such a facility, the parties obliged to deliver radioactive waste shall be charged with costs (fees and expenses) for the use.

Radioactive waste from industrial, medical and research applications initially has to be delivered to the collecting facilities of the *Länder* (*Land* collecting facilities) and stored there. The *Land* collecting facilities deliver the radioactive waste stored in them to a disposal facility. According to § 9a paragraph 3 of the Atomic Energy Act, the *Länder* have to establish *Land* collecting facilities for the storage of the radioactive waste generated in their territory. The waste originators are obliged to deliver radioactive waste to the respective facility. According to §§ 21 et seq. of the Atomic Energy Act, they have to bear the cost proportionally.

More details on costs and financial resources are given in the *Report on the Costs and Financing of the Management of Spent Fuel and Radioactive Waste* /BMUB 2015c/.

C.7 Article 10 – Transparency

Article 10.1

Member States shall ensure that necessary information on the management of spent fuel and radioactive waste be made available to workers and the general public. This obligation includes ensuring that the competent regulatory authority inform the public in the fields of its competence. Information shall be made available to the public in accordance with national legislation and international obligations, provided that this does not jeopardise other interests such as, inter alia, security, recognised in national legislation or international obligations.

Article 10.2

Member States shall ensure that the public be given the necessary opportunities to participate effectively in the decision-making process regarding spent fuel and radioactive waste management in accordance with national legislation and international obligations.

Information is made available to the general public in accordance with national legislation and international obligations. In this regard, in particular information relating to the applicable regulatory framework, monitoring of the environment, reportable events, radiological emergency situations, but also to the topic of radioactive waste management are to be listed.

The Federal Environment Ministry involves the public in all matters relating to the development of the national and international rules and regulations (see Chapter C.2.2.6) and makes them available to the public through its website, to some extent also in English, provided that this does not jeopardise interests relating to security and confidentiality.

In addition to the site-specific monitoring of the vicinity of nuclear power plants according to the Guideline on Emission and Immission Monitoring (REI), the general environmental radioactivity is recorded by extensive measurements in the entire territory of the Federal Republic of Germany, i.e. also in the vicinity of waste management facilities, by means of the Integrated Measurement and Information System for the Monitoring of Environmental Radiation (IMIS) in accordance with the Precautionary Radiation Protection Act. The data is published in the annual reports "Environmental Radioactivity and Radiation Exposure" issued by the Federal Environment Ministry and are partly accessible to the public via the Internet.

Events in radioactive waste management facilities for which reporting is mandatory are classified by the licence holders of these facilities according to the International Nuclear Event Scale (INES) of the International Atomic Energy Agency. The licence holders inform the public about all reportable events in their facilities. Own staff will be informed internally about these events. The Federal Office for Radiation Protection records these events and informs all *Land* authorities and technical experts in quarterly reports and the general public in monthly and annual reports on the website of the Federal Office for Radiation Protection.

With respect to informing the general public in the event of a radiological emergency, stipulations are laid down in §§ 51 and 53 of the Radiation Protection Ordinance. The main contents of the information to be given to the general public are specified in Annex XIII of the Radiation Protection Ordinance. Here, a distinction is made between the information to be issued to the public in advance in preparation for a radiological emer-

gency, and the relevant information in an actual emergency according § 51 paragraph 2 of the Radiation Protection Ordinance.

Public information relating to spent fuel and radioactive waste management through the competent authorities (Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Federal Ministry for Economic Affairs and Energy, Federal Ministry of Education and Research and their subordinate area: Federal Office for Radiation Protection, Federal Institute for Geosciences and Natural Resources, Federal Institute for Materials Research and Testing) and their project management organisations mainly takes place through the publicly available annual reports and their respective comprehensive websites, or for specific topics through separate publications. With respect to the disposal facility projects, the Federal Office for Radiation Protection established the information centre “INFO KONRAD” in Salzgitter-Lebenstedt, “INFO Morsleben” close to the Morsleben repository for radioactive waste, and “INFO ASSE” close to the Asse II mine for informing the public.

In addition, the public is informed by the respective licence holders of the nuclear waste management facilities, in some cases, specific discussion forums or advisory groups have been set up with the licence holders and the public.

On principle, the public also has the option to access environmental information according to the Environmental Information Act (UIG).

In parallel with the wide range of information provided to the public, the public is involved within the framework of the licensing procedure for radioactive waste management facilities. By this, the public is given the opportunity to bring in their interests directly into the procedure.

The need for an environmental impact assessment (EIA) for the licensing of the construction, operation and decommissioning of facilities or in case of an essential modification of the facility or its operation, and the procedure of the environmental impact assessment within the licensing procedure are regulated in principle in the Act on the Assessment of Environmental Impacts. If a licensing procedure is carried out with public participation, the applicant has to submit, inter alia, an understandable brief description of the facility and the change applied for to inform the public. A safety report, which is checked by the competent authority with the help of technical experts in the course of the licensing process, is also to be prepared by the applicant. It essentially serves to describe the impacts related to the change, including the possibly changed effects of design basis accidents, and the precautionary measures set out, so that affected persons can assess whether they want to act to safeguard their rights. The licensing authority takes account of the objections in their decision-making and presents this in the licensing statement.

As part of the drafting of the National Programme, a Strategic Environmental Assessment (SEA) has been carried out by the Federal Environment Ministry and, as far as required in case of future changes of this programme, will be carried out according to the Environmental Impact Assessment Act. To this end, the potential environmental impacts to be expected from the implementation of the National Programme were and will be determined and presented in an environmental report for public participation. In

the framework of the Strategic Environmental Assessment, the environmental impacts of the National Programme, including the alternatives considered, have been and will be assessed with public involvement. Within the realisation of the Strategic Environmental Assessment the neighbouring countries were involved.

With regard to the site selection procedure for the planned disposal facility especially for heat-generating radioactive waste, the currently defined participation procedure is being assessed as part of the work of the *Commission Storage of High-Level Radioactive Waste*. As the legislator, the German *Bundestag* will then decide on proposals of the Commission on changes to the general procedure for public participation. Besides the involvement of the public, in its current version, the Site Selection Act also provides for the involvement of *Land* authorities, communal head associations, regional authorities and representatives of public interests, depending on the procedural step and on whether and to what extent the former are affected.

The licensing procedure according to § 9b paragraph 1a of the Atomic Energy Act, 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.

In addition to the public participation in the licensing procedures and in the environmental assessments, representatives of science and social groups as well as members of the *Länder* governments and the German *Bundestag* as members of the *Commission Storage of High-Level Radioactive Waste* take an active role in the ongoing evaluation process. The Commission's responsibilities include, among others, the development of proposals for the basis for decision-making in the subsequent site selection procedure and for the review of Site Selection Act. Furthermore, requirements relating to the procedure of the selection process and to public participation are addressed by the Commission. Within the framework of the internet forum of the Commission, citizens can actively participate in the opinion-forming process with their own contributions. In addition, the Commission organises events for public participation. The results of the work of the *Commission Storage of High-Level Radioactive Waste* are to be submitted to the German *Bundestag*, the *Bundesrat* and the Government of the Federal Republic of Germany in the form of a report. This report is to be finalised in accordance with the requirements of the Site Selection Act by 31 December 2015. This deadline may be extended once only by six months.

For other aspects of public participation, see also Chapter 5 of the *Programme for the Responsible and Safe Management of Spent Fuel and Radioactive Waste (National Programme)* /BMUB 2015a/.

C.8 Articles 11 and 12 – National programmes

Article 11.1

Each Member State shall ensure the implementation of its national programme for the management of spent fuel and radioactive waste ('national programme'), covering all types of spent fuel and radioactive waste under its jurisdiction and all stages of spent fuel and radioactive waste management from generation to disposal.

Article 11.2

Each Member State shall regularly review and update its national programme, taking into account technical and scientific progress as appropriate as well as recommendations, lessons learned and good practices from peer reviews.

Article 12.1

The national programmes shall set out how the Member States intend to implement their national policies referred to in Article 4 for the responsible and safe management of spent fuel and radioactive waste to secure the aims of this Directive, and shall include all of the following:

- a) the overall objectives of the Member State's national policy in respect of spent fuel and radioactive waste management;
- b) the significant milestones and clear timeframes for the achievement of those milestones in light of the over-arching objectives of the national programme;
- c) an inventory of all spent fuel and radioactive waste and estimates for future quantities, including those from decommissioning, clearly indicating the location and amount of the radioactive waste and spent fuel in accordance with appropriate classification of the radioactive waste;
- d) the concepts or plans and technical solutions for spent fuel and radioactive waste management from generation to disposal;
- e) the concepts or plans for the post-closure period of a disposal facility's lifetime, including the period during which appropriate controls are retained and the means to be employed to preserve knowledge of that facility in the longer term;
- f) the research, development and demonstration activities that are needed in order to implement solutions for the management of spent fuel and radioactive waste;
- g) the responsibility for the implementation of the national programme and the key performance indicators to monitor progress towards implementation;
- h) an assessment of the national programme costs and the underlying basis and hypotheses for that assessment, which must include a profile over time;
- i) the financing scheme(s) in force;
- j) a transparency policy or process as referred to in Article 10;
- k) if any, the agreement(s) concluded with a Member State or a third country on management of spent fuel or radioactive waste, including on the use of disposal facilities.

Article 12.2

The national programme together with the national policy may be contained in a single document or in a number of documents.

C.8.1 National Programme

The *Programme for the Responsible and Safe Management of Spent Fuel and Radioactive Waste (National Programme)* /BMUB 2015a/ was drafted under the leadership of the Federal Environment Ministry (see Chapter A.4, C.2.1).

The National Programme is subject to potential revision as major changes may ensue on the basis of the recommendations of the German *Bundestag's Commission Storage of High-Level Radioactive Waste* pursuant to § 3 of the Site Selection Act.

The Federal Government meets its reporting obligation imposed by Directive 2011/70/Euratom by submitting several documents (see Figure C.8-1). The National Programme contains a programmatic overview of the spent fuel and radioactive waste management planning. The current status of spent fuel and radioactive waste management is reported every three years in *the Report for the Review Meeting 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 by 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 also 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*.

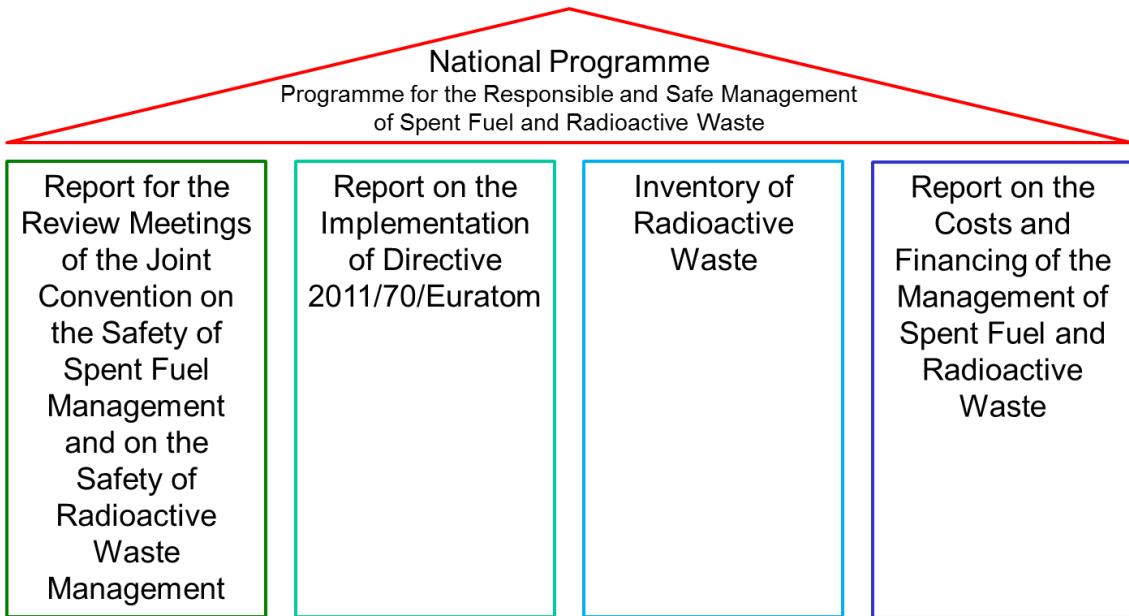


Figure C.8-1: Concept of the Federal Government to fulfil its reporting obligation within the framework of Directive 2011/70/Euratom

On behalf of the Federal Government, the Federal Environment Ministry reviews the National Programme regularly to ensure that it is up to date. Within the framework of an ARTEMIS mission, it will also be reviewed as part of a self-assessment and a subsequent peer-review on a regular basis.

The national strategy for spent fuel and radioactive waste management is completed by and based on decisions that have been taken by the legislator and are reflected in the relevant regulations, such as the Atomic Energy Act.

In accordance with the principle of transparency in the field of waste management in the Federal Republic of Germany, the National Programme is published together with

the supporting reports on the website of the Federal Environment Ministry. The environmental report, which was prepared as part of the Strategic Environmental Assessment of the National Programme, as well as information on how the comments from participation of authorities and the public on the National Programme have been taken into consideration are also published there.

One part of the National Programme refers to the construction of the disposal facility especially for heat-generating waste. In this respect, the Site Selection Act establishes chronological milestones and the framework conditions for the required information and participation of the public. For public information, the corresponding project information is provided, primarily by using the websites of the institutions involved.

C.8.2 Inventory of spent fuel and radioactive waste

At the reference date of 31 December 2014, about 8,380 Mg HM¹ had been generated in the form of spent fuel from the operation of nuclear power plants in the Federal Republic of Germany, which will have to be disposed of in Germany.

The radioactive waste returned from reprocessing in other European countries and the vitrified high-level radioactive waste generated in Germany is stored in the form of 3,164 canisters in 113 casks.

The amount of spent fuel from German research and demonstration reactors yet to be disposed of are in dry storage in 461 casks in the Ahaus storage facility, at the research centre Jülich (Forschungszentrum Jülich), and in the Zwischenlager Nord storage facility.

The amount of spent fuel from research reactors is less by several orders of magnitude than the amount from nuclear power plants and is stored at the research reactors in Berlin, Garching and Mainz as well as in 18 casks in the Ahaus storage facility.

As at 31 December 2014, there were 21,672 Mg of raw and pretreated waste, and 117,195 m³ of treated and conditioned radioactive waste stored in the Federal Republic of Germany.

According to the German approach to disposal, the definition and categorisation of radioactive waste therefore complies with the requirements for the safety assessment of an underground disposal facility. The basic subdivision into heat-generating waste and waste with negligible heat generation also applies when the waste packages to be disposed of are stored above-ground in the long term prior to emplacement in a repository mine.

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

More information on the categorisation of the radioactive waste can also be found in the *Report for the Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*. In order to permit classification according to the system of the IAEA, a transfer table has been developed (see Table C.8-1). It is, however, important to note that the data shown are estimates that are subject to uncertainties.

Table C.8-1: Table for transfer into the IAEA classification

Waste class*	Distribution (%)				Waste management route
	VLLW	LLW	ILW	HLW	Disposal
NHGW**	–	90	10	–	in deep geological formations
HGW (m ³)***	–	–	2	98	in deep geological formations
HGW (MgHM)****	–	-		100	in deep geological formations
<p>* NHGW: waste with negligible heat generation; HGW: heat-generating waste</p> <p>** The percentages in the matrix are based upon waste characteristics including radionuclide inventory and estimated annual arisings provided by the waste generators (Internal BfS-report ET-IB-52). The characteristics were compared with the limits for long-lived nuclides and heat generation specified for the IAEA's waste classification scheme.***The ratio is based on the current amount of waste from reprocessing returned to Germany and other radioactive waste. The ratio will change in the future.</p> <p>**** Spent fuel is HLW.</p> <p>Note: If spent fuel assemblies will be conditioned (depending on the disposal concept) then it could generate intermediate-level waste (ILW) (e.g. structural parts). In conclusion, spent fuel assemblies consist of high-level waste (HLW) (spent fuel) and ILW (structural parts). The ratio refers only to spent fuel ("MgHM").</p>					

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/StandAG 2013/	<p>Standortauswahlgesetz</p> <p>Gesetz zur Suche und Auswahl eines Standortes für ein Endlager für Wärme entwickelnde radioaktive Abfälle und zur Änderung anderer Gesetze (Standortauswahlgesetz – StandAG) vom 23. Juli 2013 (BGBl. I 2013, Nr. 41, S. 2553)</p>
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E. List of abbreviations

AtG	Atomgesetz <i>Atomic Energy Act</i>
AtSMV	Atomrechtliche Sicherheitsbeauftragten- und Meldeverordnung <i>Nuclear Safety Officer and Reporting Ordinance</i>
AtVfV	Atomrechtliche Verfahrensverordnung <i>Nuclear Licensing Procedure Ordinance</i>
BAFA	Bundesamt für Wirtschaft und Ausfuhrkontrolle <i>Federal Office of Economics and Export Control</i>
BAM	Bundesanstalt für Materialforschung und -prüfung <i>Federal Institute for Materials Research and Testing</i>
BfE	Bundesamt für kerntechnische Entsorgung <i>Federal Office for the Regulation of Nuclear Waste Management</i>
BfS	Bundesamt für Strahlenschutz <i>Federal Office for Radiation Protection</i>
BMBF	Bundesministerium für Bildung und Forschung <i>Federal Ministry of Education and Research</i>
BMUB	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (früher Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU)) <i>Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (former Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)</i>
BMWi	Bundesministerium für Wirtschaft und Energie (früher Bundesministerium für Wirtschaft und Technologie) <i>Federal Ministry for Economic Affairs and Energy (former Federal Ministry of Economics and Technology)</i>
CNS	Convention on Nuclear Safety
DBE	Deutschen Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mbH <i>German Service Company for the Construction and Operation of Waste Disposal Facilities</i>
ENSREG	European Nuclear Safety Regulators Group
EIA	Environmental impact assessment
ERAM	Endlager für radioaktive Abfälle Morsleben <i>Morsleben repository for radioactive waste</i>
ESK	Entsorgungskommission <i>Nuclear Waste Management Commission</i>
EU	European Union
FARS	Fachausschuss Reaktorsicherheit <i>Technical Committee for Nuclear Safety</i>

FAS	Fachausschuss Strahlenschutz <i>Technical Committee for Radiation Protection</i>
FAVE	Fachausschuss nukleare Ver- und Entsorgung <i>Technical Committee for Nuclear Fuel Cycle Matters</i>
GG	Grundgesetz <i>Basic Law for the Federal Republic of Germany</i>
GRS	Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH
HM	Heavy metal
HLW	High-level waste
IAEA	International Atomic Energy Agency
ILW	Intermediate-level waste
IMIS	Integrierte Mess- und Informationssystem zur Überwachung der Umweltradioaktivität <i>Integrated measurement and information system for monitoring environmental radioactivity</i>
INES	International Nuclear Event Scale
IRRS	Integrated Regulatory Review Service
IRS	Incident Reporting System
KTA	Kerntechnischer Ausschuss <i>Nuclear Safety Standards Commission</i>
LLW	Low-level waste
MS	Member State
NaPro	National Programme
OECD/NEA	Organisation for Economic Co-operation and Development/Nuclear Energy Agency
OSPAR	Oslo-Paris Convention
PSR	Periodic safety review
REI	Richtlinie zur Emissions- und Immissionsüberwachung kerntechnischer Anlagen <i>Guideline concerning Emission and Immission Monitoring of Nuclear Installations</i>
RSK	Reaktor-Sicherheitskommission <i>Reactor Safety Commission</i>
SEA	Strategic Environmental Assessment
SSK	Strahlenschutzkommission <i>Commission on Radiological Protection</i>
StandAG	Standortauswahlgesetz <i>Site Selection Act</i>
StGB	Strafgesetzbuch <i>Criminal Code</i>
StrlSchV	Strahlenschutzverordnung <i>Radiation Protection Ordinance</i>

UFOPLAN	Umweltforschungsplan <i>Environmental research plan</i>
UIG	Umweltinformationsgesetz <i>Environmental Information Act</i>
VLLW	Very low-level waste
WENRA	Western European Nuclear Regulators Association