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

Contents

Foreword.................................................................................................................................................. 3

1. Article 4 of Directive 2009/71/Euratom ................................................................................................. 4
   1.1.1. Article 4(1)(a) of Directive 2009/71/Euratom ................................................................................. 7
   1.1.2. Article 4(1)(b) of Directive 2009/71/Euratom ................................................................................. 10
   1.1.3. Article 4(1)(c) of Directive 2009/71/Euratom ................................................................................. 11
   1.1.4. Article 4(1)(d) of Directive 2009/71/Euratom ................................................................................. 15
   1.2. Article 4.2 of Directive 2009/71/Euratom ......................................................................................... 16

2. Article 5 of Directive 2009/71/Euratom ................................................................................................. 18
   2.1. Article 5(1) of Directive 2009/71/Euratom ....................................................................................... 18
   2.2. Article 5(2) of Directive 2009/71/Euratom ....................................................................................... 20
   2.3. Article 5(3) of Directive 2009/71/Euratom ....................................................................................... 21
      2.3.1. Article 5(3)(a) of Directive 2009/71/Euratom ................................................................................. 23
      2.3.2. Article 5(3)(b) of Directive 2009/71/Euratom ................................................................................. 23
      2.3.3. Article 5(3)(c) of Directive 2009/71/Euratom ................................................................................. 24
      2.3.4. Article 5(3)(d) of Directive 2009/71/Euratom ................................................................................. 25

3. Article 6 of Directive 2009/71/Euratom ................................................................................................. 26
   3.1. Article 6(1) of Directive 2009/71/Euratom ....................................................................................... 26
   3.2. Article 6(2) of Directive 2009/71/Euratom ....................................................................................... 27
   3.3. Article 6(3) of Directive 2009/71/Euratom ....................................................................................... 30
   3.4. Article 6(4) of Directive 2009/71/Euratom ....................................................................................... 33
   3.5. Article 6(5) of Directive 2009/71/Euratom ....................................................................................... 35


5. Article 8 of Directive 2009/71/Euratom ................................................................................................. 43

6. Article 9 of Directive 2009/71/Euratom ................................................................................................. 49
   6.1. Article 9(1) of Directive 2009/71/Euratom ....................................................................................... 49
   6.2. Article 9(2) of Directive 2009/71/Euratom ....................................................................................... 49
   6.3. Article 9(3) of Directive 2009/71/Euratom ....................................................................................... 49
Foreword

This is Germany’s Report under Article 9(1) of Directive 2009/71/Euratom of 25 June 2009. The “ENSREG Guidelines regarding Member States Reports as required under Article 9(1) of Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations” were issued by the European Nuclear Safety Regulators Group (ENSREG) in 2013 to ensure that reports are drawn up in a unified manner. The Report is based on the instructions in the ENSREG Guidelines and its content is based primarily on the reports on the Sixth Review Meeting on the Convention on Nuclear Safety – CNS and the Fourth Review Meeting on the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management – JC), as agreed with all nuclear safety regulators in the German Länder. Both reports are published in German and English on the website of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and can be downloaded from this site.
1. Article 4 of Directive 2009/71/Euratom

1.1. Article 4(1) of Directive 2009/71/Euratom

The Federal Republic of Germany is a federal state. In principle, the German Länder are responsible for implementing Federal law, unless otherwise specified. Legislative and law enforcement powers are divided between Federal organisations and organisations in the individual Länder depending on the specific area of state responsibility. The Federal Government has sole legislative powers regarding the use of nuclear energy according to Article 73.1 (14) in conjunction with Article 71 of the German Basic Law (Grundgesetz). The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) is the competent authority in the Federal Administration. Articles 22 et seq. of the “Act on the peaceful use of atomic energy and protection against the associated hazards” (Atomic Energy Act (AtG)) set out the powers to implement the Act. Federal and Länder authorities implement the AtG, along with associated regulations in accordance with Articles 22-24 of the AtG, with the Länder usually being responsible for enforcing the law as laid down in Article 24.1 of the AtG in conjunction with Article 87c, 85 GG (German Basic Law). The competent authorities in the Länder are subject to federal regulation to verify the legality and fitness for purpose of their actions. The Federal Government is responsible for any future changes in nuclear law, but the Länder are involved in the process.

Nuclear installations in this report are as defined in Article 3(1) of Directive 2009/71/Euratom.
The table below illustrates responsibilities for approving and regulating nuclear installations in the Federal Republic of Germany:

<table>
<thead>
<tr>
<th>Material</th>
<th>Activity</th>
<th>Basis</th>
<th>Licensing</th>
<th>Regulator</th>
<th>Installations (by way of example)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear fuel &amp; waste containing nuclear fuel</td>
<td>Construction and operation</td>
<td>Article 7 AtG</td>
<td>Highest Land authority</td>
<td>Land authority</td>
<td>Nuclear power plants (KKW), pilot treatment plants (PKA), vitrification plants (VEK)</td>
</tr>
<tr>
<td></td>
<td>Processing, use</td>
<td>Article 9 AtG</td>
<td>Land authority</td>
<td>Land authority</td>
<td>Activities not covered by installations as per Article 7 AtG (e.g. Central Decontamination Department (HDB))</td>
</tr>
<tr>
<td>Storage</td>
<td>Article 6 AtG</td>
<td>BfS (Federal Office for Radiation Protection)</td>
<td>Land authority</td>
<td>Land authority</td>
<td>Gorleben, Ahaus, on-site intermediate storage facilities</td>
</tr>
<tr>
<td>Import and export</td>
<td>Article 3 AtG</td>
<td>BAFA (Federal Export Department)</td>
<td>State (BMF (Federal Ministry of Finance), Customs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other radioactive material as per Article 2.1 AtG, nuclear fuel as per Article 2.3 AtG (e.g. waste with a low nuclear fuel content)</td>
<td>Handling, e.g. storage</td>
<td>Article 7 StrlSchV (Radiation Protection Regulation)</td>
<td>Land authority</td>
<td>Land authority</td>
<td>Intermediate waste repository, treatment plants</td>
</tr>
</tbody>
</table>

*1If the activity is not already covered by a licence under Articles 6, 7, 9 or 9b AtG.

The German Basic Law (Grundgesetz) and more detailed laws, specifically the Atomic Energy Act (AtG), govern the allocation of powers and responsibilities between the Federal Government and the Länder. The Länder Committee for Nuclear Energy, Main Committee, Technical Committee on Law and the Technical Committees on Reactor Safety (FARS), Radiation Protection (FAS) and Nuclear Fuel Cycle and Waste Disposal (FAVE) were set up to standardise actions and ensure understanding between the Federal Government, represented by the BMUB, and the individual nuclear licensing authorities and safety regulators in the Federal Government and the Länder. See the remarks in Article 5.1 for further information on this subject.
International treaties concluded by the Federal Republic of Germany in accordance with Article 59.2 Sentence 1 of the German Basic Law are equivalent to formal Federal laws in the legislative hierarchy. As a general rule, rights and obligations arising from the treaties only apply to the Federal Republic of Germany as the treaty party.

The Federal Republic of Germany has ratified the following international treaties in the field of nuclear safety, radiation protection, liability and national implementing regulations:

- Convention on Third Party Liability in the Field of Nuclear Energy - Paris Convention of 29 July 1960,
- Convention Supplementary to the Paris Convention of 29 July 1960 on Third Party Liability in the Field of Nuclear Energy - Brussels Supplementary Convention of 31 January 1963,
  o supplemented by the Protocols of 28 January 1964, 16 November 1982 (ratified), and supplemented by the 2004 Protocol (not yet ratified).
- The Agreement revised in 1996 and issued in a different form (London Protocol), prohibiting the dumping of any waste in the sea with very few exceptions, was also ratified by the Federal Republic of Germany in October 1998.

As part of the legislative and administrative process, binding specifications from
European Union regulations have to be transposed to the Federal Republic of Germany insofar as these require a specific transposition measure.

Directive 2009/71/Euratom was transposed into national law by the Twelfth Act to Amend the Atomic Energy Act (AtG) on 8 December 2010.

1.1.1. Article 4(1)(a) of Directive 2009/71/Euratom

The Federal Government has sole legislative powers regarding the use of nuclear energy according to Article 73.1 (14) in conjunction with Article 71 of the German Basic Law. Federal administrative powers are derived from Article 85 GG (German Basic Law) in conjunction with Articles 22 et seq. of the AtG. Accordingly, the Federal Government, represented by the BMUB, is responsible for compiling and publishing national safety requirements in this field. Articles 6, 7 AtG in conjunction with Article 49.1 StrlSchV define the binding nature of these safety requirements.

The nuclear legislative framework was established back in the 1970s and is constantly being developed. Specific technical requirements form part of the subordinate nuclear regulations (Safety Requirements for Nuclear Power Plants; Guidelines; Nuclear Safety Standards Commission (KTA) Regulations) and form the basis for the national licensing and regulatory procedure.

In this connection, the Federal Republic of Germany has opted for a prescriptive approach in which overriding, target-oriented rules are underlaid by concrete, technical requirements in the regulations issued by the Nuclear Safety Standards Commission (KTA). The KTA’s technical regulations are revised every five years.

Guidelines were also drawn up to harmonise the enforcement process in some subject areas, e.g. to implement periodic safety checks.

According to the AtG, construction, operation and decommissioning of nuclear installations, and also major changes to such installations or operation of such installations require a licence. This may only be granted if the necessary precautions to prevent damage due to construction and operation have been taken in line with the current state of the art of science and technology. The licence thus sets out, in binding terms, the specific damage precautions to be taken. These are the damage precautions required in accordance with the state of the art of science and
technology at the time the licence is issued. This stipulation is valid provided that more recent scientific and technical findings do not cast doubt on the ability to guarantee the necessary damage precautions. Under the stipulations of Article 17.1 AtG (subsequent conditions) or Article 17.3-5 AtG (Revocation of a licence), a change in the licence status is possible. The current nuclear regulations are the standard to be applied to such modification licencing procedures. If new information has not yet been incorporated in the nuclear regulations, this information may still be considered if this is necessary in order to guarantee the required damage precautions on the basis of the overriding nuclear licensing requirements.

Both the licence holder and the authorities have an underlying responsibility to observe the current state of the art of science and technology. In addition to the licensing requirements, the plant operator (licence holder) shall ensure, in accordance with Article 7d AtG that, in accordance with the continuing state of the art of science and technology, the safety precautions implemented are sufficiently well-developed, suited and appropriate to making a further, not inconsiderable contribution to further precautions against hazards for the general public.

The Federal and Länder authorities responsible for drawing up the legislative framework shall revise and, if necessary, update the regulations.

For this reason, the international state of the art of science and technology is monitored by the BMUB by taking part in international committees and evaluating the results of the work of relevant international, multilateral and bilateral committees and institutions, based on the results of research programmes sponsored by the BMUB and a variety of specialist international contacts and specialist international literature. The BMUB is supported in this undertaking by Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH. Furthermore, international regulations represent further information sources in terms of establishing the state of the art of science and technology. The state of the art of science and technology and international regulations are constantly and systematically being assessed in order to identify any potential need for change within national regulations.

The Länder's nuclear safety regulators are supported in their essential task of establishing the state of the art of science and technology by expert organisations. Their regulatory activities also allow them to acquire direct information on the
implementation of state-of-the-art science and technology in concrete technical solutions in the plants themselves. Operating experience in the Federal Republic of Germany is analysed by the Federal Government and the Länder so that the resulting findings can be utilised. This is achieved by evaluating all national and relevant international events, compiling information notices and helping to evaluate international operating experience within the International Atomic Energy Agency (IAEA) and the Organisation for Economic Co-Operation and Development (OECD-NEA). As a result of the Federal Republic of Germany’s international involvement, the BMUB has access to information on national and international operating experience and thus information on those areas in which the nuclear regulations need to be amended.

In addition, the BMUB is able to seek advice on generic and safety-related issues and on operating experience in all kinds of nuclear installations from its advisory bodies: Reactor Safety Commission (RSK), Waste Management Commission (ESK) and the Radiation Protection Commission (SSK). The comments made by these bodies influence the way that national rules are updated.

The BMUB has access to sector-specific research facilities in order to fulfil its obligations. In other words, the BMUB is able to ask independent third parties to examine scientific and technical issues of fundamental safety-related importance by awarding research and development contracts and may commission universities, research institutes and expert organisations with the task of submitting expert reports and studies with a view to clarifying specific problem areas in the fields of nuclear safety, radiation protection or the nuclear fuel cycle and waste management. The research results provide the BMUB with a basis from which to make decisions and assist in drawing up, implementing and revising, or updating the regulations. The scheduled sector-specific research projects in any one year are published in the so-called environmental research plan (UFOPLAN) the previous year.

The BMUB is thus constantly checking whether partial amendments or complete overhauls of the subordinate regulations are necessary. These checks take place no later than every five years. If updates are necessary, proposals are drafted by the BMUB and discussed in the relevant BMUB advisory bodies and with the Länder.
The nuclear safety regulators make sure that safety requirements take precedence in the regulatory and licensing procedures.

The extensive process required in order to revise and update safety requirements is illustrated in a simplified manner by the following steps:

Procedure:

Step 1: Check safety requirements to ensure they are up-to-date in line with the current state of the art of science and technology

Step 2: If necessary, draw up a draft amendment to the safety requirements

Step 3: BMUB submits the draft to the RSK, ESK and SSK advisory committees and obtains their comments

Step 4: Draft revised

Step 5: The nuclear authorities in the Länder are involved

Step 6: Discussion in Federal and Länder technical committees, agreement on amendments, draft revision

Step 7: BMUB and Länder draft published on the internet to involve specialist bodies and interested members of the public with a request for comments

Step 8: Evaluation of comments, revision of the draft, if necessary, and discussion in the Federal and Länder technical committees

Step 9: Decision reached in Federal and Länder technical committees

Step 10: Decision taken in the Länder Committee for Nuclear Energy - Main Committee

Step 11: Published on the BMUB website and in the Bundesanzeiger (BAnz) (Federal Gazette)

1.1.2. Article 4(1)(b) of Directive 2009/71/Euratom

Licensing of nuclear installations is governed by the AtG. According to Article 7 of this act, construction, operation, major changes to such installations or their operation and decommissioning require a licence. Licences may be subject to conditions in order to guarantee the protective purpose of the law. Operating, owning, making a
major change to or decommissioning a nuclear installation without the necessary licence is a criminal offence (Article 327 of the German Criminal Code (StGB)).

Today licensing procedures for nuclear power plants are still performed, but only for major changes to existing plants and for decommissioning.

The proposed changes to a nuclear power plant or operation of such a plant should be assessed systematically to determine their effects on the necessary protection and precautionary measures and processed accordingly as part of the procedure. Changes which may have effects on the plants' safety standards that are evidently more than minor effects require a licence in accordance with Article 7.1 AtG. In the case of changes that require a licence, compliance with the licensing requirements as set out in Article 7 AtG should be verified. In addition, there are changes that clearly only have minor effects on safety standards and therefore do not require a licence, although they are subject to accompanying checks by the safety authorities as part of the regulatory procedure.

The structure and execution of the licensing procedure as laid down in the AtG are described in greater detail in the Nuclear Licensing Procedure Regulation (AtVfV). This defines the application process and submission of documents, public participation and the option to split the process into a number of licensing stages (partial approvals) during construction and operation, and then the environmental impact assessment and compliance with other licensing requirements (e.g. for non-radioactive emissions and discharges into water sources).

The licensing system for plants used for processing spent fuel elements and radioactive material and for decommissioning nuclear installations is defined in a variety of regulations under the AtG and its Regulations according to the type of plant and the activity carried out.

A number of different authorities are responsible for licensing and regulating the various types of plants and activities in some cases. Uniform application of the statutory requirements and a harmonised licensing process are guaranteed by the BMUB, which monitors legality and fitness for purpose.

1.1.3. Article 4(1)(c) of Directive 2009/71/Euratom

Nuclear installations are subject to constant state regulation in accordance with the
Atomic Energy Act (AtG) and the associated nuclear regulations throughout their operating lifetime and until they are dismantled. Once again, as in the case of licensing, there are differences between actual handling practice in Articles 6 and 9 AtG and the installations licensed in accordance with Article 7 AtG.

In the case of plants or when handling nuclear fuel licensed in accordance with Article 6, 7 or 9 of the Atomic Energy Act, the Länder are responsible for nuclear regulation. They act on behalf of the Federal Government, i.e. the Federal Government can issue binding instructions on factual and legal issues in each individual case. As in the licensing procedure, the safety regulators in the Länder may seek the support of independent experts. The safety regulators remain responsible for decisions concerning the regulatory measures to be performed. As in the case of licensing, the safety regulators' main aim is to protect the public and the individuals employed in these plants from any hazards associated with operation of the plant.

In particular, the safety regulators monitor the following:

- compliance with the provisions, conditions and ancillary provisions of licensing decisions,
- compliance with the specifications of the AtG, nuclear regulations and other safety rules and guidelines, and
- compliance with the regulatory instructions issued.

Nuclear power plant operators must submit operating reports to the safety regulators on a regular basis. These contain information about operating procedures, maintenance measures and inspections, radiation protection and radioactive waste. Site visits and inspections, often accompanied by experts, are specific ways of implementing the duties of the safety regulators in the Länder as described above. Any shortcomings observed must be rectified by the plant operator.

On average, regulatory activities on site are performed by the safety regulator once a week and per plant during normal operation. Consulted experts are on site more frequently. The involvement of the plant operators' various management levels is always guaranteed. During plant overhauls involving refuelling and after special events, regulatory activities on site may even take place every working day in some
Safety-related events in nuclear installations should be reported to the safety regulators in accordance with the specifications in the Safety Officer and Notification Decree in accordance with Atomic Law (AtSMV) and, if applicable, in accordance with the respective licensing conditions. The operators also report regularly on individual topics.

In addition to constant regulation by the regulator and inspections, comprehensive safety reviews are performed periodically, on a ten-yearly basis, in all operational nuclear power plants. Since 2002, the obligation to perform safety reviews and submit the results at specified times has been set down in Article 19a AtG. Since 2010 the obligation to perform a safety review also covers other nuclear installations.

According to Article 20 AtG, the competent licensing authorities and safety regulators in the Länder may consult expert organisations or individual experts as part of their licensing and regulatory activities. This concerns licensing procedures, regulatory procedures, operating assessments, notifiable events, periodic inspections and applications to modify plants or operation of such plants.

In order to guarantee safety, the competent safety regulator monitors the following with the assistance of its own experts or other authorities:

- compliance with operating regulations,
- implementation of periodic inspections,
- evaluation of special events,
- making changes to the plant or operation of the plant,
- staff radiation protection monitoring,
- environmental radiation protection monitoring, including via the nuclear power plant remote monitoring system (KFÜ), which is not operator-dependent,
- compliance with authorised limits for discharges of radioactive material,
- the necessary protection from disruptive actions or other third-party intervention,
- reliability and technical qualifications, and the skills possessed by the responsible individuals and the knowledge possessed by other individuals employed in the plant,
• quality assurance measures.

The competent licensing authorities and safety regulators have the necessary competence to perform their duties. The experts consulted by the licensing authorities and safety regulators have access to the plant at all times, just like authority employees, in accordance with the AtG, and are entitled to perform the necessary inspections and request information (Article 20 in conjunction with Article 19.2 AtG). The outcome of the inspections or reviews forms the basis for the official decision. The decision itself is made by the authority.

An assessment of safety-related matters is carried out independently of the applicant by involving experts. To this end, the experts perform their own tests and calculations, preferably using different methods and computer programmes than the methods used by the applicant. The individuals involved in the expert report are not subject to any technical guidance. They are appointed by name by the competent licensing authorities and safety regulators by whom they are commissioned. The scope of the experts’ activities is defined by the competent licensing authorities and safety regulators.

The BMUB may also be assisted by experts if necessary. GRS, in particular, is an expert organisation employed on behalf the BMUB. It undertakes scientific research in the field of nuclear installations, primarily on behalf of the Federal Government and is consulted by the BMUB on technical issues to provide back-up.

The BMUB regularly seeks the advice of the RSK, SSK and ESK. These committees must be guaranteed to be independent and qualified and must reflect the technical/scientific range of opinions. Their activities focus primarily on providing advice on issues of fundamental importance and on initiating further safety-related developments. The committees’ advice is collated and published in general recommendations and case-specific comments.
1.1.4. Article 4(1)(d) of Directive 2009/71/Euratom

According to Article 19 AtG, the competent licensing authority and safety regulator may decree that the operator of a nuclear installation should rectify a situation which contravenes the specifications of the AtG, the nuclear regulations, the provisions of the licence or a condition imposed subsequently or which may lead to dangers for life, health or property. In particular, and depending on the specific circumstances of the case in point, it may decree that:

- protective measures should be taken, giving details of specific measures,
- operation may only continue in a restricted fashion or subject to compliance with specific conditions, or
- operation should be suspended on a temporary basis until the causes of an event have been clarified and the necessary remedial measures have been taken in order to prevent a repetition of the event.

If the licensing conditions or the regulatory instructions are not observed, the competent safety regulator may enforce compliance of the above in accordance with the general regulations which apply to police forces of the German Land in question by means of administrative constraints.

In the case of nuclear power plants, the safety regulator may require the nuclear installation to be shut down in cases in which there is clearly an imminent danger.

In accordance with the requirements laid down in Article 17 AtG, the licensing authority may impose subsequent conditions in order to guarantee safety. If there is a considerable risk to employees or the public as a result of a nuclear installation and if this cannot be rectified by appropriate measures in a suitable timescale, the licensing authority must revoke the issued licence. Revocation is also possible if licensing requirements no longer apply at a later stage or if the operator breaches legal regulations or official decisions.

In addition, the StGB (German Criminal Code), AtG and the nuclear regulations set out sanctions in the event of breaches. Articles 46, 49 AtG and the associated regulations cover infringements which are penalised by imposing fines on the individuals in question. Fines of up to 50 000 euros may be imposed in the case of infringements.
As a result of the intensive regulation of the construction, operation and decommissioning of nuclear installations in the Federal Republic of Germany, unacceptable situations are usually picked up in advance and requests for rectification of such situations are made and implemented before the need for the potential legal measures, e.g. conditions, injunctions, infringement procedures and criminal proceedings.

1.2. Article 4(2) of Directive 2009/71/Euratom

The nuclear legislative framework is subject to ongoing review by the BMUB and is updated as required, see Article 4(1)(a). The fact that safety regulators in the Federal Republic of Germany are independent from other authorities, companies or institutions that are responsible for promoting nuclear technology or economic interests offers protection from third-party influences on the legislative framework. All groups involved in the safety of nuclear installations play a role in reviewing and potentially updating the regulations. Safety-related requirements take precedence over economic interests. The aim is to achieve the best possible precautions to avoid damage and bring about further developments in national nuclear regulations, see Article 4(1)(a).

As a result of their regulatory activities, the safety regulators obtain direct information from operating experience with regard to further development of the state of the art of science and technology, as represented by specific technical solutions in the plants. They are supported in their task of establishing the state of the art of science and technology by expert organisations. The information obtained is channelled via the BMUB and the Länder into updates of existing regulations and the development of new nuclear regulations. The Safety Officer and Notification Decree in accordance with Atomic Law (AtSMV) thus forms a legally binding basis for evaluating events arising from operation.

The existing official procedures for recording, preparing, assessing and passing on safety-related operating experience from German plants are tried and tested and represent good practice on an international scale. However, experience shows that regular reviews and further development of processes are important with a view to guaranteeing that new sources of information are incorporated in the feedback
process and any gaps in information can be closed on a permanent basis. The independent review by a range of individuals is intended to guarantee a high-quality safety assessment.

The safety regulators must ensure that operating experience is analysed appropriately and that the resulting information is used for improvement purposes. In the Federal Republic of Germany, this is achieved by evaluating all national and relevant international events from operating experience, involvement in international systems for the exchange of information on operating experience (INES, IRS, WG OE) and by GRS drawing up information notices for all German plants. As a result of the Federal Republic of Germany’s international involvement, the BMUB has access to information on those areas in which the nuclear regulations need to be amended. Processes have been set up between the BMUB and the Länder to this end. The safety assessments performed by the operator should be viewed as an additional source of information on operating experience. In compliance with the licensing requirements, the operator must perform safety assessments in consideration of operating experience and in accordance with the necessary precautions based on the state of the art of science and technology. Following on from significant safety-related events, safety assessments may be demanded by the competent licensing authorities and safety regulators, especially if action needs to be taken to prevent any recurrence or to improve safety. Even if significant safety-related events occur in other plants, safety assessments may be necessary with a view to transferability.

The safety regulators review the safety assessments, assess the ensuing results and arrange for measures to improve safety if applicable.

Safety assessments must also be submitted to the licensing authorities and safety regulators as part of applications for licences for changes to nuclear installations or operation of such installations pursuant to Article 7 AtG or according to the respective licence for changes that are subject to approval as part of the regulatory process pursuant to Article 19 AtG.
2. Article 5 of Directive 2009/71/Euratom

2.1. Article 5(1) of Directive 2009/71/Euratom

Licensing and regulatory duties at Land level are performed by the highest Land authorities, i.e. by the Länder ministries in accordance with Article 24 AtG. Some individual tasks are also performed by subordinate authorities. The ministries’ responsibilities in the individual Länder are laid down by statutory regulations issued by the respective Land government.

The Federal Government defines the Federal Ministry responsible for nuclear safety and radiation protection by issuing an organisational decree. Until 1986 the Federal Ministry of the Interior was responsible for nuclear law. These powers were transferred to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) in 1986, when the latter was formed. The BMU’s responsibilities were extended by means of the organisational decree of 17 December 2013 and the name was changed, with the result that responsibility now lies with the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). Responsibility for organisation, staffing and resources for the Federal nuclear authorities thus lies with the BMUB. The BMUB has organisational powers and requests the necessary staffing and financial resources when the Federal budget is drawn up each year. The rights and obligations of the Federal Government and the Länder are set out by the German Basic Law (Grundgesetz). Articles 22-24 of the AtG set out the fundamental provisions defining who has official responsibility.

According to Article 23 AtG, the Federal Office for Radiation Protection (BfS) is responsible, amongst other things, for the following aspects of processing spent fuel elements and radioactive waste:

- licensing the storage of nuclear fuel outside Government custody to the extent that such storage is not preliminary to or part of a practice requiring a licence pursuant to Articles 7 or 9, and for the withdrawal or revocation of such licences,
- decisions on exceptions from the obligation to construct an intermediate storage facility on the site of a commercial nuclear power plant or in its vicinity if a decommissioning application has been submitted (Article 9a.2 Sentence 4 AtG).
The responsibilities of the safety regulators in the individual Länder are laid down by the Responsibilities Regulation in the Land in question. The relevant legal principles and the competent authorities in a Land are specified by means of these Responsibilities Regulations and their duties when enforcing the legal regulations are defined.

Articles 4 and 4(1)(a) provide more detailed information on the German system of Federal and Land-based safety regulators and their responsibilities.

The Federal Government and the safety regulators in the Länder set up the Länderausschuss für Atomkernenergie (LAA) (Länder Committee for Nuclear Energy), chaired by the BMUB, to prepare for and coordinate the Länder’s activities in enforcing the AtG. This is a permanent Federal-Länder committee comprising representatives from the Länder’s licensing authorities and safety regulators and the BMUB. The LAA also prepares amendments and further developments in legal and administrative regulations and in the subordinate regulations. In the interests of enforcing national nuclear law, the Länder’s licensing authorities and safety regulators and the BMUB work together to draw up regulations on standard treatment of nuclear law and these are published by the BMUB. The BMUB provides both the Chair and the Chief Executive. In preparing its decisions, the Länder Committee for Nuclear Energy makes use of a number of expert committees dealing with topics such as law, reactor safety, radiation protection, the nuclear fuel cycle and waste management and the working groups assigned to the expert committees for special permanent roles. The expert committees may use ad hoc working groups as required to cover specific and particularly urgent individual issues. The expert committees and permanent working groups meet at least twice a year, or more frequently if necessary.

The main committee meets at least once a year.
2.2. Article 5(2) of Directive 2009/71/Euratom

Articles 22 et seq. of the AtG describe the assigned tasks. The tasks of licensing and regulating nuclear power plants or other installations and activities which require a licence in accordance with Articles 6, 7 and 9 of the AtG are performed by the highest authorities in the Länder and by the BMUB as the supreme Federal authority in order to fulfil the purpose of the AtG, especially due to the paramount importance of nuclear safety to protect the public from the hazards posed by nuclear energy and the detrimental effects of ionising radiation (Article 1.2 AtG).

In legal terms this means that the licensing authorities and safety regulators are the state administrative bodies at both Federal and Länder level. According to the constitution these bodies are obliged to act in accordance with the law (Article 20.3 GG). The obligation under the AtG to guarantee the necessary precautions to prevent damage in line with the current state of the art of science and technology takes precedence over other tasks.

From an organisational viewpoint, a distinction should be made between the activities of the competent licensing authorities and safety regulators at Länder level and regulatory rights and rights to issue instructions assigned to the Federal Government.

At Federal level, all decisions relating to nuclear safety are made by the BMUB and the Federal Ministry for Economic Affairs and Energy is responsible for energy policy, thus guaranteeing a clear delineation at Federal ministerial level for organisational purposes.

At Länder level, the separation principle is taken into account by the organisational precautions taken by the individual Länder. Effective separation of the bodies responsible for regulation and licensing from other bodies that are concerned with the economic interests relating to the peaceful use of nuclear energy guarantees that different ministries are responsible for the respective tasks. If general matters relating to the energy industry, such as renewable energies, also come under the scope of a competent Land ministry, different and independent organisational units will be competent and responsible for each respective case. Impartial and safety-oriented decision-making is also further reinforced in a state organisational sense by the BMUB, which has sole responsibility for nuclear safety issues at Federal level, monitoring the legality and fitness for purpose of the administrative actions of the
competent Länder authorities. As a result, the regulatory tasks set out at government level and legitimised democratically ensure that the safety regulators implement safety-related requirements irrespective of economic or other external influences and interests.

The BMUB is responsible for the Federal powers arising from Articles 85.3 and 87c of Basic German Law in connection with licensing and regulation of nuclear installations, and in turn the BMUB does not perform any tasks relating to the use and promotion of nuclear energy.

The BMUB monitors the development of new safety solutions with a view to obtaining important information relating to the safety of operational German nuclear installations.

2.3. Article 5(3) of Directive 2009/71/Euratom

The staff of the BMUB, BfS and the competent highest authorities in the Länder comprise permanent civil servants and salaried public service employees. Legal civil servants or employees must have a university degree and suitable qualifications. Civil servants in the scientific/technical sector must have a degree from a university or technical college.

The staff requirements for BMUB and BfS are checked on a regular basis by assessing the relevant tasks. Any positions required are transferred to the organisation chart. Staff requirements are submitted to the relevant finance ministry. The department responsible for the budget then makes a decision. A similar procedure is used in relation to the authorities responsible for reactor safety and radiation protection in the Länder.

The BfS assists the BMUB via a number of specialist departments, primarily via the SK “Safety in Nuclear Engineering” and SE “Safety of Nuclear Waste Disposal” departments.

GRS is the BMUB’s central expert organisation. It has around 350 technical and scientific employees working in the field of nuclear safety. In the Federal Länder the tasks of licensing and regulation are performed by the highest Länder authorities (ministries). In this respect they are acting on behalf of the Federal Government
As the nuclear safety regulators, the highest Länder authorities (ministries) monitor compliance with the provisions laid down in nuclear licences and check whether orders or decrees are observed. They deal with information requiring approval and check compliance with operating regulations, requirements for safety-related plant components which need to be tested on a periodic basis and internal radiation protection and environmental monitoring. Organisation of the competent specialist department within a ministry and staff resources is geared to the existing nuclear installations. The competent authorities may consult experts as part of licensing and regulatory procedures in accordance with Article 20 of the AtG.

As a general rule, charges are made for issuing licences for nuclear installations and for regulatory activities by the Länder. The costs are paid to the General Treasury Department in the Land in question by the licence holder. The costs payable for a construction and operating licence for a nuclear power plant are calculated as a total of two thousandths of the construction costs. A modification that requires a licence costs between 500 and 1 million euros. Regulatory costs are calculated based on the actual cost of individual activities and range between 25 and 500,000 euros. Payments for the experts consulted are also made as expense payments by the applicant or licence holder. These are clearly in excess of the regulatory costs. The official licensing and regulatory costs for an operational power plant unit amount to approximately 8 man-years annually. The cost of experts amounts to around 6 – 10 million euros each year, which corresponds to annual staff costs of 25 – 40 man-years.

According to the Federal Budget, the BMUB has access to approximately 23 million euros a year for inspections in the field of reactor safety including the nuclear fuel cycle and waste management. This includes assessment and evaluation of operating experience, inspections relating to specific safety-related issues, further development of technical requirements for nuclear installations and dealing with specialist and individual issues in connection with licensing and regulation of nuclear power plants. Additional budget resources are also used to finance the activities of the advisory committees and to cover the cost of external experts participating in international cooperation work. Inspections in the field of radiation protection are also financed at an annual cost of approximately 8 million euros.
The Reactor Safety Commission (RSK), set up in 1958, advises the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) on matters relating to the safety and safeguarding of nuclear installations. In addition, it plays a major role in continuing to develop safety standards for nuclear installations. The RSK currently consists of 16 members who are appointed for a three-year period. The RSK makes use of a range of specialist sub-committees when preparing its comments. The RSK’s recommendations and comments are published on its website (www.rskonline.de).

The Radiation Protection Commission (SSK), set up in 1974, currently has 17 members. It advises the BMUB on all matters relating to protection from ionising and non-ionising radiation. The SSK’s recommendations and comments are published on its website (www.ssk.de). In the event of a nuclear or radiological incident or corresponding exercises, the Radiation Protection Commission also provides the SSK emergency team.

The Waste Management Commission (ESK) was set up in 2008 in response to the growing importance of nuclear waste management issues. It currently has 12 members and is responsible for tasks which were previously performed by the Fuel Cycle and Waste Management Working Group of the RSK. As a result of its advisory role, the Commission makes scientific and technical recommendations or comments to the BMUB which are published on the Commission’s website.

However, the relevant nuclear licensing authority and safety regulator is not bound by these experts’ specialist assessments. The authority’s staff must recognise interdependencies and establish whether there is an underlying reason for official action. If this is the case, they will exercise their professional judgement to decide whether action should be taken and what form this action should take.

2.3.1. Article 5(3)(a) of Directive 2009/71/Euratom

The legal instruments which stipulate that the safety regulator may ask the licence holder to fulfil the national safety requirements and the content of the respective licence are already described in Article 4(1)(d).

2.3.2. Article 5(3)(b) of Directive 2009/71/Euratom
See the comments on Article 4.1 d) and Article 5.3 a) in this respect.

2.3.3. Article 5(3)(c) of Directive 2009/71/Euratom

The safety regulators’ staff and the experts consulted by the safety regulators shall have access to the plant at all times in accordance with the AtG, and are entitled to perform the necessary inspections and request information on the relevant matters (Article 19.2 AtG). Amongst other things, the plant operator is obliged to provide the necessary workforce and resources and submit documents in this connection (Article 19.2 Sentence 3 AtG in conjunction with Article 36 of the Product Safety Act). The safety regulator is not bound by the outcome of the inspections of the consulted experts.

In addition to constant regulation by the regulator, comprehensive safety reviews are performed periodically, on a ten-yearly basis, in nuclear power plants that are authorised for power operation. Since 2002, the obligations to perform safety reviews and submit the results at specified times have been set down in Article 19a AtG.

According to Article 19 AtG, the safety regulator may decree that the operator should rectify a situation which contravenes the specifications of the AtG, the nuclear regulations, the provisions of the licence or a condition imposed subsequently or which may lead to dangers for life, health or property. Depending on the specific circumstances, it may decree whether protective measures should be taken and, if so, which measures, with the result that operation may only continue in a restricted fashion or subject to compliance with specific conditions, or that operation should be suspended on a temporary basis until the causes of an event have been clarified and remedial measures have been taken.

In the case of nuclear power plants in long-term shutdown states/post-operation, the LAA Technical Committee on Reactor Safety has recommended that the licence holder should draw up an assessment of the current safety status of the plant for the post-operating phase.

In addition to self-monitoring by the licence holder, the nuclear licensing authorities and safety regulators in the Länder have their own systems for continuous recording of measurement data on the emission and immission behaviour of the plants (remote
monitoring of nuclear reactors, KFÜ).

This continuous monitoring is an effective instrument used by safety regulators in accordance with Article 19 AtG along with real-time transmission of operating data. The basic requirements imposed on the KFÜ are recorded in the "General recommendations for remote monitoring of nuclear power plants". The safety regulator is responsible for detailed implementation.

2.3.4. Article 5(3)(d) of Directive 2009/71/Euratom

The principle whereby the licence holder is responsible underlies the licensing and regulatory requirements of the AtG. In accordance with Article 7 AtG, the construction and operating licence is only granted if the applicant can prove that he has taken the necessary technical and organisational precautions to ensure safe operation. During operation it is up to the plant operator to comply with his responsibility for safety at all times. This is monitored and ensured by the licensing authorities and safety regulators, who can take the actions laid down in Articles 17 and 19 AtG. Article 7 AtG also stipulates that the licence to construct and operate a plant may only be granted provided that there are no doubts as to the reliability of the applicant and the responsible individuals and provided that these individuals possess the necessary technical qualifications. In order to avoid a major hazard to the public, the safety regulator may also revoke the licence if necessary.

In accordance with specific requirements laid down in Article 17 AtG, the nuclear licensing authority may impose subsequent conditions in order to guarantee safety. If there is a considerable risk to employees or the public from a nuclear installation and if this cannot be rectified by appropriate measures in a suitable timescale, the licensing authority must revoke the granted licence. Revocation is also possible if licensing requirements no longer apply at a later stage or if the operator infringes legal regulations or official decisions.

In addition, the StGB (German Criminal Code), AtG and the nuclear regulations set out sanctions in the event of breaches.

All possible measures taken by the safety regulator to implement conditions are already described in Article 4.1 d).
3. Article 6 of Directive 2009/71/Euratom

3.1. Article 6(1) of Directive 2009/71/Euratom

Article 7c.1 of the AtG stipulates that the holder of the licence for the nuclear installation is responsible for nuclear safety and that this responsibility cannot be delegated.

The licence holder is also the "Radiation protection supervisor" in accordance with Article 31 of the Radiation Protection Regulation (StrlSchV). In the case of companies, the duties of the radiation protection supervisor are performed by an individual who is entitled to represent the operating company. The position and duties of the radiation protection supervisor are described in Articles 32 and 33 of the StrlSchV. The duties of the radiation protection supervisor include taking protective measures in accordance with the state of the art of science and technology to protect individuals and the environment from the detrimental effects of ionising radiation. The duties also include providing suitable plants and equipment and regulating the operating procedure appropriately with adequate and suitably trained staff and providing protection against safety-related significant events. The radiation protection supervisor deploys the necessary number of radiation protection officers to manage or supervise activities in order to guarantee radiation protection during operation of nuclear installations. The radiation protection supervisor remains responsible even if he has appointed radiation protection officers.

In addition, the AtSMV (Safety Officer and Notification Decree in accordance with Atomic Law) requires a nuclear safety officer to be appointed. The rights and obligations of the nuclear safety officer are covered in Article 4 of the decree. These tasks include evaluating and implementing operating experience and reporting notifiable events. The technical qualification guidelines cover additional responsibilities and qualifications.

The overriding documents issued by the operators of nuclear installations, such as their management principles or company guidelines, acknowledge that the safety of nuclear power plants takes precedence over other company objectives.
3.2. Article 6(2) of Directive 2009/71/Euratom

During plant operation, the specifications of the AtG and the regulations issued as a result of the AtG must be observed. The requirements and regulations of the safety regulators on the basis of the above and the provisions of the licence and subsequent conditions must be complied with.

Under the terms of the licence, the licence holder is legally obliged to prove by regular periodic inspections that plant features which are important for the safety of the plant and safety and barrier functions are in place and that the quality and effectiveness of safety-related measures and equipment is guaranteed. The corresponding provisions are included in the licences, safety specifications and in the safety documentation.

In addition, in accordance with Article 19a of the AtG, comprehensive safety reviews are performed periodically, on a ten-yearly basis, in operational commercial nuclear power plants. These include a deterministic safety status analysis, a probabilistic safety analysis and a deterministic plant security analysis. The safety review is in addition to the continuous review under the heading of regulation. It is carried out using the “Guidelines for performing periodic safety reviews (PSÜ) for nuclear power plants in the Federal Republic of Germany”. The results of the safety review should be submitted to the safety regulator and are assessed by independent experts on behalf of the safety regulator. The requirement to submit the results of a safety review does not apply if the licence holder definitively informs the safety regulator and the licensing authority that he intends to shut down power operation of the plant on a definitive basis no later than three years after the deadline for submission of the safety review for this plant as specified in the AtG.

In 2010, guidelines were also developed for performing periodic safety reviews for intermediate storage facilities for irradiated fuel elements and heat-generating radioactive waste in containers.
It is the responsibility of operators of nuclear installations to ensure that the safety of the plant over its entire operating lifetime complies with the provisions of the applicable licences for plant operation. If new safety-related findings are available, the need for appropriate improvements should be investigated.

Periodic tests on safety equipment are performed by the plant operator, these being classified according to their safety-related importance. Periodic tests include functional tests to prove functionality and non-destructive tests to prove that the equipment is in perfect condition.

The periodic tests on important safety-related systems are performed in accordance with the test manual. The object, nature and scope of the test and the testing interval are defined in the test list in the manual, along with the plant’s operating status during the test, name of the test instructions and the number of consulted experts required to be present, if any. The test list forms part of the safety specifications for plants which are subject to approval. How the test is carried out is defined as a function of the testability of the respective system functions. The intention is to ensure that the tests are performed under general conditions which comply with the safety requirements in a particular case. If important system functions cannot be tested directly, e.g. integrity at high pressures and temperatures, indirect evidence must be provided. The specifications for performing tests are revised regularly in the light of operating experience and progress in safety research and amended if necessary. Updates to the test manual are submitted to the safety regulator for approval.

In addition to the plant operator’s own checks, safety is reviewed as part of the regulatory process. The safety regulator uses various methods to check whether plant operators are complying with their obligations. The test methods used in this process are also selected according to the plant status, e.g., construction, operation, overhaul or modification.

During the construction and commissioning phase, additional tests are performed by the experts consulted on behalf of the safety regulator to monitor compliance with the provisions of the licensing decision and the regulatory procedure. These additional tests are tests which are independent of the manufacturer and are intended to verify the values, dimensions or modes of operation defined in the written documents submitted. In addition, checks are performed on material compositions in the
manufacturers’ premises, for example, component assembly is checked and functional tests are undertaken. Similar tests take place during construction on the construction site. During commissioning, the stipulations in the safety specifications for the plant are verified and compliance with the general conditions for incident analysis is monitored. These additional checks by consulted experts also apply in the event of retrofitting, modifications or when exchanging components in operational nuclear installations.

The safety regulator of the German Land in question regularly carries out inspections on site to perform tests and checks in the nuclear power plant. In some cases this may also involve consulting experts. Such inspections may be geared to obtaining responses to specific questions or may be performed as part of a general plant visit.

Furthermore, regular and preventive maintenance measures on the power plant systems are scheduled and performed by the operator during plant operation and operating experience is evaluated.

Licensing conditions, for example, require operators to submit written reports on a variety of topics. These may, for example, include factual information on operation, safety, radiation protection including environmental monitoring and on the existence and whereabouts of radioactive substances. These reports are assessed by the safety regulator, subordinate authorities or by consulted experts. Any anomalies are investigated by further research. The current operating status of the nuclear power plants is monitored directly by the safety regulator of the Land in question or a subordinate authority with the aid of the KFÜ.

Thanks to the KFÜ, authority staff are able to monitor important operating parameters and emission data for the plant online. The transmitted values are updated at frequent intervals and saved so that they are also available for research purposes at a later date if necessary. If specified limits are exceeded, the safety regulator is automatically notified.

Following on from significant safety-related events, safety assessments may be demanded by the safety regulator, especially if action needs to be taken to prevent any recurrence or to improve safety. Even if significant safety-related events occur in other nuclear plants, safety assessments may be necessary with a view to
transferability. In some cases, such safety assessments may thus lead to measures with a view to improving safety. New information from plant operation and from the world of science and technology may make it necessary to update existing safety guidelines.

The safety regulators also assess the results of the safety reviews performed in accordance with the Atomic Energy Act. They are supported in their efforts by independent experts. If necessary, the safety regulator may require measures to be taken as a result of this assessment.

The dynamic approach to safety requirements stipulated by law under the terms of the AtG involves continuous assessment of the condition of the plant.

As part of the regulatory procedure, the safety of nuclear installations is reviewed on a continuous basis. If new safety-related findings come to light, the need for improvements should be investigated.

3.3. Article 6(3) of Directive 2009/71/Euratom

Article 7.2 of the AtG includes, amongst other things, the licensing stipulation that the necessary precautions to prevent damage during construction and operation of nuclear installations must be taken in the light of the state of the art in science and technology. In the case of damage precautions, this entails the concept of graduated safety precautions (defence in depth concept). Preventive measures are required in safety levels 1-4b. Mitigating actions as part of internal emergency protection are required in safety level 4c. The measures to be taken and the equipment to be installed with a view to guaranteeing quality and avoiding or managing incidents ensure comprehensive and reliable protection from the radioactive substances present in nuclear power plants. These requirements are applied to both power and non-power operation.

The graduated safety concept (defence in depth) is described in the "Safety Requirements for Nuclear Power Plants" and defines the requirements with regard to actions and equipment for the individual safety levels. The underlying features of this concept are laid down in greater detail in the specifications in the Nuclear Regulations, and in particular, those issued by the KTA.
The defence in depth concept imposes high requirements with regard to the design and quality of technical equipment and staff qualification for safety level 1 (normal operation). The aim of the first safety level is to avoid faults. In the case of safety level 2 (abnormal operation) the concept incorporates measures to manage faults and avoid incidents. Safety level 3 (design-basis incidents) covers technical equipment and measures to manage incidents and prevent the occurrence of incidents with multiple failures of safety equipment. The German regulations require a high level of reliability for this level. Article 49 of the Radiation Protection Regulation (StrlSchV) sets out design guide values which must not be exceeded in the event of radioactive substances being released during incidents. The underlying design-basis incidents are described in Appendix 2, entitled "Events to be considered", to the "Safety Requirements for Nuclear Power Plants".

The Nuclear Regulations also describe requirements for precautions against incidents which exceed the design requirements for incident prevention and are covered in safety level 4. These include very rare events (such as Anticipated Transient without Scram (ATWS)) in safety level 4a, events with multiple failures of safety equipment (e.g. station blackout) in safety level 4b and accidents with severe fuel element damage in safety level 4c.

The "Safety Requirements for Nuclear Power Plants" promote a safety concept according to which all equipment required to shut down the nuclear power plant safely and maintain it in the shut-down state, dissipate decay heat or prevent the release of radioactive substances, must be maintained in a condition such that it is able to fulfil its safety-related functions not only in the case of both internal and external events, but also in emergency situations (for example, in the event of emergency scenarios such as an aircraft crash or explosion blast wave). The events and measures applicable to safety levels 4b and 4c are included in the contents of the "Safety Requirements for Nuclear Power Plants". Preventive measures (to avoid damage) are anticipated for events in safety level 4b, whilst mitigating measures (to restrict damage) are anticipated for events in safety level 4c.

The "Safety Requirements for Nuclear Power Plants" also require organisational instructions to be provided for the emergency measures implemented in safety levels 4b and 4c.
The concept of avoiding and managing incidents is implemented across all German nuclear power plants. The principles set out in the German regulations such as, for example, "automation", "safety-oriented measures", "functional separation", "redundancy and diversity" are in use across all German nuclear power plants wherever technically feasible and reasonable. The first of these measures is particularly important in order to trigger reactor protection mechanisms. Manual measures to manage incidents are not necessary in the first phase of the incident, although they are possible. Wherever possible, redundant safety equipment is located in separate rooms and segregated. This means that there are no links between the redundant equipment which might lead to one set of equipment having a mutual negative effect on the other equipment. Separation of redundant equipment applies not only in the case of process engineering, but also on equal terms in control and instrumentation and electrical engineering. Important safety-related equipment is separated by physical or spatial means to rule out the possibility of neighbouring redundant equipment being affected in the event of individual system faults, for example (e.g. radiation), flooding, fire or in the case of external events. The diversity principle is implemented at component level where there is considerable potential for systematic errors (for example common cause failures (CCF) and this is particularly important from a safety viewpoint.

The multi-stage concept of avoiding and managing design-basis incidents has led to measures being taken at an early stage to prevent a core meltdown even in the event of beyond design-basis scenarios.

Handling radioactive substances is also covered in the Radiological Protection Regulation (StrlSchV). This was last amended in 2011 and adapted to the basic Euratom Standards. The Radiological Protection Regulation includes specifications for protecting individuals and the environment from damage caused by ionising radiation from man-made and natural sources. It sets out basic requirements and limits for use with radioactive substances. This includes handling nuclear fuel and constructing, operating and decommissioning nuclear installations in accordance with Article 7 of the AtG. Organisational and physical safety measures and medical monitoring are specified.

The main aim of reviews in the licensing procedure for nuclear installations is to
ensure that the design value of 50 millisieverts (calculated over all exposure pathways as a 50 or 70-year committed effective dose) is not exceeded as the effective dose in the environment surrounding the plant in the event of an incident in accordance with Article 6 StrlSchV (avoiding unnecessary radiation exposure, reducing radiation exposure). Other design values apply to individual organs and tissues. The radiological calculation methods and assumptions to be used for verification purposes are defined in the calculation principles.

Accidents are highly unlikely given the design of the plants. Nuclear plant accidents involving the release of considerable amounts of radioactivity are regarded as emergency situations in which the dose cannot be restricted by setting dose limits. Instead, intervention guide values are intended to guarantee public protection when implementing emergency measures outside the plant. In order to protect the general public, preventive technical and organisational measures have been taken as part of internal emergency protection, confirmed, amongst other things, by the results of risk analyses and probabilistic safety analyses, with a view to managing beyond design-basis plant conditions or at least reducing their effects both inside and outside the plant. The intention is to avoid radiological situations which require radical safety measures such as evacuation or longer-term resettlement. Notwithstanding these measures on the part of the plant, additional measures to protect the public may, if necessary, be taken under the heading of external emergency planning, if significant amounts of radioactivity are being released from a plant or there is a risk of such releases.

3.4. Article 6(4) of Directive 2009/71/Euratom

Responsibility for nuclear safety lies with the holder of the licence for the nuclear installation according to Article 7c.1 AtG. This responsibility cannot be delegated. Article 7c.2 (1) AtG requires the licence holder to set up and apply a management system granting due priority to nuclear safety. KTA Regulation 1402 and the “Safety Requirements for Nuclear Power Plants” give details of further requirements in this respect (see information in Article 4 “Organisational requirements”). KTA Regulation 1402 expressly stipulates that company policy should make safety a priority. Implementation of the management system described here guarantees the necessary procedures to achieve this company objective. A significant change in approved operating procedures or responsibilities requires approval as a significant change to
operation according to Article 7.1 AtG.

The management principles or company guidelines issued by all German operators of nuclear installations acknowledge that the safety of nuclear power plants takes precedence over other company objectives. Both the relevant management system and measures to encourage safety-oriented behaviour amongst staff, referred to as the “safety culture”, are subject to ongoing development with a view to implementing these principles.

Even before KTA Regulation 1402 was drawn up, German operators had already submitted the “VGB Safety Management Guidelines” (mid-2008). This was based on the “Safety management system optimisation concept” (1999/2002) and described the improvement in safety standards in German nuclear power plants, the principles and objectives of a safety management system (SMS), and the requirements imposed on an SMS with a view to guaranteeing a high safety standard. The VGB Guidelines were incorporated by the plant operators’ representatives when drawing up KTA Regulation 1402.

Safety as a priority is also the fundamental principle underlying the work of the safety regulators. This principle is incorporated in the descriptions of the duties of the safety regulators and licensing authorities and is set down in specific terms in regulatory practice. When licensing a nuclear installation and performing regulatory activities during operation, the regulator checks the precautions taken by the applicant or operator with a view to fulfilling its responsibility to ensure safe operation of the installation and prioritising safety. Regulation by the Länder is systematically divided into different regulatory areas (for example, maintenance, periodic tests, radiation protection). Regular evaluation of the findings of the regulatory process enables the Länder to manage their regulatory duties, e.g. by additional tests on any findings which arise so that safety-related issues are monitored with the appropriate level of attention. The safety regulator holds discussions with the licence holder’s managerial staff to confirm whether safety has been given priority at strategic level when operating the plants. The latter’s comments and behaviour are of particular importance in this respect. For example, the safety regulators obtain information on the safety-oriented behaviour of operating staff by means of extensive checks carried out during on-site inspections and by assessing notifiable and other events. By
regulating and monitoring application of the management systems, the safety regulators are able to check, amongst other things, whether safety is prioritised in the principles underlying the management system and how this is achieved. In addition to principles, those processes in which the prioritisation of safety is demonstrated particularly clearly (for example company objectives, management review) form the focus for regulatory activities. The safety culture assessment system (VGB-SBS) is used by the plant operator as a tool for self-monitoring. This safety culture assessment system forms part of the safety culture programme and is also used to check the effectiveness of the management system based on user information.

The safety regulators have obtained information about the methods and procedures used by plant operators. The safety regulators are informed about implementation of the VGB-SBS and its key results. Furthermore, some safety regulators in the Länder make use of indicators to get an impression of the plant operator’s safety performance and target their activities accordingly. Some of these safety performance indicators are drawn up by the licence holders or experts and reported to the safety regulators. Other indicators are collated by the safety regulators themselves. For example, the nuclear safety regulator in Baden-Württemberg uses a set which currently comprises 42 safety performance indicators and in recent years these have also been monitored to establish their significance and usability for regulatory purposes, the quality of data collection and the frequency with which data is collected and evaluated.

Evaluation of these and other indicators is discussed with the operator in conjunction with other information from the regulatory process, and is thus used to assess the operator’s safety management procedures. In general terms, the aim of using these indicators is to pick up any changes as soon as possible as a sort of early warning system. The causes of such changes cannot usually be deduced from the indicators themselves. The cause of the changes needs to be established by holding discussions with the operators or by detailed analyses.

3.5. Article 6(5) of Directive 2009/71/Euratom

According to Article 7.2 AtG, a licence to construct, operate or make a substantial modification to a nuclear power plant may only be granted if there are no doubts as to the reliability of the applicant and the necessary precautions in line with the state of the art of science and technology have been taken to prevent damage as a result of
construction and operation of the plant. The licensing requirement of reliability also includes the necessary financial standing and economic credibility of the applicant. Provision of the necessary resources is thus a prerequisite to guarantee the necessary precautions to prevent damage in line with the state of the art of science and technology. The necessary reliability and precautions to prevent damage thus set the standard for regulatory activities during operation. According to Article 7c.2 AtG, the operator is also required to provide and maintain permanent appropriate financial and staff resources to fulfil its obligations concerning nuclear safety of the nuclear installation. If the licensing requirements no longer apply at a later date, the competent authority may revoke the operating licence in accordance with Article 17 AtG.

In order to cover the ensuing costs of operating nuclear power plants, plant operators are required to make provisions for decommissioning the plants and waste disposal, these provisions being updated on an annual basis. These provisions are regularly assessed by independent auditors and the Finance Department.

If nuclear installations are operated by public operators, the body responsible for the necessary financial resources is also responsible for safety-related duties in connection with these plants. If the operators are not public operators, they must provide the necessary resources themselves.

When licensing a nuclear installation, the licensing authority checks whether the applicant can be expected to ensure safe operation on the basis of its financial resources.

In principle, any change in the operator of a plant requiring a licence, e.g. if the power plant is sold to another company, requires approval in accordance with Article 7 AtG. Changes in the nature of the company and changes which may affect the financial resources of the licence holder are also subject to approval. In the past, corresponding licences were granted in connection with changes in ownership affecting the German energy supply utilities. The safety regulator mainly checks that plant operators have adequate financial resources to perform safety assessments and safety improvements by ensuring that corresponding measures are performed in real time and with a high quality standard.
The necessary technical qualifications of the individuals responsible for construction, operation and decommissioning is a licensing requirement according to Article 7 AtG and must thus also be guaranteed permanently as a requirement for operation. Other individuals employed in connection with operation and decommissioning of the plant must also have the necessary knowledge with regard to safe operation of the plant, potential hazards and the safety measures to be applied. The corresponding proof of the technical qualifications of the responsible individuals and the necessary knowledge of other individuals employed in connection with operation of the plant must thus be enclosed with all applications for a licence to construct, operate or decommission a plant, or for a substantial modification to a plant. According to Article 7c.2 (3) AtG the operator is obliged to provide education and further training for those of his staff who are entrusted with duties relating to the nuclear safety of nuclear installations in order to maintain and expand their knowledge and skills in the field of nuclear safety. Detailed requirements concerning the expertise of the responsible staff members and the subject-specific knowledge of other staff are defined in corresponding technical qualification guidelines. According to Article 33 StrlSchV the duties of the radiation protection supervisor also include the requirement to provide adequate and suitable staff.

Measures taken by the operator to ensure adequate staff resources are monitored by the safety regulator on the basis of the submitted reports. Individual aspects of staff procurement, staff development and staff resources are examined in depth and assessed via discussions with the operator and inspections in the plant.

The public vocational training system in the Federal Republic of Germany provides excellent conditions to ensure that the operators of nuclear installations are able to appoint specialist workers, foremen, technicians, engineers and scientists who have received a basic technical education corresponding to vocational requirements with a state-recognised final examination as part of their schooling and vocational training. In addition to public vocational training, the power plant operators set up a power plant training centre (Kraftwerksschule) in 1970 to cover the specific requirements of power plant staff.
Due to the high quality criteria imposed by plant operators on their staff, power plant operators on average invest several man-days per year and employee in training over the entire power plant staff. Due to the considerable demand for training, each plant has its own training concept. This is usually implemented using highly qualified and experienced shift managers who put together the training programmes and in some cases carry out this training themselves. If necessary, specialists within the technical departments or external specialists, e.g. from universities, plant manufacturers or the Simulator Centre, are used too. The quality of the training concept is maintained by close partnerships with the technical departments and the Simulator Centre.

Technical staff receive regular instruction in safety-oriented behaviour as part of their initial training and during further training measures. For example, in facilities for managing radioactive waste and spent fuel elements, staff spend approximately 5% of their working time on training and further training.

The specific requirements regarding the qualifications of employees in nuclear power plants who are regarded as responsible staff, or other staff employed in connection with nuclear operations according to the Guidelines, are defined in nuclear power plant training manuals. These also describe measures with a view to acquiring, maintaining and demonstrating expertise. Thus, for example, the responsible shift staff must pass an examination before starting work for the first time. The training manual also records measures to monitor the success of training and to document the training undertaken.

Requirements for other staff employed in the plant as per the above Guidelines also apply to external staff. Depending on the nature of the activity, vocational qualifications, practical experience and proof of knowledge are already required during the recruitment process. In addition, special teaching sessions are also provided in the power plants themselves. Information relating to the specific site, covering topics such as radiation protection, fire safety, health & safety and plant information as a minimum, is provided in such sessions. Individuals in positions of authority (e.g. radiation protection planners, operation managers) also require additional training.

In accordance with Article 7.2 (2) AtG, when licensing a nuclear installation, the plant operator must prove to the licensing authority that he permanently maintains an adequate number of qualified staff to operate his plant. The plant operator’s evidence is drawn up on the basis of the relevant technical qualification guidelines and checked by the safety regulator as part of the licensing procedure. Significant changes to staffing levels on the operator’s site, which might have a negative effect on safe operation, require approval.

The technical qualification guidelines are supplemented by guidelines for monitoring technical qualifications of the responsible shift staff, maintaining the technical qualifications of the responsible nuclear power plant staff and on the specific technical qualifications of the individuals responsible for radiation protection. The guidelines describe the job-related initial qualifications, training and further training requirements, training courses undertaken and practical experience acquired by technical staff in nuclear power plants, and the necessary tests and licences for the competent shift staff according to their responsibilities. Training on the simulator forms part of the training specified by the Guidelines for shift managers, deputy shift managers and reactor operators.

The plant operator is also required to train his staff in accordance with Article 7.2 (3) AtG.

When using external staff, the applicant must ensure that the necessary knowledge is guaranteed by using supervisors if required. This also applies in the event that knowledge is communicated by the external company. Corresponding evidence must be submitted to the safety regulator on request.

Maintenance of competence and transfer of know-how within technical positions is ensured by means of training programmes and by “parallel appointments” over a number of years. In such cases, the young employee shadows the experienced employee in the allocated technical position for up to three years, depending on the nature of the task at hand. In addition, continuous progression planning is also undertaken by plant operators working closely with universities and nuclear research institutions. This includes sponsoring nuclear engineering chairs, providing financial
support for doctorates and industrial placements and courses for students.

All German nuclear power plants have plant-specific full-scale simulators. Simulator training is an important part of the programmes to ensure that competence is maintained. The training programmes are regularly adapted to the latest knowledge or information. Methods for managing stress and communication are also included in the training courses. Particular attention is attached to incorporating operating experience back into the process. The Simulator Centre trains the responsible operating staff for almost all German nuclear power plants. Two companies were set up in 1987 to run the Centre:

- GfS Gesellschaft für Simulatorschulung mbH, which carries out the training,
- KSG Kraftwerkssimulator-Gesellschaft mbH, which provides the simulators and other infrastructure.

Over 2000 course attendees from 17 nuclear power plants visit the Simulator Centre every year. They learn and practise what they have learned on 13 simulators (9 PWR simulators (another is currently under construction), and 4 BWR simulators) as part of 500 – 600 courses to make sure they know how to operate and understand their nuclear power plants under all conceivable operating conditions. The KSG/GfS Simulator Centre is thus the world’s largest facility of its kind.

The simulators reproduce the visual appearance of the respective nuclear power plants and their technical, physical and time-related behaviour in precise detail. The operating staff will experience the same working conditions and requirements in the simulators as will occur or may occur in reality when they are operating and monitoring the plant.

The training programmes cover the whole range of nuclear power plant operating modes: normal operation, operating faults and all incidents and accidents in a variety of combinations under the most diverse general conditions. Training focuses equally on operating and understanding the technology AND on the behaviour of individuals in the team: ability to work in a team, communication, decision-making and leadership behaviour.

The training programmes in the Simulator Centre are kept constantly updated using
experience from power plant operation and analyses. In particular, events which indicate shortcomings in technical qualifications or suggest that the behaviour of the operating staff is not safety-oriented, for example, are used for this purpose.

The training managers at the Simulator Centre undertake comprehensive training and regularly visit the plants.

In addition to the safety regulators’ in-house official training and further training programmes and the training and further training programme offered by the Bundesakademie für die öffentliche Verwaltung (BAKöV) (Federal Academy for Public Administration), the safety regulators’ staff have access to the same training opportunities as the plant operating staff, as a general rule. In addition to the courses run by the Kraftwerksschule Essen and its simulator courses, this includes all training and further training opportunities offered by the TÜV Academy and GRS.

The authorities’ seminars and the GRS training programme are used to train specialist staff employed by the authorities and expert consultants:

- The authorities’ seminars on all aspects of nuclear technology, given by GRS at regular intervals, are intended particularly for younger authority staff. There are seminars on subjects such as the basics of reactor physics, the nuclear fuel cycle and waste disposal, major events / incidents / accidents in nuclear installations, IAEA INES User’s Manual, principles of radiation protection, radiological emergency protection, official regulation of nuclear reactor operation, nuclear regulations - law and technology, selected current topics relating to nuclear licensing and regulatory procedures, fire safety in nuclear power plants, operational management of nuclear power plants.

- The trainee programme for prospective experts in the field of nuclear safety lasts for one year and has been performed successfully for the past four years. The focus of this programme is on expert knowledge of nuclear safety and international collaboration in this area. Advanced courses have been offered on subjects such as reactor physics, plant security and reactor system engineering. In the practical part of the training, the trainees learnt about the work of the specialist divisions in GRS. This training concept is currently under review (as at: December 2013).
In addition to the training programmes offered by the Federal Republic of Germany, all authority and expert staff also have access to the courses and training opportunities offered by the European Nuclear Safety Training and Tutoring Institute (ENSTTI), a shared initiative by four European expert organisations GRS (from the Federal Republic of Germany), IRSN (France), UJV (Czech Republic) and LEI (Lithuania).
5. Article 8 of Directive 2009/71/Euratom

The BMUB informs and involves the general public in all matters relating to developing national and international regulations. The publications of draft regulations or drafts in the Federal Gazette help to achieve this, along with a timescale for comments. All laws, regulations and the entire set of subordinate nuclear regulations, including all KTA regulations, can be accessed by the public via the BMUB, BfS and KTA websites or by publication in the Federal Gazette. The Safety Requirements for Nuclear Power Plants are also published in English along with the complete set of KTA regulations.

Events in nuclear installations which must be notified are classified by the operators of nuclear installations according to the IAEA’s International Nuclear Event Scale (INES). The BfS records these events and informs all nuclear authorities in the individual Länder, experts, manufacturers and operators of nuclear power plants by means of quarterly reports, and also informs the general public of notifiable events in nuclear power plants, research reactors and other nuclear installations by means of monthly and annual reports on the BfS website. Plant operators inform the general public of all notifiable events in their nuclear power plants. The individual staff members are informed of notifiable events in-house.

Widespread public participation is available as part of the licensing procedure. As a result, citizens should have the opportunity to express their concerns directly as part of the procedure. Public participation is compulsory for construction licences. The authority may dispense with public participation when approving significant changes in accordance with the Nuclear Licensing Procedure Regulation if the change does not lead to any detrimental effects on the general public. However, public participation must take place if this is required according to the Environmental Impact Assessment Act.
The Nuclear Licensing Procedure Regulation contains regulations on the following:

- the conditions under which the licensing authority may dispense with public participation or must arrange for public participation,
- public notification of the project and public display of the application documents in a suitable location in the vicinity of the site for a period of two months, including the request for any objections to be made within the display period (Articles 4-7a AtVfV),
- holding a hearing at which any objections which have been submitted can be discussed by the licensing authority, the applicant and the objectors (Articles 8-13 AtVfV).

The licensing authority takes the objections into account when making its decision and records this in its justification for the licensing decision.

If a licensing procedure is performed with public participation, the applicant must submit an easily understandable brief description of the plant and the requested modification to inform the general public (Article 6.1 (3) in conjunction with Article 3.4 AtVfV). The applicant must also draw up a safety report (Article 6.1 (2) in conjunction with Article 3.1 (1) AtVfV), which is checked by the competent licensing authority with the aid of experts as part of the licensing process. This is primarily used to describe the effects associated with the modification, including any potentially different effects of design-basis incidents, and to set out the precautionary measures so that affected citizens can assess whether they wish to act to protect their rights.

The need for an environmental impact assessment when licensing the construction, operation or decommissioning of a nuclear power plant or in the event of a significant change to the plant or its operation and the environmental impact assessment process as part of the nuclear licensing procedure is covered in the Environmental Impact Assessment Act in conjunction with Article 2a AtG and the regulations of the Nuclear Licensing Procedure Ordnance based on the AtG.
Information on the plans to construct a plant to process spent fuel elements is provided by notification and public display of documents in accordance with Article 4 AtVfV. The hearing which may need to be held is covered in Articles 8 to 13 AtVfV. The hearing entails a verbal discussion between the authority, the objectors and the applicant of any objections to the proposed project which may have been raised previously. The hearing should provide the opportunity for individuals who have raised objections within the timescale laid down in Article 7 AtVfV to explain their objections. According to Article 12.1 AtVfV, this is not a public hearing.

Directive 2011/70/Euratom concerning management of radioactive waste and spent fuel elements focuses on the requirement for each member state to set up a national programme which includes comprehensive measures for the sustainable management of existing radioactive waste and irradiated fuel elements which have accrued and are still accruing. This programme is intended to ensure and improve the transparency and traceability of any necessary decisions relating to waste management, including final storage of radioactive waste and irradiated fuel elements in the eyes of the general public. The respective national programme should be reviewed by an international group of experts and developed at regular intervals. This ensures the transparency and traceability of the ongoing procedure and guarantees that citizens will be comprehensively involved on the basis of reliable information.

The procedure described above, and in particular public participation by means of the AtVfV and the Environmental Impact Assessment Act (UVPG), guarantees that the general public have access to all necessary information relating to the safety of planned facilities for processing spent fuel elements.

The work of the National Federal Crisis Management and Assessment Centres, the nuclear safety regulators in the individual Länder and GRS was assessed in positive terms by an IRRS mission in 2008 and 2011, immediately after the Fukushima reactor accident. The existing structures for assessing situations and providing extensive information to the general public were highlighted in this process.

In discharging the responsibilities of the licence holder, plant operators have also set themselves the aim of informing the general public by means of transparent and open communication methods.
These include the following by way of example:

- public relations,
- external reporting of notifiable events,
- crisis communications,
- external communication of power plant-specific topics (operation, overhauls, maintenance and modernisation projects) wherever possible and
- PR work on-site, e.g. power plant discussions.

In addition to site-related monitoring of the environment around nuclear power plants in accordance with the Guidelines for Emission and Immission Monitoring of Nuclear Installations, general environmental radioactivity in the Federal Republic of Germany is recorded on a large scale in accordance with the Precautionary Radiation Protection Act thanks to the Integrated Measurement and Information System for the Monitoring of Environmental Radioactivity (IMIS). The resulting data is published in the annual reports on "Environmental radioactivity and radiation exposure" issued by the BMUB and can also be consulted by the general public via the internet in some cases.

The alarm regulations issued by the operators of nuclear power plants include the regulations for raising the alarm in emergencies. These form part of the operating manual and safety specifications. The regulations set out the plant operator’s emergency plan in its entirety. Amongst other things, this includes measures to ensure efficient communication and cooperation with external bodies such as the competent authorities and on notifying the general public.

In German Länder with nuclear installations close to state boundaries, disaster management exercises extending over several Länder are performed in partnership with neighbouring states at extended intervals. The aim is to optimise shared disaster management by the relevant bodies in the wider area and to agree how the public should be notified by media and PR operations.

The Euratom Directive on informing the general public in the event of radiological emergencies (89/618/Euratom) is transposed via Articles 51 and 53 StrlSchV. Appendix XIII of the Radiation Protection Regulation defines the main content of the information provided to the general public. A distinction is made between information
to be conveyed to the general public in preparation for a radiological emergency and
the relevant information in the event of an actual emergency as defined in Article 51.2
StrlSchV.

The public in the area surrounding a plant must be informed in advance, at intervals of
at least five years, of the key points which include the following:

- basic principles of radioactivity and the effects of radioactivity on humans and
  the environment,
- radiological emergencies and the consequences for the population and the
  environment, including proposed rescue and safety measures,
- information on how affected individuals will be alerted and how the progress of
  the situation will be reported on an ongoing basis and
- information on how affected individuals should behave and act.

Information will be provided by a brochure drawn up by the plant operators in
consultation with the disaster management authorities. This brochure will be issued to
the general public in consultation with the disaster management authorities in the area
surrounding nuclear installations.

A website (www.jodblockade.de) has been available to the general public since 2010,
specifically to cover the administration of iodine tablets. This site contains extensive
information on this protective measure. In the event of a significant safety-related
event in a nuclear installation that leads to a radiological emergency in the
surrounding area, the competent authorities will inform members of the public who
may possibly be affected without delay in accordance with the specifications in Article
51.2 StrlSchV and provide information on appropriate behaviour including precise
details of the health & safety measures to be taken.

The information to be passed on to the general public is summarised in Appendix XIII
Part A of the Radiation Protection Regulation and relates to the following in particular:

- nature and characteristics of the event, specifically its cause, spread and
devolution,
- safety instructions and actions for specific population groups and
- details of the competent authorities responsible for disaster management.
In the event of an early warning stage (pre-alarm), the following information and instructions should be given to the general public by way of example:

- a request to switch on the radio and television
- preparatory instructions for specific institutions
- recommendations for professions which are particularly affected

In addition to regulations governing responsibilities, this includes procedures by which the various institutions involved are able to agree the content of the information they issue. This also describes how citizens can get in touch with the authorities responsible for disaster management and the media used to inform the public. Sample texts to this end are provided in the outline recommendations. Suitability of the preparatory measures with a view to informing the general public is assessed in exercises. Informing the general public also allows the disaster management plan to be consulted by the public with the exception of personal and safety-sensitive information.
6. Article 9 of Directive 2009/71/Euratom

6.1. Article 9(1) of Directive 2009/71/Euratom


6.2. Article 9(2) of Directive 2009/71/Euratom

Responsibility of the Commission.

6.3. Article 9(3) of Directive 2009/71/Euratom

Reporting takes place as part of the European IRRS programme. The German reports on the IRRS 2008 mission and the IRRS Follow-up Mission in 2011 have been published. There is no obligation to send these separately to the Commission.