

## Guide to the decommissioning, the safe enclosure and the dismantling of facilities or parts thereof as defined in § 7 of the Atomic Energy Act

16 September 2021

**Note:** This translation is intended solely as a convenience to the non-German readers. Any discrepancies or differences in the translation are not binding and have no legal effect for compliance or enforcement purposes. In case of discrepancies, the German official version shall prevail.

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## 1. Introduction

The experience gained from previous decommissioning procedures (licensing and supervisory procedures) for nuclear facilities in the Federal Republic of Germany shows, both with regard to the technical execution and the technical rules and legal regulations to be applied, that adequate means exist to allow decommissioning projects to be licensed and carried out safely.

In the case of licences pursuant to § 7(3) of the Atomic Energy Act (AtG), the licensing authorities stipulate the requirements for decommissioning and safe enclosure or the dismantling of facilities or parts thereof, in some cases with analogous application of the rules and guidelines that exist for construction and operation of the facilities. Relevant parts of the requirements are tailored to suit the specific conditions with regard to the decommissioning and safe enclosure or the dismantling of the facility.

The aim of the Guide is,

- to summarise the aspects of licensing and supervision which are relevant in the decommissioning procedure,
- to achieve a common understanding between the Federation and the Länder to ensure that decommissioning procedures are carried out appropriately, and
- to harmonise the existing views and procedures where possible.

Accordingly, the Guide includes proposals for an appropriate procedure for the decommissioning, safe enclosure and dismantling of facilities or parts thereof as defined in § 7(3) AtG in respect of the application of the statutory regulations for planning, preparation and implementation of decommissioning projects as well as their licensing and supervision. These proposals are primarily aimed at the decommissioning procedures of nuclear power plants. For research reactors and nuclear fuel cycle facilities, there may be different conditions that are to be considered on a facility-specific basis.

Appendix 1 of the Guide contains definitions of the key terms as used in this Guide. The term “decommissioning”, for example, is generally used in this Guide both as a single word and as a compound term (e.g. decommissioning procedure) in the wider sense as a generic term for all measures aimed at decommissioning (including safe enclosure and dismantling). This is in line with technical language and international usage. In the Atomic Energy Act, however, reference is made to “decommissioning, safe enclosure and dismantling”. There, the term “decommissioning” is thus used in a narrower legal sense. In this Guide, this narrower legal usage of the term “decommissioning” is only applied by way of exception if in the text direct reference is made to the Atomic Energy Act or if decommissioning, safe enclosure and dismantling are mentioned together.

This revised Guide replaces the Guide to the decommissioning, safe enclosure and dismantling of facilities or parts thereof as defined in § 7 AtG of 23 June 2016 (Federal Gazette (BAnz) AT 19.07.2016 B7) and constitutes a document, which summarises the relevant aspects for decommissioning procedures and the aids appropriate for their implementation.

## 2. Framework

### 2.1 General

Based on the purpose of the Atomic Energy Act, also in accordance with international recommendations /1/, /2/, the ultimate objective of all decommissioning actions is to release nuclear facilities from regulatory control under nuclear and radiation protection law. The decommissioning actions can also be terminated by conversion of the remaining parts not yet released to another use licensed under nuclear or radiation protection law.

According to § 7(3) AtG, decommissioning, safe enclosure and dismantling of facilities or parts thereof shall require a licence. The release of a facility from regulatory control under nuclear and radiation protection law pursuant to § 7(1) AtG is effected in accordance with the nuclear licence pursuant to § 7(3) AtG. The clearance of radioactive substances and objects is effected in accordance with §§ 31 to 42 of the Radiation Protection Ordinance (StrlSchV). Only for substances and objects including soil areas that are subject to regulatory control under nuclear and radiation protection law but cannot be contaminated or activated due to the practice referred to in § 4(1) sentence 1 No. 4 of the Radiation Protection Act (StrlSchG) can the release from regulatory control under nuclear and radiation protection law be effected by means of removal. The basic procedure for removal is to be described in a licensing document.

The assessment of the decommissioning actions in terms of safety begins with the hazard potential, which is determined by the inventory of radioactive substances, the technical condition of the facility, and its safety-related design. The applicable design requirements for construction and operation cannot be unconditionally used for the safety assessment of decommissioning actions. Based on the condition of the shut down facility, the safety assessment of the planned decommissioning actions must be founded on the provisions of § 80 StrlSchG and §§ 99 and 104 in conjunction with § 194 StrlSchV and all other protective requirements of the Radiation Protection Ordinance. For accident analyses, event sequences are to be postulated that can be derived from the type, quantity and distribution of remaining radioactive substances together with the decommissioning actions applied for.

As long as there is still nuclear fuel in the facility during decommissioning that exceeds the masses or concentrations defined in § 2(3) AtG, the requirements that are necessary to guarantee safety for this configuration must continue to be fulfilled.

### 2.2 Legal regulations

The legal bases for decommissioning procedures are the Atomic Energy Act (AtG) and the Radiation Protection Act (StrlSchG) as well as the associated ordinances and general administrative provisions. There are no other laws and regulations specific to the decommissioning procedure. The statutory regulations also primarily deal with the construction and operation of nuclear facilities.

The regulations that are of particular importance for decommissioning projects are outlined briefly below and listed in the Handbook on Nuclear Safety and Radiation Protection /3/.

#### Atomic Energy Act (AtG)

Atomic Energy Act as amended and promulgated on 15 July 1985 (Federal Law Gazette (BGBl.) I, page 1565), as last amended by Article 1 of the Act of 10 August 2021 (Federal Law Gazette (BGBl.) I, page 3530)

In § 7(3), the Atomic Energy Act includes the basic provision for licensing the decommissioning of a nuclear facility and the safe enclosure or dismantling of the facility or parts thereof. At the same time, this is the only provision of the Atomic Energy Act which relates specifically to decommissioning for facilities as defined in § 7(1) AtG.

The basic provisions of § 9a AtG apply to the utilisation of radioactive residues as well as radioactive components that have been disassembled or dismantled, and the management of radioactive waste.

§ 2a AtG describes the role of the environmental impact assessment within the nuclear licensing procedure and defines general rules for its performance.

§ 7(1a) AtG specifies when the authorisation to operate a facility for the fission of nuclear fuel for the commercial generation of electricity will expire at the latest.

**Radiation Protection Act (StrlSchG)**

Radiation Protection Act of 27 June 2017 (Federal Law Gazette (BGBl.) I, page 1966), as last amended by Article 2 of the Act of 20 May 2021 (Federal Law Gazette (BGBl.) I, page 1194)

Decommissioning is an activity pursuant to § 4(1)(4) StrlSchG and thus a planned exposure situation pursuant to § 2(2) StrlSchG. Part 2 of the Act regulates radiation protection in planned exposure situations.

**Act on the Environmental Impact Assessment (UVPG)**

Act on the Environmental Impact Assessment as amended and promulgated on 18 March 2021 (Federal Law Gazette (BGBl.) I, page 540), amended by Article 14 of the Act of 14 September 2021 (Federal Law Gazette (BGBl.) I, page 4147)

Appendix 1 No. 11 UVPG stipulates that an environmental impact assessment (EIA) must be carried out for stationary facilities for the fission of nuclear fuel whose maximum exceeds 1 kW continuous thermal load and for all planned measures for decommissioning, safe enclosure or dismantling of the facility or parts thereof.

**Nuclear Licensing Procedure Ordinance (AtVfV)**

Nuclear Licensing Procedure Ordinance as amended and promulgated on 3 February 1995 (Federal Law Gazette (BGBl.) I, page 180), as last amended by Article 3 of the Ordinance of 11 November 2020 (Federal Law Gazette (BGBl.) I, page 2428)

The licensing procedure for the decommissioning, safe enclosure and dismantling of facilities or parts thereof according to § 7 AtG is based on the Nuclear Licensing Procedure Ordinance. It contains provisions which are specific to decommissioning, in particular for the involvement of third parties and for the EIA in §§ 4(4) and 19b AtVfV.

To examine the other provisions related to the project that are subject to public law, reference is made to § 14 AtVfV and for projects subject to an EIA also to § 14a AtVfV.

Other regulations in the Nuclear Licensing Procedure Ordinance which are relevant here relate to the documents to be submitted for radioactive residues (§ 3(1)(8) AtVfV).

**Radiation Protection Ordinance (StrlSchV)**

Radiation Protection Ordinance of 29 November 2018 (Federal Law Gazette (BGBl.) I, page 2034, 2036), as last amended by Article 83 of the Act of 10 August 2021 (Federal Law Gazette (BGBl.) I, page 3436)

The Radiation Protection Ordinance is of particular relevance for the decommissioning actions. Its provisions contained in § 4(1)(4) apply to the decommissioning and safe enclosure of a facility as well as to the dismantling of a facility or parts thereof as defined in § 7 AtG, and therefore determine, to a large extent, the technical and operational measures, procedures and precautions for protection against damage from ionising radiation. In particular, §§ 31 to 42 StrlSchV regulate clearance unless existing regulations are maintained in force according to § 187 StrlSchV.

**Nuclear Financial Security Ordinance (AtDeckV)**

Nuclear Financial Security Ordinance of 25 January 1977 (Federal Law Gazette (BGBl.) I, page 220), as last amended by Article 13 of the Ordinance of 29 November 2018 (Federal Law Gazette (BGBl.) I, page 2034)

§ 12 AtDeckV constitutes a specific provision for the decommissioning of facilities. Accordingly, the standard limit is determined according to the activity still present in the facility pursuant to the values given in the column for unsealed radioactive substances in Annex 2 AtDeckV.

**Waste Management Transfer Act (EntsorgÜG)**

Waste Management Transfer Act of 27 January 2017 (Federal Law Gazette (BGBl.) I, page 114), as last amended by Article 2 of the Act of 25 June 2021 (Federal Law Gazette (BGBl.) I, page 2137)

The Act regulates the transfer of radioactive waste to BGZ Gesellschaft für Zwischenlagerung mbH as the third party commissioned by the Federation with storage management as well as the transfer of the further waste management obligation to this company and its financing by the Waste Management Fund.

### Other nuclear ordinances

Other nuclear ordinances also applicable in the decommissioning procedure:

- Nuclear Waste Management Ordinance (AtEV)  
Nuclear Waste Management Ordinance of 29 November 2018 (Federal Law Gazette (BGBl.) I page 2034, 2172)
- Cost Ordinance under the Atomic Energy Act and the Radiation Protection Act (AtKostV)  
Cost Ordinance under the Atomic Energy Act and the Radiation Protection Act of 17 December 1981 (Federal Law Gazette (BGBl.) I page 1457), as last amended by Article 5 of the Act of 20 May 2021 (Federal Law Gazette (BGBl.) I page 1194)
- Nuclear Safety Officer and Reporting Ordinance (AtSMV)  
Nuclear Safety Officer and Reporting Ordinance of 14 October 1992 (Federal Law Gazette (BGBl.) I, page 1766), as last amended by Article 18 of the Ordinance of 29 November 2018 (Federal Law Gazette (BGBl.) I, page 2034)
- Nuclear Trustworthiness Verification Ordinance (AtZüV)  
Nuclear Trustworthiness Verification Ordinance of 1 July 1999 (Federal Law Gazette (BGBl.) I, page 1525), as last amended by Article 82 of the 10 August 2021 (Federal Law Gazette (BGBl.) I, page 3436)

### 2.3 Guidance instruments

The existing rules and recommendations for nuclear facilities such as

- announcements by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the formerly competent Federal Ministry of the Interior (BMI),
- decisions of the of the Länder Committee for Nuclear Energy (LAA) – General Committee –
- recommendations of the Nuclear Waste Management Commission (ESK), the Reactor Safety Commission (RSK) and the Commission on Radiological Protection (SSK),
- standards of the Nuclear Safety Standards Commission (KTA), and
- technical standards

have been created primarily for the construction and operation of these facilities.

### **Announcements by the BMU and the formerly competent BMI as well as KTA safety standards**

The announcements by the BMU and the formerly competent BMI as well as the KTA safety standards were assessed for their applicability to the decommissioning of nuclear facilities and were divided into the following three categories:

Category I: The rule is to be applied throughout the decommissioning stage, taking into account the current condition of the installation and the hazard potential.

Category II: The rule is to be applied, taking into account the current condition of the installation and the hazard potential as long as there is still nuclear fuel in the installation and the fundamental safety functions of subcriticality and residual heat removal must be fulfilled.

Category III: The rule is not relevant.

For categories I and II, the protection-goal-oriented consideration of the current condition of the facility and the reduced hazard potential means that individual regulatory contents may no longer be relevant during decommissioning.

In Appendix 2, the announcements and standards are assigned to the different categories based on the listings given in the Handbook on Nuclear Safety and Radiation Protection /3/ and in the KTA Program of Standards /4/.

Appendix 3 contains comments e.g. on the adaptation of some announcements and standards to the protection goals or their partial application.

If there are no special nuclear safety requirements or requirements in terms of radiation protection, the general technical standards can be applied instead of the KTA safety standard.

### **Decisions of the of the Länder Committee for Nuclear Energy (LAA) – General Committee**

The following decisions of the Länder Committee for Nuclear Energy (LAA) – General Committee – specify the procedure of federal regulatory review and assessment and the necessary documents as part of the procedure for granting a decommissioning licence:

- “Bundesaufsichtliche Prüfung von Stilllegungs- und Abbaugenehmigungen” (Federal supervisory review of decommissioning and dismantling licences of 3/4 July 2014
- “Rechtlicher Rahmen der Beurteilung des Szenarios „Terroristischer Flugzeugabsturz“ durch die Exekutive” (Legal framework of the assessment of the “terrorist aircraft crash” scenario by the executive) of 11 July 2016
- “Stilllegungsgenehmigungen bei Forschungsreaktoren” (Decommissioning licences for research reactors) of 28/29 June 2018

### **Recommendations of the Nuclear Waste Management Commission (ESK)**

The following ESK recommendations are generally relevant in terms of decommissioning:

- Guidelines for the decommissioning of nuclear facilities of 5 November 2020 /5/
- Requirements for operating reports of ongoing decommissioning projects of 26 July 2018 /6/

Furthermore, the ESK prepared a recommendation “Guidelines for the storage of radioactive waste with negligible heat generation” in a revised version of 10 June 2013 /7/, which is also applicable with regard to radioactive waste from the dismantling of nuclear facilities. This recommendation was recommended for application by decision of the Länder Committee for Nuclear Energy – General Committee – on 13/14 June 2013.

### **Recommendations of the Reactor Safety Commission (RSK)**

The following RSK statements may be relevant in terms of decommissioning, depending on whether the spent fuel pool still contains fuel assemblies and/or fuel rods:

- Requirements in connection with passive spent fuel pool cooling of 27 March 2019 /8/
- Requirements for cooling of the fuel assemblies in the spent fuel pool during residual operation of 21 October 2020 /9/

Other specific recommendations on the decommissioning of nuclear facilities are not available at present. Statements given so far refer to actual decommissioning procedures.

### Recommendations of the Commission on Radiological Protection (SSK)

The following SSK recommendations listed in the Handbook on Nuclear Safety and Radiation Protection /3/ are relevant in terms of decommissioning:

- "Planung der Iodblockade in der Umgebung stillgelegter Kernkraftwerke" (Planning iodine thyroid blocking in the vicinity of decommissioned nuclear power plants) of 10 April 2014 /10/
- "Planungsgebiete für den Notfallschutz in der Umgebung stillgelegter Kernkraftwerke" (Planning areas for emergency preparedness in the vicinity of decommissioned nuclear power plants) of 20/21 October 2014 /11/
- "Einführung von Dosisrichtwerten (Dose Constraints) zum Schutz vor beruflicher Strahlenexposition bei der Umsetzung der Richtlinie 2013/59/EURATOM in das deutsche Strahlenschutzrecht" (Introduction of dose constraints to protect against occupational radiation exposure when transposing Directive 2013/59/ Euratom into German radiation protection law) of 11 December 2014 /12/

Other specific recommendations on the decommissioning of nuclear facilities are not available at present. Statements given so far refer to actual decommissioning procedures. Other SSK recommendations on general or plant-specific issues of radiation protection or emergency response are also to be considered in the decommissioning procedure.

### Technical standards

Only a few standards are explicitly applicable to decommissioning. The DIN standards specific to nuclear technology cover various areas of nuclear technology, such as: basic requirements, terms and symbols; construction, operation and inspection of individual components or entire systems; radiological measurement technology, dosimetry; measuring techniques for contamination, discharges and for the clearance of radioactive substances; operation of equipment, etc. These standards are to be applied to decommissioning if relevant. Deviations from the technical standards may be permitted in individual cases if the required level of safety can be guaranteed to a comparable degree in another way.

## 2.4 International regulations, standards and recommendations

The Handbook on Nuclear Safety and Radiation Protection /3/ lists multilateral agreements and legal provisions of the European Union.

The obligations under Article 37 of the Euratom Treaty are binding. The rules of the Espoo Convention and the Paris Convention have been transposed into national law.

Moreover, the convention on spent fuel and nuclear waste management as well as the safety standards of the International Atomic Energy Agency (IAEA) in Vienna serve as guidance.

### Euratom-Treaty

Article 37 of the Euratom Treaty stipulates that for any plan for discharges of radioactive effluents in whatever form, "general data" shall be submitted to the European Commission from which potential impacts on the territory of other states of the European Union can be determined. Annex 3 of the Commission Recommendation of 11 October 2010 on the application of Article 37 of the Euratom Treaty /13/ stipulates that for the dismantling of nuclear reactors, mixedoxide fuel fabrication plants and reprocessing plants (except research reactors whose maximum power does not exceed 50 MW continuous thermal load), general data shall be given on the site and its surroundings, on the installation, on the discharge of airborne radioactive effluents during normal operation, on the discharge of liquid radioactive effluents during normal operation, on the disposal of solid radioactive waste from the installation (also including the specified clearance levels, material types and amounts), on unplanned releases of radioactive effluents, on emergency plans and, finally, on environmental monitoring. Usually (depending on the exposure in the vicinity of the plant), data on effective doses in other Member States affected are also to be provided. The data are to be notified to the Commission via the competent federal ministry, if possible one year before, but at least six months before the competent licensing authority issues a licence for the discharge of radioactive substances.

### Espoo Convention

Germany is a party to the international "Convention on Environmental Impact Assessment in a Transboundary Context" of 25 February 1991, the so-called Espoo Convention, as well as its two amendments. Accordingly, the authorities and the public of other, potentially affected neighbouring states shall be involved prior to approval of the project within the

framework of a transboundary environmental impact assessment if the project may have transboundary environmental effects.

### Paris Convention

The Paris Convention of 29 July 1960 (later supplemented by protocols) in force in Germany and most Western European countries, contains substantive rules on the civil liability of the operator of a nuclear facility for damage caused by a nuclear incident.

### Convention on spent fuel and nuclear waste management

The convention on spent fuel and nuclear waste management (Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management), adopted on 5 September 1997 at the IAEA in Vienna, is not directly binding for the licensing and supervisory authority or the applicant. However, it must be implemented by the Federal Republic of Germany at the national level /14/. The convention also extends to the decommissioning, the safe enclosure and the dismantling of nuclear facilities. Article 26 (Decommissioning) of the convention is the central provision to decommissioning with references to other articles relevant in this context, such as Article 22 (Human and financial resources), Article 24 (Operational radiation protection) and Article 25 (Emergency preparedness). Furthermore, Article 26 (Decommissioning) mentions the obligation to record and keep information important in terms of decommissioning. In addition to the more stringent obligations of Article 26 (Decommissioning), further requirements are relevant for decommissioning.

### Safety standards of the IAEA

The requirements of the IAEA safety standards are considered in the revision process of the German regulations. The following IAEA safety standards are relevant in terms of decommissioning:

- Fundamental Safety Principles /15/,
- General Safety Requirement Part 6: Decommissioning of Facilities /1/,
- General Safety Requirement Part 5: Predisposal Management of Radioactive Waste /16/,
- Safety Guide on Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities /2/,
- Safety Guide on Decommissioning of Medical, Industrial and Research Facilities /17/,
- Safety Guide on Safety Assessment for the Decommissioning of Facilities Using Radioactive Material /18/,
- Safety Guide on Storage of Radioactive Waste /19/,
- Safety Guide on Release of Sites from Regulatory Control on Termination of Practices /20/.

## 3. Decommissioning planning and application documents

The approaches for the planning and compilation of application documents as described below have been developed from experience gained so far with the aim of promoting a uniform practice for decommissioning procedures.

The term decommissioning concept is understood as the conceptual approach to decommissioning already in place during construction and operation of the facility. This decommissioning concept is further developed in parallel to the operation of the facility, so that a decommissioning plan in terms of § 19b(1) AtVfV can be submitted at the time of first application for decommissioning. A fundamental decision in decommissioning planning concerns the choice of a decommissioning strategy, i.e. which of the two options – immediate dismantling or safe enclosure – will be implemented.

According to § 7(3) AtG, the decommissioning of a facility as defined in § 7(1) AtG, the safe enclosure of the definitively decommissioned facility and the dismantling of the facility or parts thereof shall require a licence, without defining in more detail the facts under licensing law. So far, necessary licences were mainly granted on a step-by-step basis. Within the framework of the procedure for the first licence, the decommissioning actions as a whole as well as their procedural implementation are to be examined to assess whether the measures applied for in the first licence will interfere with or prevent other measures, and whether an appropriate sequence of dismantling measures is planned (§ 19b(1) AtVfV). At the same time, an environmental impact assessment of the entire decommissioning project is to be carried out for the first licence (§ 19b(3) AtVfV).



For facilities to be decommissioned, the existing management system is to be adapted to the changed hazard potential and the requirements of decommissioning.

### 3.1 Decommissioning concept

To prepare for decommissioning, requirement 3.11 (7) of the safety requirements for nuclear power plants /21/ stipulates the following:

“The condition of nuclear power plants shall be such that they can be decommissioned in compliance with the radiation protection provisions. A concept shall exist for their removal after final decommissioning in compliance with the radiation protection provisions.”

Equivalent requirements are laid down in 2.15 of the safety requirements for nuclear fuel supply facilities /22/.

This requires addressing decommissioning and disposal well in advance of cessation of operation.

The operating licences for nuclear power plants generally stipulate a periodic review of the decommissioning plan. Important aspects include the technical documentation of the facility, its systems, components, buildings and materials as well as data relevant for radiation protection (dose rate atlas and contamination atlas) and the consequences of special events which are relevant for the decommissioning procedure.

In addition, all maintenance provisions can be used for planning the decommissioning actions.

### 3.2 Decommissioning strategies

According to § 7(3) AtG, the following decommissioning strategies are available in Germany:

- Dismantling:  
immediate dismantling of the facility or parts thereof and release from nuclear regulatory control
- Safe enclosure:  
transferring the facility to a state of low maintenance for a longer period, thereby postponing dismantling and release from nuclear regulatory control to a later point in time

Nuclear power plants whose authorisation for power operation has permanently expired pursuant to § 7(1a) AtG or whose power operation has permanently ceased and whose operators are contributors according to § 2(1) sentence 1 of the Waste Management Fund Act (Entsorg-FondsG) shall immediately be shut down and dismantled according to § 7(3) AtG. In individual cases, the competent authority may permit temporary exceptions for parts of the facility to the extent and for as long as this is necessary for reasons of radiation protection.

### 3.3 Post-operational phase

The safety status of the facility in the post-operational phase is to be assessed. A checklist for carrying out an assessment of the current safety status of the facility for the post-operational phase /23/ shows which aspects are important for assessing the post-operational phase and should be considered.

The required availability of systems in the post-operational phase is based on the regulations in the operating manual (BHB) for the standstill of the nuclear facility. The operator retains the right to apply for further adaptations to longer-term standstill periods, taking particular account of the related nuclear hazard. Simplifications in the area of safety specifications (SSp), e.g. availability of systems or reduction of in-service inspections, are also possible. Under certain circumstances, the post-operational phase may already include preparations for the safe enclosure or for dismantling the facility, in so far as these are covered by the operating licence or do not represent significant changes (i.e. they can be carried out in accordance with the operating manual as insignificant changes). This includes, for example,

- the removal of fuel assemblies, fuel rods or nuclear fuel as early as possible,
- decontamination of the facility and systems,
- taking material samples from systems and components (e.g. for the purpose of a radiological characterisation of the facility) required for the licence application for decommissioning,
- an inventory of hazardous (e.g. flammable, toxic, water-endangering) substances,
- adaptation of the operating procedures,
- utilisation of radioactive substances and disposal of radioactive waste from the operational phase,

- shutting down and isolating systems and installations no longer required, and
- creation of open spaces and of internal transport routes.

### 3.4 Application documents

According to § 3(1) AtVfV, the application for a licence according to § 7(3) AtG shall include all documents needed to examine the licensing prerequisites in analogous application of § 7(2) AtG.

According to § 19b(1) AtVfV, the first application shall also include specifications on all measures planned for decommissioning, for safe enclosure or for the dismantling of facilities or parts thereof. The information is to outline the various application and licensing steps in the decommissioning procedure, taking into account the situations in which a licence must be applied for according to § 7(3) AtG. This information is intended to provide a basis for assessing, in particular, if other measures are interfered with or prevented, and whether the dismantling measures are planned in an appropriate order also in terms of radiation protection. In the case of a first application, § 19b(3) AtVfV stipulates that the EIA shall extend to all measures planned for decommissioning, safe enclosure or dismantling of the facility or parts thereof (see Section 4.3).

For the decommissioning of nuclear facilities, this means that the following details regarding the technical content of the application documents are required in particular:

- a) Description of the facility, the site and the surrounding area as well as the operating history of the facility, insofar as it is relevant for decommissioning, and possibly a preview of the subsequent use of the site
- b) Legal provisions, technical standards and other provisions considered for the decommissioning procedure
- c) Description of the decommissioning actions applied for as well as the demonstration that they will not impede subsequent decommissioning actions
- d) Description of the planned decommissioning and dismantling techniques
- e) Description of new systems or systems to be modified
- f) Safety assessments including accident analyses, taking into account the provisions of § 104 in conjunction with § 194 StrlSchV for the planned decommissioning actions and the operation of new or modified systems and with a view to fulfilling the dose reduction requirement in § 8(2) StrlSchG and other radiation protection principles and radiation protection provisions for workers, the environment and the public. It is to be demonstrated how the necessary protection against damage is ensured.
- g) Estimation and evaluation of the radioactive inventory and, where applicable, of dangerous substances and supporting documents
- h) Description and classification of the arising radioactive waste, its conditioning, storage and disposal as well as the measures for radioactive waste reduction
- i) Description of the clearance procedure for radioactive substances and their utilisation as well as the description of the removal procedure
- j) Description of the radioactive discharges with exhaust air and wastewater, application values for discharges and radiological exposure calculated therefrom
- k) Programme for environmental monitoring
- l) Measures for the protection of workers, fire protection and radiation protection during decommissioning including the construction of new facilities or the modification of existing ones
- m) Description of the operational organisation and responsibilities for decommissioning; proof of the technical qualification of the responsible staff, the maintenance of technical qualification and the necessary knowledge of persons otherwise engaged
- n) Description of accompanying controls (quality assurance) and their implementation (e.g. by means of work schedules)
- o) Description of the clearance procedure for the site and the removal procedure
- p) Planned reporting to the supervisory authorities

- q) Description of physical protection measures
- r) Information on other environmental impacts of the decommissioning project
- s) Planned procedure for the permission to perform a decommissioning action (e.g. dismantling step procedure)

For projects requiring an EIA (e.g. first application for decommissioning), in addition to the report on environmental impact studies, the following documents are to be provided together with the application (§ 3(2) AtvFV):

- t) Survey of the most important alternative technological processes examined by the applicant, including a statement of the main reasons for the selection of a procedure
- u) References to difficulties encountered in compiling the data for the environmental impact assessment.

If a state of safe enclosure is initiated, corresponding statements are to be made in the application documents both for the safe enclosure phase and for the phase preparing enclosure.

In addition, the following is to be submitted for the safe enclosure:

- v) Description of the physical-technical state of the facility in safe enclosure
- w) Planned monitoring and maintenance programme
- x) Description of existing or new systems for maintaining safe enclosure, e.g. barriers, ventilation, discharge of condensate, instrumented monitoring

With regard to safe enclosure, the transfer of knowledge from staff with operating experience to staff for dismantling at a later stage must be ensured by means of documentation and retention of relevant information.

Kind and scope of the safety reviews to be conducted periodically during safe enclosure (at least every ten years) are to be specified in the decommissioning licence.

### 3.5 Safety considerations

Compared to power operation, the potential hazard of a nuclear facility under decommissioning is significantly reduced.

Following the removal of the fuel assemblies, the hazard potential is mainly determined by the activity inventory and the possibilities of a release of radionuclides associated with decommissioning.

If there are any fuel assemblies left in the nuclear facility, proof is to be provided for planned decommissioning actions that these will have no retroactive effects on the safe operation of systems and components necessary for compliance with the protection goals.

If there are other nuclear facilities at the site, possible interactions of decommissioning actions with other nuclear facilities are to be outlined and evidence is to be provided that there is no reason to suspect any inadmissible impact on them.

In the case of reactors, a considerable reduction of the activity inventory is already achieved solely by removal of the fuel assemblies. The possibility of criticality is thus excluded. Activation activity is safely contained in the activated components themselves. The contamination present in the facility and the activation activity which could be converted into a releasable form as a result of the dismantling work are thus key factors for considering accidents relating to decommissioning actions.

The radioactive inventory of nuclear fuel cycle facilities is very different from that of reactors. There is no activation activity. As long as there is still fissile material in the facility, the radioactive material in dispersible form and the possibility of criticality pose the most significant potential hazard in nuclear fuel cycle facilities. Removal of the nuclear fuel from the facilities will reduce the potential hazard significantly. In case of incorporation, the alpha-emitters remaining in the facilities will result in exposures that are dominant for the workers at the facility and, in the event of release, for the general public.

According to § 104(3) StrlSchV, structural or technical protective measures considering the potential damage extent shall be taken for decommissioning projects pursuant to § 7(3) AtG, so as to limit exposure in the event of accidents. The licensing authority determines the kind and scope of the protective measures, taking into account the individual case, particularly the potential hazard of the facility and the probability of the occurrence of an accident. According to § 104(6) StrlSchV, the protection goals for the prevention of accidents shall be specified by general administrative provisions. Until

their entry into force, an accident planning value of 50 mSv is applicable for the effective dose as defined in § 194 StrlSchV. Some of the safety considerations (accident analyses) already made for the construction and operation of the facility under decommissioning can continue to be referred to. As long as there is still nuclear fuel in the facility during decommissioning exceeding the masses or concentrations mentioned in § 2(3) AtG, all necessary safety precautions must continue to be observed and must be included in the corresponding considerations.

Many decommissioning actions, particularly those for the dismantling of parts of facilities, involve very similar techniques to those of the maintenance procedures and modification measures already licensed for operation. Thus, special safety considerations or accident analyses are only required if the state of the facility is altered, for the dismantling of components, for new systems which are to be erected or systems which are to be modified and for new technical processes. Relevant for kind and scope of the necessary precautions against damage according to the state of the art in science and technology are the criteria resulting for the reduced potential hazard of a nuclear facility under decommissioning.

In decommissioning procedures, the following events are to be considered and assessed in terms of safety on a case-by-case basis (identical to those stated in the ESK Guidelines for the decommissioning of nuclear facilities /5/):

a) Internal hazards:

- Internal fire
- Leakage from vessels
- Internal flooding
- Component failure
- Events during the handling of loads
- Events during transport operations
- Mutual interference of multi-unit facilities and neighbouring facilities at the site
- Internal explosions
- Chemical impacts
- Failures and malfunctions of safety-relevant structures, systems and components

b) External hazards:

Natural hazards, e.g.:

- Earthquake
- Flooding (high water)
- Rain (also heavy rain events)
- Hail
- Storm (including tornado)
- Snowfall
- Snow loads
- Frost
- Lightning
- Exceptional heat waves
- High or low humidity

- Biological hazards (e.g. microbiological hazards)
- Forest fire

Man-made hazards, e.g.:

- Aircraft crash
- External explosion
- Ingress of hazardous substances
- External fire

If there are still fuel assemblies in the facility during decommissioning, the following event categories (based on the safety requirements for nuclear power plants /21/) are also relevant:

- Reduced heat removal from the spent fuel pool
- Loss of coolant from the spent fuel pool
- Reactivity changes in the spent fuel pool and criticality accident
- Events during handling and storage of fuel assemblies

The barriers in place during operation of the facility to prevent the release of radioactive substances into the facility or into the environment are modified during the decommissioning actions. For example, in nuclear power plants, the core internals and the primary circuit are thermally or mechanically disassembled as part of the dismantling work. In this respect, it may become necessary to use local housings or stationary/mobile ventilation and filter systems.

After removal of the fuel assemblies from the facility, nearly all internal accidents can be assigned to the “basic types” fire, leakage from vessels or systems containing radioactive fluid and drop of loads. Generally, the accident fire in the facility is radiologically representative of these “basic types”, in particular if the filter system should fail as a consequence of the fire.

### 3.6 Definition of decontamination and dismantling techniques

These techniques include all processes for the decontamination of systems, components and buildings as well as separation and demolition techniques in the context of dismantling.

The type and extent of decontamination work which needs to be carried out depends on the type of facility (different radioactive substances, degree of contamination), on the type of clearance and disposal of the radioactive substance and on the respective objective of decommissioning.

The decontamination techniques are chosen in the context of the following aspects:

a) Aspect of radiation protection:

- avoidance of unnecessary exposure,
- dose reduction, and
- removal of contamination to increase the admissible time individuals can stay in working areas or to achieve appropriate conditions for carrying out decommissioning actions.

b) Aspect of recycling of radioactive substances:

- non-detrimental utilisation of radioactive substances or parts of the facility as far as possible,
- reduction in the volume of radioactive substances that must be placed in storage facilities, and
- minimisation of secondary waste generated during decontamination and dismantling.

c) Other aspects:

- Where required, establishment of boundary conditions for another use of the facility or the site.

Regarding the dismantling techniques, a distinction is to be made between the established conventional techniques including the maintenance techniques used during operation on the one hand, and the remote techniques with the associated radiation and occupational safety measures.

The choice of dismantling techniques depends on

- a) the technological task (material, size of component, environmental conditions, accessibility),
- b) the radiation protection conditions (type and amount of activity present, prevention of releases, possibility of aerosol formation, contamination hazard, confinement of mobile activity and measures for limiting the individual and collective dose),
- c) the intended further treatment and recycling of substances, the management of conventional waste and the radioactive waste management, and
- d) the secondary waste generated.

Today, there are a large number of proven techniques available for the decontamination and dismantling of facilities or parts thereof. The operational safety, the emission behaviour, and applicable measures for radiation protection of workers as well as costs for it are known.

As far as the licensing procedure is concerned, it is therefore sufficient to describe these tried and tested techniques adequately from a safety point of view and to establish the boundary conditions for their use.

The decontamination and dismantling techniques to be applied are specified in the detailed planning and accompanied by regulatory supervision.

The remote dismantling techniques to be applied in some cases require the use of special manipulators and devices. Where the operational reliability of this equipment cannot be immediately assumed and where specific characteristics of the facility are also to be taken into account, proof of suitability (preliminary checks, acceptance and functional tests, in-service inspections, safety analyses) are to be provided for this equipment. In this case, the principle proceeding of the dismantling is already to be submitted with the application documents. Where appropriate, preliminary tests may be carried out on test rigs to optimise the individual dismantling steps.

### 3.7 Staffing provisions

The requirements for staffing provisions are both applicable to own staff and external staff. The applicant/operator has to ensure that an adequate number of staff with the required qualification and knowledge is available in all phases and periods of the decommissioning project until release from regulatory control under nuclear and radiation protection law. The use of own staff as responsible persons in terms of the technical qualification guideline is to be maintained with regard to preserving the knowledge about the facility and ensuring the fulfilment of responsibility and control obligations. As defined in § 7(2)(1) AtG, the responsible persons must have the required technical qualification. Persons otherwise engaged in the decommissioning actions must possess the necessary knowledge as defined in § 7(2)(2) AtG. The organisational structures necessary for safety must be ensured. In addition, it must be ensured that the knowledge about the facility and the dismantling experience is retained during the period of dismantling with all technical, personnel and organisational changes. The documentation must be transferred in full and retained also in the event of a change of licence holder so that no essential knowledge about the facility and its operating and dismantling history will get lost. The applicant/operator has to submit appropriate documentation on the staffing provisions.

Regarding the trustworthiness of own staff and external staff, the regulations of the Nuclear Trustworthiness Verification Ordinance apply.

### 3.8 Financial security

Regulations on the amounts of coverage are laid down in §§ 7 to 19 AtDeckV. As long as there is nuclear fuel in the facility, the amount of coverage is calculated according to § 9 AtDeckV.

For the decommissioning of facilities, the regulations on the amounts of coverage are laid down in § 12 AtDeckV. A condition for application of § 12 AtDeckV is that the facility contains only the activated and contaminated components and, if any, radioactive substances for testing purposes. Where, due to the circumstances of the individual case, the assessment of activity necessarily involves undue expense or is not possible at all, the administrative authority may reduce the

amount of coverage to 5% of the coverage last determined prior to the decommissioning or made non-operational in any other way.

The licence holder has to provide proof of the specified amount of coverage.

#### **4. Licensing procedure**

The permissions and conditions of a licence for decommissioning, safe enclosure or dismantling of the facility or parts thereof as defined in § 7(3) AtG are specified on the basis of the licence application applying § 7(2) AtG accordingly.

Depending on the type of application, the decommissioning project for a nuclear facility can be regulated by a single licence but can also be divided into phases that are licensed separately with their own licences as defined in § 7(3) AtG.

According to § 19b(1) AtVfV, the documents to be enclosed with the first application for a licence pursuant to § 7(3) AtG shall also include specifications on all measures planned for decommissioning, safe enclosure or dismantling. The purpose of this information is, in particular, to provide a basis for assessing whether the measures applied for do not interfere with or prevent other measures and whether the dismantling measures are planned in an appropriate order. This assessment, however, does not constitute a preliminary positive overall assessment with a corresponding linking function as it is required according to § 18(1) AtVfV for granting of partial licences for construction and operation.

Also in case of a fundamental change of the overall concept, if for example instead of safe enclosure immediate dismantling is chosen, the licence application has to include documents enabling an assessment of the overall concept in terms of feasibility and plausibility as well as of compatibility and logical sequence of the steps.

With the separate licences pursuant to § 7(3) AtG it is possible to define conditions according to which parts of the facility or ancillary installations which are no longer required in the decommissioning project for achieving the purposes outlined in § 1 AtG and which might be used elsewhere are released from regulatory control under nuclear and radiation protection law and thus the extent of the facility and also the boundaries of the controlled and supervised area according to the Radiation Protection Ordinance might be redefined.

This means that those parts of the facility not required for safety purposes (buildings, systems, components) can only be dismantled and removed upon receipt of a corresponding licence in so far as they are included in the extent of the facility specified in § 7(1) AtG.

Dividing the decommissioning project into phases can facilitate the introduction of new techniques and the implementation of the experience gained from the phases already completed. The assessment of the next phase can also take place in parallel to the execution of the phase which has already been licensed. This approach may also result in a gain in time as regards the completion of the overall project. In the procedures which have taken place so far it has proven itself for large projects, such as the dismantling of nuclear power plants or nuclear fuel cycle facilities, to divide the decommissioning procedure into technically delimitable phases. With increasing decommissioning experience, however, the number of phases applied for in more recent decommissioning projects is decreasing.

##### **4.1 Checking the licensing prerequisites**

The licence may only be granted if the licensing prerequisites defined in § 7(3) in conjunction with § 7(2) AtG, to be applied as appropriate, are fulfilled or if their fulfilment can be ensured by ancillary conditions (§ 15(2) sentence 1 AtVfV) and the other provisions under public law have been observed (§ 14 AtVfV). Completeness of the application documents as defined in § 3 AtVfV and their assignment to the licensing prerequisites can be checked using the list given in Appendix 4. In addition, Appendix 4 refers to documents of other legal provisions which, due to the concentration effect of the nuclear licence (§ 8(2) AtG) are to be checked or considered in the nuclear licensing procedure according to § 14 AtVfV.

##### **4.2 Transition from operating licence to decommissioning licence**

If the operating licence is suspended upon issuance of the decommissioning licence, then the conditions and regulations of the operating licence which continue to be required are to be incorporated in the decommissioning licence.

If the operating licence is not completely suspended upon issuance of the decommissioning licence, then the unaltered conditions and regulations of the operating licence will remain in force.

During the transition from the operating to the decommissioning licence, there must be no gaps in terms of the required conditions and regulations for ensuring the safety of the facility. It must be ensured at all times that the conditions and regulations are clear and complete.

### 4.3 Environmental impact assessment and involvement of third parties

As defined in Appendix 1 No. 11 UVPG, an EIA is required for the decommissioning, safe enclosure and dismantling of stationary facilities for the fission of nuclear fuel whose maximum exceeds 1 kW continuous thermal load.

Notwithstanding § 4(4) AtVfV, § 19b(2) AtVfV also stipulates that an announcement and disclosure of the project for public inspection cannot be waived if for such facilities a first application for decommissioning as defined in § 7(3) AtG is filed. As defined in § 19b(3) AtVfV, the EIA then extends to all measures planned for decommissioning, safe enclosure or dismantling of the facility or parts thereof. For this purpose, the documents specified in § 6(1) and (2) AtVfV are to be disclosed for public inspection.

Further applications on individual measures for decommissioning or safe enclosure or dismantling of the entire facility or individual parts of a facility to be licensed under nuclear law require a general preliminary assessment according to § 9(1)(2) in conjunction with § 5 UVPG (see Appendix 1 No. 11.1 UVPG).

In the preliminary assessment by the licensing authority, criteria such as the remaining radioactive inventory (sometimes reduced by several orders of magnitude), the absence of significant release forces (such as high pressures and temperatures) and the constantly changing structure of the facility during dismantling are to be considered.

For projects subject to an EIA, the assessment of the environmental impact includes the determination, description and evaluation of the main effects upon the objects of legal protection mentioned in § 1a(2) AtVfV (humans, animals, plants and biological diversity, surface, soil, water, air, climate and landscape, cultural heritage and other material goods, including the respective interactions) which are significant for checking whether the prerequisites for approval are fulfilled.

For projects pursuant to § 7 AtG, the licensing authority shall make public announcements in accordance with §§ 4 to 6 AtVfV and disclose the documents for public inspection. As defined in § 4(4) AtVfV, the licensing authority may waive announcement and public disclosure in the process of issuing licences under § 7(3) AtG (decommissioning, safe enclosure, dismantling) if, according to § 4(2) AtVfV, no additional or other aspects would have to be described in the safety analysis report which give reason to suspect any adverse effects for third parties.

According to § 4(4) AtVfV, a waiver of the announcement and disclosure for public inspection shall not be permissible if it is mandatory to prepare an EIA according to the Act on the Environmental Impact Assessment (UVPG).

If announcement and disclosure for public inspection are required, the possibilities to make objections and the hearing are restricted to the project which has been applied for (§ 4(4) sentence 3 in conjunction with (2) sentence 4 AtVfV).

According to § 8(1) AtVfV, all objections submitted in time shall be discussed by the licensing authority with the applicant and the persons by whom the objections are raised (hearing). If an involvement of third parties would not be required according to § 4(4) AtVfV – since no additional or other aspects would have to be described which give reason to suspect any adverse effects for third parties – the licensing authority may waive the discussion of objections as defined in § 19b(2) AtVfV (see also § 7(4) AtG).

According to § 2a AtG, the EIA is an integral part of the nuclear licensing procedure that is regulated by the provisions of the Nuclear Licensing Procedure Ordinance. § 7(4) AtG stipulates that, as a rule, all federal, Länder, local and other regional authorities whose jurisdiction is concerned shall be involved in the licensing procedure.

If the project may have significant transboundary environmental impacts, a transboundary environmental impact assessment is to be carried out in accordance with §§ 54 to 57 UVPG.

According to § 25(3) of the Administrative Procedure Act (VwVfG), the authority shall work towards ensuring that the applicant informs the public concerned at an early stage (if possible, already before filing the application for decommissioning) about the objectives of the project, the means to realise it and the likely impacts of the project. The result of this early public participation performed before the application is submitted shall be communicated to the public concerned and the authority without delay, at the latest when the application is submitted.

In addition, the authority shall work towards ensuring that the licence holder informs the public concerned at the end of decommissioning about the decommissioning actions carried out, the radioactive waste produced and the condition of the facility at the time of release from regulatory control under nuclear and radiation protection law.



## 5. Supervision

§ 19(1) AtG stipulates, among other things, that the handling of radioactive substances and the possession of facilities of the type referred to in § 7 AtG shall be subject to state supervision. Thus, the decommissioning of nuclear facilities and all other measures associated with safe enclosure or dismantling are subject to supervision under nuclear law, as was the operation of the facility before its decommissioning.

Within the framework of supervision (accompanying control), the nuclear supervisory authority has to ensure that, in particular, the provisions of the licence pursuant to § 7(3) AtG are adhered to. According to § 20 AtG, the nuclear supervisory authority may consult authorised experts for this task. This requires clear formulation of the subject of the licence. Accordingly, it is to be checked already before granting of the licence whether the planned methods and processes are appropriate and clearly enough defined for decommissioning and whether they ensure the necessary precautions against damage according to the state of the art in science and technology during execution of the planned decommissioning actions. In this respect, it is also to be defined in the licence whether and to what extent decisions, e.g. on methods and processes to be applied during the individual work steps, may remain reserved for the permit procedure within the framework of supervision.

In the case of immediate dismantling, the supervisory authority conducts safety reviews at least every ten years depending on the hazard potential of the nuclear facility. In this context, the results of reviews within the framework of nuclear licensing or supervisory procedures of the last ten years are taken into account. The authority determines the scope of the safety review depending on the condition of the facility.

### 5.1 Permits for decommissioning actions

For the practical work during decommissioning of nuclear facilities, appropriate permit procedures are required that can be applied for planning and performance of specific decommissioning actions. A permit procedure for the decommissioning project can be stipulated in the licence for decommissioning. During the course of decommissioning, such an organisational instrument is of particular importance to ensure radiation protection and occupational safety. All relevant decommissioning actions in the facility should therefore be subjected to such a procedure in order to take account of the requirements of radiation protection (e.g. IWRS guideline Part II /24/), occupational safety and fire protection, physical protection and all other protection goals related to safety.

For planning, control and monitoring of the work associated with dismantling, several permit procedures work well in practice. Thus, it is possible, e.g., to manage the specific work steps and auxiliary equipment, the planned dismantling techniques, devices which are to be used, the decontamination techniques, the disposal objective, the fire protection measures, the transport measures and the radiation protection measures (housing, extraction, respiratory protection, etc.) for a defined dismantling work by means of a step-by-step dismantling procedure. In this respect, the relevant radiological boundary conditions are to be considered. The step-by-step dismantling procedure enables supervision of, e.g., dose-relevant work on predefined work items by the authority or authorised experts and subsequent documentation of work performance.

The documents and auxiliary means used in the permit procedure can be used to document decommissioning actions, experience gained during decommissioning and the individual and collective dose of staff for the individual processes.

It may be useful to continue the work permit procedure already introduced during power operation of the facility and also to apply it to decommissioning actions in accordance with the regulations of the operating manual (maintenance regulations – SSp) and in accordance with IWRS guideline Part II /24/.

### 5.2 Documentation

The measures carried out during the decommissioning project are documented in accordance with the terms of the decommissioning licence.

The documentation must ensure that the current status of the facility with regard to

- the radioactive inventory and its distribution, and
- the condition of the remaining buildings, residual operating systems and components

is clear and is accessible for supervisory review. In addition to this, data concerning radiation protection of the staff and the transfer of radioactive and non-radioactive substances are to be documented. The basic requirements for documentation are essentially laid down in the BMU guidelines "Principles for the Applicant's/Licensee's Documentation of Technical Documents Pertaining to the Construction, Operation and Decommissioning of Nuclear Power Plants" /25/, "Requirements for the Documentation at Nuclear Power Plants" /26/ and KTA safety standard 1404 "Documentation during the

Construction and Operation of Nuclear Power Plants" /27/ (see Appendix 3). It is only necessary to keep a second set of documentation until the nuclear fuel is removed.

In view of § 1 No. 2 AtG, the documentation obligation as provided for in the decommissioning licence may also comprise safety-relevant findings during dismantling of the facility. Accordingly, e.g., it should be documented and immediately communicated to the supervisory authority as a safety-relevant operating experience if new indications and findings on components that may belong to safety-relevant systems and equipment of nuclear facilities in operation are found during dismantling of the facility, if this is still known to the licence holder due to his technical knowledge from own former operation.

For safe enclosure, the documentation is to be compiled in such a way that all necessary safety-relevant information is available also in the event of a possible change in the licence holder and continuation of the decommissioning actions (dismantling of the facility).

The requirements concerning the radiological protection documentation according to the Radiation Protection Ordinance remain unaffected.

For release of the facility, including the site, from regulatory control under nuclear and radiation protection law (completion of dismantling of the facility in the scope described in the licence), the competent authority is to be provided with a set of documentation under the terms of the licence, which includes

- a description of the state of the site after completion of the decommissioning actions, and
- the criteria used for clearance and removal, measurement methods and results for all of the structures remaining on the site and for the area of the site itself.

This documentation is to be kept for 30 years from the date of release of the facility from regulatory control, analogous to § 86(2)(1) StrISchV.

After completion of all decommissioning actions, the operator should prepare a final decommissioning report /1/. It serves to document that the final state envisaged in the decommissioning plan has been achieved. The supervisory authority receives the report to verify whether the requirements for the release of the entire facility from regulatory control under nuclear and radiation protection law are fulfilled. The final decommissioning report refers to the documentation and is to be retained together with it (i.e. for at least 30 years, comparable to the requirements of the Radiation Protection Ordinance). The supervisory authority determines where the final decommissioning report is to be stored together with the documentation.

The final decommissioning report includes

- a summary of the decommissioning plan, its updates and associated approvals,
- information on personnel exposure,
- details of radioactive discharges and releases to the environment,
- summary information on cleared materials and the whereabouts of the radioactive waste,
- references to the clearance documentation of the facility site,
- a description of the final state of the facility, in particular of the materials and structures remaining at the site, and
- continuing obligations and potential restrictions on use and their monitoring.

The licence holder may summarise experiences and lessons learned from the project or specify details on methods and tools to make them available for future decommissioning projects.

## 6. Radioactive and non-radioactive substances from decommissioning

During the decommissioning of nuclear facilities, radioactive residues as well as disassembled or dismantled radioactive components arise that, according to § 9a AtG, must either be utilised without detrimental effects or disposed of properly as radioactive waste in a controlled manner. The resulting materials can be reused in another installation or facility licensed under nuclear or radiation protection law. By means of a clearance as defined in the Radiation Protection Ordinance, slightly radioactive substances can be released from regulatory control under nuclear or radiation protection law

(see sections 6.1 and 6.2). Only for non-radioactive substances, release from regulatory control under nuclear and radiation protection law can be effected with a removal (see sections 6.1 and 6.3).

Substances that cannot be reused or recycled, cleared or removed are disposed of in accordance with the requirements of nuclear law, such as the Waste Management Transfer Act or the Nuclear Waste Management Ordinance.

### **6.1 Release from regulatory control under nuclear and radiation protection law**

The release of a facility as defined in § 7(1) of the Atomic Energy Act (AtG) from regulatory control under nuclear and radiation protection law is effected under the terms of the nuclear licence pursuant to § 7(3) AtG. For radioactive substances and activated or contaminated objects, release from regulatory control under nuclear and radiation protection law can only be effected by means of clearance in accordance with § 31 to 42 StrlSchV. The procedure for clearance can be regulated in the licence pursuant to § 7(3) AtG or in separate clearance notices.

Substances and objects from practices referred to in § 4(1) sentence 1 No. 4 StrlSchG that are not from the controlled area and for which contamination or activation by the practice is excluded can be removed. The proceeding for a removal is to be described in a licensing document.

Evacuation as defined in § 58(2) StrlSchV does not replace clearance or removal.

In addition, the facility including the site with the still existing structures (buildings, equipment/systems) can be converted into another installation or facility licensed under nuclear or radiation protection law (as a new facility or by affiliation to an existing facility). In this case, the procedure defined under nuclear law is changed into another procedure under nuclear or radiation protection law and thus regulatory control under nuclear and radiation protection law is continued.

### **6.2 Clearance according to the Radiation Protection Ordinance**

The purpose of clearance according to § 68(1)(1) StrlSchG in conjunction with § 31(1) sentence 1 StrlSchV is the release of radioactive substances and movable objects, buildings, rooms, sections of rooms and structural elements, soil areas, facilities or parts thereof (here: objects) from regulatory control under nuclear and radiation protection law that originate from practices referred to in § 4(1) sentence 1 No. 1 in conjunction with § 5(39) No. 1 or 2, or from practices referred to in § 4(1) sentence 1 nos. 3 to 7 StrlSchG and are activated or contaminated with radioactive substances due to these practices. Clearance is granted to the applicant according to § 32(1) StrlSchV by the competent authority in accordance with § 33(1) and (2) StrlSchV in writing in a clearance notice. The radiation protection executive applies for clearance and is the holder of the clearance after it has been granted. Clearance is a legally binding decision in the form of an administrative act.

The objective of clearance is to establish that substances originating from practices that have no or very low (radiologically harmless) radioactivity are no longer radioactive substances as defined by law. The specific activity of cleared substances can be disregarded and does not require further legal regulation ("de minimis" principle). Thus, after clearance, these substances do not require any further regulatory control under nuclear and radiation protection law. According to § 2(2) sentence 1 No. 2 AtG and, identical in content, § 3(2) sentence 1 No. 2 StrlSchG, the activity or specific activity of such a substance may be disregarded if it falls below specified clearance levels and clearance has been granted. Merely falling below clearance levels (in the case of very low but existing or activity to be assumed due to the practice) does not justify, without regulatory clearance, that a radioactive substance can be regarded as a non-radioactive substance as defined by law.

The prerequisite for granting a clearance pursuant to § 33 StrlSchV is compliance with the dose criterion pursuant to § 31(2) StrlSchV stipulating that an effective dose in the range of only 10 microsieverts per calendar year can occur for members of the public through the substances and objects to be cleared (10 microsievert concept). In this context, dose contributions not resulting from contamination from practices referred to in § 4(1) sentence 1 No. 4 StrlSchG, such as fallout from nuclear accidents or nuclear weapons tests, are not to be taken into account (see Recommendation of the Commission on Radiological Protection "Clearance of Materials, Buildings and Sites with Negligible Radioactivity from Practices subject to Reporting or Authorisation" of 12 February 1998, Reports of the Commission on Radiological Protection, Vol. 11).

The applicant for a clearance pursuant to § 32(1) StrlSchV is required to demonstrate compliance with the dose criterion to the competent authority.

When demonstrating compliance with the dose criterion, the applicant can choose between an unrestricted and a specific clearance. According to § 32(2) StrlSchG, an unrestricted clearance shall not require any definitions regarding the future use, utilisation, disposal, possession of the cleared substances and objects or their transfer to third parties. However, the clearance levels of Appendix 4 Table 1 Column 3 StrlSchV only apply to solid substances and flammable liquids, see Appendix 8 Part B No. 3 StrlSchV.

§ 32(3) StrlSchV stipulates that in the case of a specific clearance, the future use, utilisation, disposal, possession of the cleared substances and objects or their transfer to third parties shall be restricted. This may result both from material properties of the substance or object concerned and from the predetermined choice of waste management path.

If the clearance levels of Appendix 4 Table 1 StrlSchV are to be applied for clearance, the specifications of appendices 4 and 8 StrlSchV are to be observed. The specifications result from the main parameters of the calculation models on which the respective type of clearance is based and with which the clearance levels of Table 1 were derived. In addition to compliance with these clearance levels, compliance with the specifications is therefore also to be demonstrated to the extent that these cover the characteristics of the specific waste management path as well as the disposal objective planned that are relevant for compliance with the dose criterion. If the applicant demonstrates compliance with clearance levels and specifications to the competent authority pursuant to §§ 35 and 36 StrlSchV, the authority may assume that the dose criterion for clearance is fulfilled.

As set out in § 37 StrlSchV, clearance in individual cases is also possible under the conditions specified in § 37(1) sentence 2 nos. 1 to 4 StrlSchV. Clearance in individual cases is generally a specific clearance as referred to under § 32(3) StrlSchV and an unrestricted clearance only if the prerequisites of § 32(4) StrlSchV apply. Thus, each clearance is to be considered either a specific or an unrestricted clearance. Compliance with the dose criterion is generally verified on the basis of calculation models that are adapted to the individual case. Any resulting clearance levels as well as the specifications for the disposal objective and waste management path resulting from the boundary conditions of these calculation models are to be indicated and complied with.

Compliance with clearance levels and specifications is to be ensured from the point of view of nuclear and radiation protection law. For example, in the case of a building clearance for demolition according to § 36(1)(6) in conjunction with Appendix 4 Table 1 Column 13 and Appendix 8 Part A No. 1 and Part D StrlSchV, it is to be ensured that the related requirements from the calculation models for verifying compliance with the dose criterion are ultimately fulfilled by a corresponding demolition (conventional without radiation protection measures).

The chosen waste treatment facilities must comply with the specifications, i.e., among other things, they must comply with the provisions under waste law used in the calculation models, e.g. from the Landfill Ordinance. According to § 36(2) StrlSchV, the competent authority must not have any indications that the dose criterion for clearance at the site of the waste treatment facility is not complied with in the case of a specific clearance for landfill disposal or incineration or for recycling of metal scrap. Indications of non-compliance may exist, for example, if assumptions from the calculation models do not correspond to the real conditions at the site of the waste treatment facility. Overlapping of material streams from several clearances to one waste treatment facility is also to be taken into account.

If, at the time of the specific clearance for disposal, the waste treatment facility is located in a Land other than the facility of the holder of the clearance or if another supreme Land authority is responsible for radiation protection in a Land, the competent authority shall, pursuant to § 39(1) StrlSchV, reach agreement with the supreme Land authority responsible for the enforcement of the Radiation Protection Ordinance in the case of disposal of more than 10 Mg per calendar year.

The only criterion for the clearance of radioactive substances and objects is the presence of contamination or activation from the respective practice, see § 31(1) StrlSchV. According to § 39(1) sentence 2 StrlSchV, clearance is in particular required for all substances and objects from specified controlled areas. These are controlled areas in which contamination or activation from the practice cannot be ruled out.

The competent authority may grant the clearance subject to the condition precedent that it confirms the proof of compliance with the content of the clearance notice by the radiation protection executive, who is the holder of the clearance (§ 33(3) in conjunction with § 42(1) StrlSchV). In addition to the supervision pursuant to § 19 AtG, the authority has the possibility, within the framework of the clearance regulations, to carry out a control or confirmation step as to how far the radiation protection executive, who is the holder of the clearance, follows the clearance notice before substances are finally transferred for accomplishing the intended disposal objective.

In addition, the clearance may also be granted by the authority subject to a condition, reservation of revocation or reservation of inclusion of, amendment of or addition to a condition, as stipulated under § 33(4) StrlSchV. This gives the authority the possibility to further specify the clearance process and the intended waste management path. § 17(1) sentences 2 to 4 AtG on restrictions, conditions and time limits is to be applied by analogy as amended. In this respect, it is possible to grant the clearance subject to a condition precedent, such as the fulfilment of additional conditions, or a resolutive condition stating when the clearance is no longer valid.

§ 42(3) StrlSchV obliges the radiation protection executive, who is the holder of the clearance, to inform the competent authority, the supervisory and licensing authority under nuclear and radiation protection law, if one of the requirements on which the granting of the clearance depends is no longer fulfilled. As a rule, he is obliged to do so until the intended disposal objective has been achieved on the intended waste management path.

Documentation obligations in connection with clearance are listed in § 86 StrlSchV on record keeping and notification regarding the clearance. § 86(1) No. 1 specifies the contents to be documented, while § 86(1) No. 2 regulates notification to the competent authority. § 86(2) regulates the availability and retention periods of the documents. § 86(3) regulates in nos. 1 and 2 in which cases exceptions to the documentation obligation are permissible. In the case of the clearance of buildings for demolition and for reuse and further use and in the case of the clearance of soil areas, the requirement under § 86(1)(1)(a) in conjunction with Appendix 8 Part D or Part E can be fulfilled by documenting the surface-specific activity levels. In addition, § 42 StrlSchV on the duties of the holder of a clearance stipulates under (2) that measurements of the specific activity (clearance measurements), which are required to determine compliance with the content of the clearance notice, as well as the results of the clearance measurements must be documented by the holder of the clearance in any case.

Regulations relating to the area of waste treatment of radioactive substances and their clearance in accordance with the Radiation Protection Ordinance are contained in the overall complex of the relevant provisions under nuclear and radiation protection law (in particular § 2(2) and § 9a AtG, § 3(2) StrlSchG, §§ 31 to 42 and §§ 85, 86, 187 StrlSchV, §§ 1 to 8 AtEV, and the guideline on the control of radioactive waste /28/).

Clearance in the context of decommissioning can be divided into the following main steps:

- The applicant's application pursuant to § 32(1) StrlSchV for clearance. This application may include, for example, corresponding work instructions and clearance schedules according to which the clearance procedure is to be carried out.
- The granting of clearance in writing pursuant to § 33(1) StrlSchV.
- The determination of compliance with the content of the clearance notice by the holder of the clearance pursuant to § 42(1) StrlSchV.
- The competent authority may reserve the right to confirm the proof of compliance provided with the content of the clearance notice pursuant to § 33(3) StrlSchV.
- According to § 19 AtG, the competent authority may carry out further inspection steps based on random samples within the framework of supervision. In doing so, it may consult an authorised expert, as stipulated under § 20 AtG.

Within the framework of supervision, the competent authority has to control compliance with the requirements for clearance specified in the clearance notice, the sampling and measurement methods as well as the provisions of the decommissioning licence pursuant to § 7(3) AtG that relate to the clearance.

Regulatory control may also comprise the review of the documentation, checking the technical qualification of the personnel, control of compliance with the licensed procedure and, where appropriate, own random sample measurements or carried out by a consulted authorised expert.

### 6.3 Removal

Since during decommissioning as defined in § 7(3) AtG, also considerable amounts of substances that are subject to regulatory control under nuclear and radiation protection law but cannot be contaminated or activated as a result of the practice referred to in § 4(1) sentence 1 No. 4 StrlSchG, these substances can be released from regulatory control under nuclear and radiation protection law by means of removal.

In this Guide, removal refers to a proceeding for releasing non-radioactive substances as well as objects non-contaminated and non-activated due to the practice referred to in § 4(1) sentence 1 No. 4 StrlSchG from regulatory control under nuclear and radiation protection law. Removal is not permissible for substances and objects originating from practices referred to in § 4(1) sentence 1 No. 4 StrlSchG and from controlled areas specified in more detail in the Radiation Protection Ordinance under § 31(1) sentence 2. Removal can be performed for substances and objects for which contamination or activation can be excluded due to the operating history and use and which are subject to regulatory control under nuclear and radiation protection law because they are located at the site of a facility licensed pursuant to § 7(1) AtG or are connected with the practice referred to in § 4(1) sentence 1 No. 4 StrlSchG. A soil area may also be released by removal if contamination is excluded. The general procedure for removal is to be described in a licensing document.

The absence of contamination and activation for removal of non-contaminated and non-activated substances and objects including soil areas from the practice referred to in § 4(1) sentence 1 No. 4 StrlSchG is to be confirmed by appropriate measurements (evidence preservation measurements) under consideration of the operating history. Type and scope of the measurements can be specified within the nuclear supervisory procedure on a case-by-case basis.

Contamination not resulting from practices referred to in § 4(1) sentence 1 No. 4 StrlSchG (for example "fallout") may be disregarded in the removal procedure (so-called "background subtraction").

#### 6.4 Measurement methods and sampling

For the choice of measurement methods and measuring instruments for clearance, § 90(4) StrlSchV stipulates that the radiation protection executive who is the holder of clearance in accordance with § 33(1) StrlSchV shall ensure that appropriate radiation measuring instruments are used for a clearance measurement in accordance with § 42(2) StrlSchV. § 90(5) StrlSchV further states that it shall be ensured that

1. the radiation measuring instruments
  - a) meet the requirements of the measurement purpose,
  - b) are available in sufficient quantity, and
  - c) are regularly tested and serviced regarding their functionality,
2. the date and the results of the functional test and servicing are recorded, and
3. records are kept for ten years from the date of the functional test or servicing and submitted to the competent authority upon request or deposited at an office stipulated by it.

The following methods are available, among others, for clearance measurement of be-ta/gamma-contaminated material: beta surface measurement, gamma spectrometry, and total gamma measurement. Proven methods are also available for clearance measurement of alpha-contaminated material. When using these methods, the applicable technical standards are to be observed /29/.

The measurement methods to be applied for the subsequent orientation and decision measurements are determined within the framework of the preliminary analysis. For this analysis, as a rule, representative material samples are to be used to determine the radionuclide mix and the relative proportions of the individual radionuclides by means of spectrometric measurement methods and, where required, radionuclide analyses; or balancing procedures may also be used in the individual case. Further, the spatial activity distribution is to be determined by random sampling on material or surfaces. Based on the determined radionuclide mix, the "reference nuclides" (well measurable radionuclides) are to be defined which, together with the nuclide vector, can be used in the clearance measurement to derive the total activity and the activity of the individual nuclides.

If a nuclide vector is determined in connection with the clearance measurement, the sampling strategy plays an important role. It comprises the determination of representative sampling sites at process-related accumulation points as well as the choice of appropriate sampling methods. These sampling methods must consider the properties of the base material and the contamination and show reproducible extracting factors.

The clearance measurement is performed in accordance with the provisions laid down in the clearance notice. As a rule, material batches are to be formed as homogeneous as possible in terms of spatial activity distribution and radionuclide vector in order to obtain representative measurement results. The clearance measurement is to be performed such that the specific activity or contamination of the material cannot be underestimated (conservatism of the measurement).

The requirements and approach described in this section are also applied to the evidence preservation measurement prior to removal of non-contaminated and non-activated substances, taking into account the even significantly lower radiological potential.

#### 6.5 Treatment and storage of radioactive substances

The methods for treatment of radioactive substances and waste arising from the decommissioning of nuclear facilities are generally comparable with the methods for the treatment of radioactive substances and waste from the operation of nuclear facilities.

For the collection, sorting, storage, conditioning and documentation of radioactive waste from decommissioning, the same boundary conditions apply as for waste from operation (see AtEV, StrlSchV, guideline on the control of radioactive waste /28/, KTA safety standard 3604 /30/). To reduce the volume of waste, the residues should be separated according to utilisable substances and radioactive wastes already when they arise.

Decay storage of radioactive unsegmented large components may reduce the volume of radioactive waste and avoid unnecessary exposure. Decay storage of large components is legally permissible if the licensing prerequisites of § 6 AtG or § 12 StrlSchG are met. The further treatment of the large components can then take place within the framework of a

handling licence. With regard to later segmentation of large components planned after storage, it is to be ensured that any radioactive waste that may still be produced can be transferred to a disposal facility. In this respect, the national waste management programme is to be taken into account.

As long as no method of treatment of the components has been determined and there are objectively still possibilities of utilisation, these substances are not to be considered radioactive waste (subjective waste term of § 9a(1) AtG). Thus, with regard to the clearance objective, they can be stored as radioactive residues.

In order to avoid unnecessary occupational exposure, the radioactive residues only have to be treated to such a degree that storage is possible and the radioactive waste can later be conditioned without considerable efforts to a form then required for disposal. If, in particular, contaminated and activated metal parts are concerned for which the nuclide vector indicates a decay of the activity within a foreseeable period of time so that the material can be cleared by measurements, later clearance is given preferential consideration instead of disposal.

The storage of radioactive material is to be described and, where necessary, regulated in the licensing notice, as must the preparation for transport. For the storage of radioactive waste from operation and decommissioning and radioactive residues, construction and operation of an on-site storage facility can be applied for, which can be integrated into residual operation during decommissioning and dismantling, but which must continue to be operated independently after the dismantling of the facility. According to § 7 AtEV, the radioactive waste from previous operation and decommissioning of the facility shall be kept at a storage facility until it can be delivered to a disposal facility and will be called off by the operator of the disposal facility. For optimisation of the decommissioning process, it is also possible to create places for large components in the storage facility under the prerequisites set out above.

Since 2019, the legal basis for the licensing of the storage facility at the site of the facility to be decommissioned may either be § 12(1) StrlSchG or § 7(3) AtG.

Furthermore, the licensing notice may specify, without prejudice to the guideline on the control of radioactive waste /28/, under which prerequisites external conditioning facilities can be made use of. For external transports that might be necessary in this context and which may require a separate licence, the relevant regulations are §§ 27 to 29 StrlSchG.

## 7. References

- /1/ IAEA: General Safety Requirement on Decommissioning of Facilities, Part 6, No. GSR Part 6, Vienna, 2014
- /2/ IAEA: Decommissioning of Nuclear Power Plants, Research Reactors and other Nuclear Fuel Cycle Facilities, Specific Safety Guide No. SSG-47, Vienna, 2018
- /3/ Handbuch Reaktorsicherheit und Strahlenschutz, herausgegeben vom Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Vertrieb Bundesamt für die Sicherheit der nuklearen Entsorgung, Salzgitter, Stand 02/21, [https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/rsh\\_node.html](https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/rsh_node.html)
- /4/ KTA-Regelprogramm, Kerntechnischer Ausschuss (KTA), Salzgitter, Stand: 20. Januar 2021, [http://www.kta-gs.de/common/regel\\_prog1.htm](http://www.kta-gs.de/common/regel_prog1.htm)
- /5/ Leitlinien zur Stilllegung kerntechnischer Anlagen, Empfehlung der Entsorgungskommission vom 5. November 2020
- /6/ Anforderungen an Betriebsberichte laufender Stilllegungsprojekte, Empfehlung der Entsorgungskommission vom 26. Juli 2018
- /7/ Leitlinien für die Zwischenlagerung von radioaktiven Abfällen mit vernachlässigbarer Wärmeentwicklung, Empfehlung der Entsorgungskommission, revidierte Fassung vom 10. Juni 2013 sowie Erläuterung der Änderungen vom 10. Juni 2013
- /8/ Anforderungen bei einer passiven Kühlung der Brennelemente im Lagerbecken, Stellungnahme der Reaktor-Sicherheitskommission vom 27. März 2019
- /9/ Anforderungen an die Kühlung der Brennelemente im Lagerbecken im Restbetrieb, Stellungnahme der Reaktor-Sicherheitskommission vom 21. Oktober 2020
- /10/ Planung der Iodblockade in der Umgebung stillgelegter Kernkraftwerke, Empfehlung der Strahlenschutzkommission vom 10. April 2014 (BAnz AT 05.11.2014 B3)
- /11/ Planungsgebiete für den Notfallschutz in der Umgebung stillgelegter Kernkraftwerke, Empfehlung der Strahlenschutzkommission vom 20./21. Oktober 2014 (BAnz AT 13.05.2015 B4)
- /12/ Einführung von Dosisrichtwerten (Dose Constraints) zum Schutz vor beruflicher Strahlenexposition bei der Umsetzung der Richtlinie 2013/59/EURATOM in das deutsche Strahlenschutzrecht, Empfehlung der Strahlenschutzkommission vom 11./12. Dezember 2014 (BAnz AT 10.08.2015 B3)
- /13/ Empfehlung der Kommission vom 11. Oktober 2010 über die Anwendung des Artikels 37 des Euratom-Vertrags (2010/635/Euratom) (ABl. L 279 vom 23.10.2010, S. 36)
- /14/ Gesetz zu dem Gemeinsamen Übereinkommen vom 5. September 1997 über die Sicherheit der Behandlung abgebrannter Brennelemente und über die Sicherheit der Behandlung radioaktiver Abfälle (Gesetz zu dem Übereinkommen über nukleare Entsorgung) vom 13. August 1998 (BGBl. 1998 II S. 1752)
- /15/ IAEA: Fundamental Safety Principles, Safety Fundamentals No. SF-1, Vienna, 2006
- /16/ IAEA: General Safety Requirement on Predisposal Management of Radioactive Waste, Part 5 No. GSR Part 5, Vienna, 2009
- /17/ IAEA: Decommissioning of Medical, Industrial and Research Facilities, Specific Safety Guide No. SSG-49, Vienna, 2019
- /18/ IAEA: Safety Guide on Safety Assessment for the Decommissioning of Facilities Using Radioactive Material, Safety Standards Series No. WS-G-5.2, Vienna, 2008
- /19/ IAEA: Safety Guide on Storage of Radioactive Waste, Safety Standards Series No. WS-G-6.1, Vienna, 2006
- /20/ IAEA: Safety Guide on Release of Sites from Regulatory Control on Termination of Practices, Safety Standards Series No. WS-G-5.1, Vienna, 2006
- /21/ Sicherheitsanforderungen an Kernkraftwerke in der Fassung der Bekanntmachung vom 3. März 2015 (BAnz AT 30.03.2015 B2) und die Interpretationen zu den Sicherheitsanforderungen vom 29. November 2013 (BAnz AT 10.12.2013 B4), geändert am 3. März 2015 (BAnz AT 30.03.2015 B3)
- /22/ Sicherheitsanforderungen an Kernbrennstoffversorgungsanlagen von April 1997 und Juni 2004 BMU RS III 3



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- /23/ Merkpostenliste für die Durchführung einer Bewertung des aktuellen Sicherheitsstatus der Anlage für die Nachbetriebsphase mit Anschreiben des BMUB vom 2. Oktober 2014
- /24/ Richtlinie für den Strahlenschutz des Personals bei Tätigkeiten der Instandhaltung, Änderung, Entsorgung und des Abbaus in kerntechnischen Anlagen und Einrichtungen: Teil 2: Die Strahlenschutzmaßnahmen während des Betriebs und der Stilllegung einer Anlage oder Einrichtung – IWRS II vom 17. Januar 2005 (GMBI. 2005, Nr. 13, S. 258)
- /25/ Grundsätze zur Dokumentation technischer Unterlagen durch Antragsteller /Genehmigungsinhaber bei Errichtung, Betrieb und Stilllegung von Kernkraftwerken, Bekanntmachung des Bundesministers für Umwelt, Naturschutz und Reaktorsicherheit vom 19. Februar 1988 (BAnz. 1988, Nr. 56)
- /26/ Anforderungen an die Dokumentation bei Kernkraftwerken vom 5. August 1982 (GMBI. 1982, Nr. 26, S. 546)
- /27/ KTA 1404 Dokumentation beim Bau und Betrieb von Kernkraftwerken, Sicherheitstechnische Regel des KTA, Fassung 2013-11
- /28/ Richtlinie zur Kontrolle radioaktiver Abfälle mit vernachlässigbarer Wärmeentwicklung, die nicht an eine Landessammelstelle abgeliefert werden vom 16. Januar 1989 (Banz. 1989, Nr. 63a), letzte Ergänzung vom 14. Januar 1994 (BAnz. 1994, Nr. 19)
- /29/ DIN 25457, Teile 1 und Beiblatt 1, Teile 4, 6 und 7, Aktivitätsmessverfahren für die Freigabe von radioaktiven Reststoffen und kerntechnischen Anlagenteilen, Deutsche Norm, Teil 1 und Beiblatt 1 von 2014, Teil 4 von 2013, Teil 6 von 2018, Teil 7 von 2017
- /30/ KTA 3604 Lagerung, Handhabung und innerbetrieblicher Transport radioaktiver Stoffe (mit Ausnahme von Brennelementen) in Kernkraftwerken, Sicherheitstechnische Regel des KTA, Fassung 2020-12

## 8. Appendix 1: Definition of terms

The following defines the terms as used in this document related to the decommissioning and safe enclosure or dismantling of nuclear facilities.

### Dismantling

The dismantling of a nuclear facility or parts thereof includes removal of structures (buildings, systems, components) which were the subject of the licence for construction and operation of the facility in accordance with § 7(1) AtG or are to be evaluated as such. In this context, removal includes dismantling, handling of the residues and transfer of the residues to an on-site or off-site facility.

### Waste, radioactive

According to § 3 AtAV, radioactive waste shall be defined as any radioactive material in gaseous, liquid or solid form for which no further use is intended and which is subject to control as radioactive waste by a supervisory authority if the levels of the specific activity of Appendix 4 Table 1 Column 3 and the activity of Appendix 4 Table 1 Column 2 StrlSchV are exceeded. Exceptions to this are discharges as defined under § 99 StrlSchV.

### Shutdown

The shutdown of a facility is any cessation or interruption of power operation. Shutdown as such is covered by the operating licence.

### Facility

The facility includes all parts which are covered in a licensing procedure as defined in § 7(1) AtG.

Since (with the exception of safe enclosure) the facility is in a state of constant physical change during the decommissioning procedure, type and extent of the facility can alter as decommissioning actions progress, e.g. by releases from regulatory control.

### Operation

Operation covers all conditions and processes in the facility between implementation of the first partial operating licence and final cessation of this operation.

If the operator has finally stopped power operation or production in the facility, then the so-called post-operational phase begins if the operating licence continues to be valid.

### Release

The release terminates the regulatory control of a facility under nuclear and radiation protection law pursuant to § 7(1) AtG or of parts thereof. It is carried out in accordance with the licence pursuant to § 7(3) AtG. In the case of objects that may contain radioactive substances or may be activated or contaminated, in particular because they belong to the controlled area, the release is effected based on a clearance pursuant to §§ 31 to 42 StrlSchV if compliance with the content of the clearance notice pursuant to § 42(1) StrlSchV has been established and, if applicable, confirmed by the competent authority in accordance with § 33(3) StrlSchV and if there are no longer any obligations under radiation protection law to be observed, also those due to ancillary provisions of the clearance notice.

### Clearance

Clearance is an administrative act which has as its purpose the release of radioactive substances from regulatory control under nuclear and radiation protection law that originate from practices referred to in § 4(1) sentence 1 No. 1 in conjunction with § 5(39) No. 1 or 2, or from practices referred to in § 4(1) sentence 3 nos. 3 to 7 StrlSchG as well as of movable objects, buildings, rooms, sections of rooms and structural elements, soil areas, facilities or parts thereof (objects) that are activated due to these practices or contaminated with such radioactive substances.

### Removal

In this Guide, removal refers to a proceeding described in the licence pursuant to § 7(3) AtG for the release of substances as well as movable objects, buildings, rooms, parts of rooms and components, soil areas, facilities or parts of thereof (objects) from regulatory control under nuclear and radiation protection law which cannot be contaminated or activated due to the practice referred to in § 4(1) sentence 1 No. 4 StrlSchG and which are not from the controlled area.

**Power operation**

The operating phase of a nuclear power plant in which heat is generated in a targeted manner.

For research reactors, the term power operation is to be applied by analogy. For nuclear fuel cycle facilities, the term production operation is usually used and is equivalent to power operation.

**Management system**

A management system comprises all definitions, regulations and organisational aids that are provided within the company to plan the safety-relevant tasks, to carry them out under controlled conditions and to control and improve their achievement. In this Guide, management system refers to a process-oriented, integrated management system.

**Post-operational phase**

The post-operational phase of a nuclear facility comprises the period between final cessation of power operation or production in the facility and the utilisation of an enforceable licence for decommissioning, for safe enclosure or for dismantling as defined in § 7(3) AtG by the owner of the nuclear facility.

**Residual operation**

Residual operation is referred to as the operation of all supply, safety and auxiliary systems required for decommissioning and the operation of installations required for the dismantling of components, systems and buildings after granting of the decommissioning licence.

**Residues, radioactive**

Radioactive substances, dismantled radioactive plant components, parts of buildings (rubble from demolition) and removed soil as well as movable objects, being contaminated or activated for which the waste management path has not been decided yet, until decision of the licence holder that they are to be classified as radioactive waste. In this sense, the residue can be utilised in the own or another facility which may lead to the production of radioactive waste, or be cleared immediately or after decay storage according to §§ 31 to 42 StrlSchV.

**Safe enclosure**

Safe enclosure covers the state and the processes in a shut down nuclear facility after removal of the nuclear fuel during which it remains unchanged with its main components in their respective condition for a longer period of time and during which the radioactive inventory remains safely contained.

Regardless of the fact that the radioactive inventory must always be safely contained, this term refers to a certain technical condition of the facility which is also mentioned in § 7(3) AtG as an independent situation which shall require a licence.

**Decommissioning**

In this Guide, the term "decommissioning" is generally used both as a single word and as a compound term (e.g., decommissioning procedure) in the wider sense as a generic term for all measures aimed at decommissioning (including safe enclosure and dismantling). This is in line with technical language and international usage. In contrast, the AtG distinguishes between the terms decommissioning (of the entire facility), safe enclosure and dismantling. According to the AtG, decommissioning begins when the first decommissioning licence is made use of. This definition – as "decommissioning in the narrower sense" – is only used in this Guide where reference is made to the legal framework, in particular the AtG, or where decommissioning, safe enclosure and dismantling are mentioned together.

**Decommissioning procedure**

In this Guide, "decommissioning procedure" refers to the licensing and supervisory procedure.

**Decommissioning project**

Decommissioning project is understood to be the technical and administrative implementation or execution.

**Decommissioning action**

Decommissioning actions are understood to be the individual technical and administrative measures for project execution.

### **Decommissioning concept**

A decommissioning concept is understood to be the conceptual approach to decommissioning that already demonstrates during the licensing procedure for the construction and operation of a facility, i.e. well in advance of decommissioning, that the facility can be decommissioned in compliance with the radiation protection provisions.

### **Decommissioning planning**

The planning of decommissioning contains specifications on all measures planned for decommissioning, safe enclosure or the dismantling of the facility or parts thereof which, in particular, make it possible to assess whether the decommissioning actions applied for do not interfere with or prevent subsequent decommissioning actions and whether a reasonable order is envisaged.

### **Standstill**

Standstill is the state of a facility after it has been shut down. The scope of the required systems depends on the regulations for standstill of the facility specified in the operating manual.

### **Substances, radioactive**

Radioactive substances in terms of § 2(1) AtG refer to all substances containing one or more radionuclides and whose activity or specific activity in conjunction with nuclear energy or radiation protection cannot be disregarded under the provisions of the AtG for a statutory ordinance adopted on the basis of the AtG.

The term also covers radioactively contaminated components and building structures.

### **Preliminary analysis**

The preliminary analysis is an examination to determine the radionuclide mix, the relative proportions of radionuclides and their geometric distribution in a material batch.

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**9. Appendix 2: Classification of the BMI/BMU and KTA safety standards in terms of their applicability to decommissioning procedures**

The announcements issued by the BMU and the formerly competent BMI as well as the KTA safety standards were assessed for their applicability to decommissioning procedures for nuclear facilities and classified according to the following three categories:

Category I: The rule is to be applied throughout the decommissioning stage, taking into account the current condition of the facility and the hazard potential.

Category II: The rule is to be applied, taking into account the current condition of the facility and the hazard potential as long as there is still nuclear fuel in the facility and the fundamental safety functions of subcriticality and residual heat removal must be fulfilled.

Category III: The rule is not relevant.

For categories I and II, the protection-goal-oriented consideration of the current condition of the facility and the reduced hazard potential means that individual regulatory contents may no longer be relevant during decommissioning. In addition to the categorisation, for some announcements and standards (marked with \*), Appendix 3 contains comments e.g. on their adaptation to the protection goals or their partial application.

The listing in this annex is based on the announcements contained in the Handbook on Nuclear Safety and Radiation Protection /3/, whereby only those announcements are listed that relate to the topic of the Decommissioning Guide requiring categorisation, and on the KTA Program of Standards /4/. Announcements and standards that have been superseded or withdrawn are still listed in some cases if this is deemed useful as background information, e.g. for older decommissioning projects.

## Announcements of the BMU and the formerly competent BMI:

Docu- ment number	Title of the announcement of the BMU and the formerly competent BMI <i>[for German original titles see <a href="https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/3/3_node.html">https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/3/3_node.html</a>]</i>	Category
3.0.1	Safety requirements for nuclear power plants as amended and promulgated on 3 March 2015 (Federal Gazette (BAnz) AT 30.03.2015 B2)	I*
3.0.2	Interpretations of the safety requirements for nuclear power plants of 22 November 2012 of 29 November 2013 (Federal Gazette (BAnz) AT 10.12.2013 B4) as amended and promulgated on 3 March 2015 (Federal Gazette (BAnz) AT 30.03.2015 B3)	I*
3.1	Safety criteria for nuclear power plants of 21 October 1977 (Federal Gazette (BAnz) No. 206 of 3 November 1977), updated and superseded by safety requirements for nuclear power plants of 3 March 2015 and the interpretations thereto of 29 November 2013 as amended and promulgated on 3 March 2015 (see 3.0.1 and 3.0.2)	III
3.2	Guideline concerning the proof of the technical qualification of nuclear power plant personnel of 24 May 2012 (Joint Ministerial Gazette (GMBI) 2012, No. 2, page 611) Adaptation of proof of technical qualification of nuclear power plant personnel at nuclear power plants without authorisation for power operation, BMU circular of 21 May 2013 (file number RS I 6 - 13831-1/1 and 13831-1/2) with Annex 1 Notes:  - Guideline for the maintenance of technical qualification of responsible nuclear power plant personnel see 3.38  - Guideline relating to the contents of the examination of the technical qualification see 3.39	I*
3.3	Guideline relating to the proof of the technical qualification of research reactor personnel of 16 February 1994 (Joint Ministerial Gazette (GMBI) 1994, No. 11, page 366)	I*
3.4	Guidelines concerning the requirements for safety specifications for nuclear power plants of 27 April 1976 (Joint Ministerial Gazette (GMBI) 1976, No. 15, page 199)	I*
3.5	List of contents and structure of a standard safety analysis report for nuclear power plants with pressurized water reactor or boiling water reactor of 26 July 1976 (Joint Ministerial Gazette (GMBI) 1976, No. 26, page 418)	I*
3.6	Guideline for the protection of nuclear power plants against pressure waves from chemical reactions by means of the design of nuclear power plants with regard to strength and induced vibrations and by means of the adherence to safety distances of 13 September 1976 (Federal Gazette (BAnz) No. 179)	I*
3.7.1	Compilation of information required for review purposes under licensing and supervisory procedures for nuclear power plants of 20 October 1982 (Federal Gazette (BAnz) No. 6a)	III
3.7.2	Compilation of the data required for the building inspection of nuclear facilities of 6 November 1981 (Joint Ministerial Gazette (GMBI) 1981, No. 33, page 518)	I*
3.8	Principles for subcontracting of authorised experts of 29 October 1981 (Joint Ministerial Gazette (GMBI) 1981, No. 33, page 517)	I
3.9.1	Principles for the applicant's/licensee's documentation of technical documents pertaining to the construction, operation and decommissioning of nuclear power plants of 19 February 1988 (Joint Ministerial Gazette (GMBI) 1988, No. 56)	I
3.9.2	Requirements for the documentation at nuclear power plants of 5 August 1982 (Joint Ministerial Gazette (GMBI) 1982, No. 26, page 546)	I*

Docu- ment number	Title of the announcement of the BMU and the formerly competent BMI <i>[for German original titles see <a href="https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/3/3_node.html">https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/3/3_node.html</a>]</i>	Category
3.10	Implementation of the Radiation Protection Ordinance and the X-ray Ordinance; reporting on special events of 30 March 2015 (Joint Ministerial Gazette (GMBI) 2015, No. 16, page 306)	I*
3.11	Safety requirements for nuclear fuel supply facilities; April 1997 and June 2004 BMU RS III 3	I*
3.12	Data for the evaluation of site properties for nuclear power plants of 11 June 1975 (Umwelt 1975, No. 43)	III
3.14	Design guidelines and reference data for iodine sorption filters for the separation of gaseous fission iodine at nuclear power plants of 25 February 1976 (Joint Ministerial Gazette (GMBI) 1976, No. 13, page 168)	II*
3.18	Licences under § 3(1) StrlSchV or § 6 AtG concerning the intermediate storage of depleted and/or natural and enriched uranium in the form of uranium hexafluoride (UF <sub>6</sub> ); topic: licensing assumptions and requirements of 15 February 1979 (Joint Ministerial Gazette (GMBI) 1979, No. 8, page 91)	III
3.19	Guideline according to StrlSchV and RöV on occupational medical care for occupationally exposed persons by approved medical practitioners of 18 December 2003 (Joint Ministerial Gazette (GMBI) 2004, No. 19, page 350)	I
3.20	Radiological protection control by biological indicators: chromosome aberration analysis at the institute for radiological hygiene of the Federal Health Office of 9 March 1983 (Joint Ministerial Gazette (GMBI) 1983, No. 10, page 176)	I
3.22	Checklist for carrying out an assessment of the current safety status of the facility for the post-operational phase with BMUB cover letter of 2 October 2014	III
3.23	Guideline concerning emission and immission monitoring of nuclear installations (REI) of 7 December 2005 (Joint Ministerial Gazette (GMBI) 2006, No. 14-17, page 254)	I
3.24	Guideline on leak tests on sealed radioactive substances of 4 February 2004 (Joint Ministerial Gazette (GMBI) 2004, page 530), amended on 7 September 2012 (Joint Ministerial Gazette (GMBI) 2012, No. 47/48, page 919)	I
3.25	Principles relating to the provision to be made for the handling and disposal of spent fuel of nuclear power plants of 19 March 1980 (Federal Gazette (BAnz) No. 58)	I
3.27	Guideline relating to the assurance of the necessary knowledge of the persons otherwise engaged in the operation of nuclear power plants of 30 November 2000 (Joint Ministerial Gazette (GMBI) 2001, No. 8, page 153)	I*
3.29	Regulation of legislation competencies for the transport of radioactive substances (nuclear fuels and other radioactive substances) (BMU RS II 1, as of March 1993)	III
3.33.1	Guidelines for the assessment of the design of nuclear power plants with pressurised water reactors against accidents as defined in § 28(3) StrlSchV (incident guidelines) of 18 October 1983 (Federal Gazette (BAnz) 1983, No. 245a), updated and superseded by safety requirements for nuclear power plants of 3 March 2015 and the interpretations thereto of 29 November 2013 as amended and promulgated on 3 March 2015 (see 3.0.1 and 3.0.2)	III
3.33.2	Incident calculation bases for the guidelines for the assessment of the design of nuclear power plants with PWR according to § 28(3) StrlSchV of 18 October 1983 (Federal Gazette (BAnz) No. 245a), version of Chapter 4 on the calculation of radiation exposure of 29 June 1994 (Federal Gazette (BAnz) No. 222a of 26 November 1994), amendment of Chapter 4 on the calculation of radiation exposure according to § 49 StrlSchV of 20 July 2001 adopted at the 186th meeting of the Commission on Radiological Protection on 11 September 2003, published in the series of reports of the Commission on Radiological Protection, Issue 44, 2004	I*

Docu- ment number	Title of the announcement of the BMU and the formerly competent BMI <i>[for German original titles see <a href="https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/3/3_node.html">https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/3/3_node.html</a>]</i>	Category
3.34	Framework guideline on the preparation of expert opinions in nuclear administrative procedures of 15 December 1983 (Joint Ministerial Gazette (GMBI) 1984, No. 2, page 21)	I
3.35	Checklist items for application documents in the licensing procedures for installations for the generation of ionising radiation of 12 November 2003 (Joint Ministerial Gazette (GMBI) 2004, No. 1, page 9), as amended by BMUB circular of 22 September 2014 (Joint Ministerial Gazette (GMBI) 2014, No. 68, page 1411)	III
3.36	Calculation basis for the determination of radiation exposure due to disruptive action or other interference by third parties (SEWD) on nuclear facilities and installations – SEWD-Berechnungsgrundlage of 28 October 2014 (Joint Ministerial Gazette (GMBI) 2014, No. 68, page 1315)	I
3.37	Recommendations concerning the regulatory content of decisions relating to the release of radioactive materials from nuclear power plants with light water reactors of 8 August 1984 (Joint Ministerial Gazette (GMBI) 1984, No. 21, page 327)	I
3.38	Guideline for the maintenance of technical qualification of responsible nuclear power plant personnel of 17 July 2013 (Joint Ministerial Gazette (GMBI) 2013, No. 36, page 712) Adaptation of the maintenance of technical qualification of nuclear power plant personnel at nuclear power plants without authorisation for power operation, BMUB circular of 23 January 2014 (file number RS I 6 - 13831-1/3) with annex	I*
3.39	Guideline relating to the contents of the examination of the technical qualification of 24 May 2012 (Joint Ministerial Gazette (GMBI) 2012, No. 30, page 905) Adaptation of the contents of the examination of the technical qualification of nuclear power plant personnel at nuclear power plants without authorisation for power operation, BMU circular of 21 May 2013 (file number RS I 6 - 13831-1/1 and 13831-1/2) with Annex 2	I*
3.40	Guideline relating to the technical qualification required in radiological protection according to StrlSchV of 21 June 2004 (Joint Ministerial Gazette (GMBI) 2004, page 799), as amended on 19 April 2006 (Joint Ministerial Gazette (GMBI) 2006, No. 38, page 735)	I
3.41	Guideline relating to the procedure for the preparation and implementation of maintenance work and modifications at nuclear power plants of 1 June 1978 (Joint Ministerial Gazette (GMBI) 1978, No. 22, page 342), under revision	I
3.42.1	Guideline for physical radiological protection controls for determining body doses Part 1: Determination of body dose due to external radiation exposure (§§ 40, 41, 42 StrlSchV; § 35 RöV) of 8 December 2003 (Joint Ministerial Gazette (GMBI) 2004, No. 22, page 410)	I
3.42.2	Guideline for physical radiological protection controls for determining body doses Part 2: Determination of body dose due to external radiation exposure (incorporation monitoring) (§§ 40, 41, 42 StrlSchV of 12 January 2007 (Joint Ministerial Gazette (GMBI) 2007, No. 31/32, page 623), appendices 1 to 6, Appendix 7.1, Appendix 7.2, Appendix 7.3, Appendix 7.4 Note: the Guideline on requirements for incorporation measuring points of 30 September 1996 (GMBI. 1996, No. 46, p. 996) is hereby repealed and replaced.	I
3.43.1	Guideline for the protection against radiation of personnel during the execution of maintenance work in nuclear power plants with light water reactors: Part I: The precautionary protective measures to be taken during the planning of the plant – IWRS I of 10 July 1978 (Joint Ministerial Gazette (GMBI) 1978, No. 28, page 418)	I*
3.43.2	Guideline for the protection against radiation of personnel during the execution of maintenance work, modification, disposal and the dismantling in nuclear installations and facilities: Part II: The radiation protection measures to be taken during the operation or decommissioning of an installation or facility – IWRS II of 17 January 2005 (Joint Ministerial Gazette (GMBI) 2005, No. 13 page 258)	I



Docu- ment number	Title of the announcement of the BMU and the formerly competent BMI <i>[for German original titles see <a href="https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/3/3_node.html">https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/3/3_node.html</a>]</i>	Category
3.44	Guideline on the verification of the licensee's monitoring of radioactive effluents from nuclear power plants of 5 February 1996 (Joint Ministerial Gazette (GMBI) 1996, No. 9/10, page 247)	I
3.45	Licences under the terms of § 3(1) StrlSchV for the mobile use and storage of radioactive materials in the context of non-destructive material testing of 14 November 1991 (Joint Ministerial Gazette (GMBI) 1992, No. 6, page 120)	I
3.46.1	Licence under § 8(1) StrlSchV for the carriage of radioactive substances for radiographic examinations within the frame of the non-destructive testing of materials of 29 May 1978 (Joint Ministerial Gazette (GMBI) 1978, No. 21, page 334)	III
3.46.2	Instruction sheet for the carriage of radioactive materials for radiographic examinations within the frame of the non-destructive testing of materials of 20. November 1981 (Joint Ministerial Gazette (GMBI) 1982, No. 2, page 22)	III
3.47	Model licence for employment in third-party facilities pursuant to § 15 of the Radiation Protection Ordinance (Model licence for employment in third-party facilities or installations), BMUB circular of 16 September 2017, file number RS II 3 - 15509/8.	I
3.48	Guideline for the design approval of ionization chamber smoke detectors of 15 February 1992 (Joint Ministerial Gazette (GMBI) 1992, No. 8, page 150)	III
3.49	Interpretations of the safety criteria for nuclear power plants; single failure concept – principles for the application of the single failure criterion of 2 March 1984 (Joint Ministerial Gazette (GMBI) 1984, No. 13, page 208), updated and superseded by safety requirements for nuclear power plants of 3 March 2015 and the interpretations thereto of 29 November 2013 as amended and promulgated on 3 March 2015 (see 3.0.1 and 3.0.2)	III
3.50	Interpretations of the safety criteria for nuclear power plants of 17 May 1979 (Joint Ministerial Gazette (GMBI) 1979, No. 14, page 161) on safety criterion 2.6: external hazards, on safety criterion 8.5: heat removal from the containment, updated and superseded by safety requirements for nuclear power plants of 3 March 2015 and the interpretations thereto of 29 November 2013 as amended and promulgated on 3 March 2015 (see 3.0.1 and 3.0.2)	III
3.51	Interpretations of the safety criteria for nuclear power plants of 28 November 1979 (Joint Ministerial Gazette (GMBI) 1979, No. 5, page 90) on safety criterion 2.2: testability, on safety criterion 2.3: radiation exposure in the environment, on safety criterion 2.6: external hazards, on safety criterion 2.7: protection against fire and explosion, supplementary interpretation on safety criterion 4.3: residual heat removal after loss-of-coolant accidents, updated and superseded by safety requirements for nuclear power plants of 3 March 2015 and the interpretations thereto of 29 November 2013 as amended and promulgated on 3 March 2015 (see 3.0.1 and 3.0.2)	III

Docu- ment number	Title of the announcement of the BMU and the formerly competent BMI	Category
3.52.1	[for German original titles see <a href="https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/3/3_node.html">https://www.base.bund.de/DE/base/gesetze-regelungen/rsh/3/3_node.html</a> ]	
3.52.1	<ul style="list-style-type: none"> <li>- Explanatory notes on the reporting criteria for reportable events according to Appendix 1 AtSMV (as of 09/2015)</li> <li>- Explanatory notes on the reporting criteria for reportable events according to Appendix 2 AtSMV (as of 11/2007)</li> <li>- Explanatory notes on the reporting criteria for reportable events according to Appendix 3 AtSMV (as of 03/2007)</li> <li>- Explanatory notes on the reporting criteria for reportable events according to Appendix 4 AtSMV (as of 04/2007)</li> <li>- Explanatory notes on the reporting criteria for reportable events according to Appendix 5 AtSMV (as of 04/2013)</li> <li>- Explanatory notes on the reporting criteria for reportable events according to Appendix 7 AtSMV (as of 12/2018)</li> <li>- Compilation of terms used in the reporting criteria of the AtSMV (as of 04/2015)</li> </ul>	I
3.52.2	Reporting of a reportable event in installations according to § 7 AtG for the fission of nuclear fuels (reporting form, as of 01/19)	I
3.52.3	Reporting of a reportable event in installations according to § 7 AtG of the nuclear fuel cycle (reporting form, as of 01/19)	I
3.52.4	Reporting of a reportable event during the storage of solidified high-level fission product solutions according to § 6 AtG (reporting form, as of 01/19)	III
3.53	Guideline relating to the contents of the examination of the technical qualification of responsible shift personnel in research reactors of 14 November 1997 (Joint Ministerial Gazette (GMBI) 1997, No. 42, page 794)	I*
3.54.1	Basic recommendation for remote monitoring of nuclear power plants of 12 August 2005 (Joint Ministerial Gazette (GMBI) 2005, No. 51, page 1049)	I*
3.54.2	Recommendation for calculating the fee as defined in § 5 AtKostV for the remote monitoring of nuclear power plants of 21 January 1983 (Joint Ministerial Gazette (GMBI) 1983, No. 8, page 146)	I*
3.55.1	Model rules for the use of the state collecting facilities for radioactive wastes in the Federal Republic of Germany of 17 March 1981, Joint Ministerial Gazette (GMBI) 1981, No. 11, page 163)	III
3.56	Notice on the application of the German version of the International Nuclear and Radiological Event Scale (INES) in nuclear facilities and in the field of radiation protection outside the scope of nuclear technology – German INES Handbook of 20 February 2015 Federal Gazette (BAnz) AT 30.03.2015 B1)	I
3.57.1	Requirements relating to the physical protection service and physical protection officers in nuclear installations and facilities (OSD- Richtlinie) of 4 July 2008 (Joint Ministerial Gazette (GMBI) 2008, No. 39, page 810)	I*

Docu- ment number	Title of the announcement of the BMU and the formerly competent BMI	Category
3.57.3	Guideline for protecting LWR nuclear power plants against disruptive action or other interference by third parties of 6 December 1995 (Joint Ministerial Gazette (GMBI) 1996, No. 2, page 32) (without text)	I*
3.59	Guideline on the control of radioactive waste with negligible heat generation that is not handed over to a Land collection facility of 16 January 1989 (Federal Gazette (BAnz) No. 63a of 4 April 1989), last amended on 14 January 1994 (Federal Gazette (BAnz), No. 19) Note: replaced by Guideline for the control of radioactive residues and radioactive wastes of 19 November 2008 in terms of contents (see 3.60), but not officially withdrawn	III*
3.60	Guideline on the control of radioactive residues and radioactive waste of 19 November 2008 (Federal Gazette (BAnz), No. 197)	I
3.61	Guideline for the technical qualification of radiation protection officers at installations for fission of nuclear fuels of 20 February 2014 (Joint Ministerial Gazette (GMBI) 2014, No. 13, page 289)	I*
3.62	Guideline relating to measures for the protection of facilities of the nuclear fuel cycle and other nuclear facilities against disturbances or other interference by individuals entitled to access to the facility of 28 January 1991 (Joint Ministerial Gazette (GMBI) 1991, No. 9, page 228)	II*
3.63	Guideline for the protection of radioactive substances against disruptive action or other interference by third parties during transportation of 4 December 2003 (Joint Ministerial Gazette (GMBI) 2004, No. 12, page 238) (without text)	I*
3.64	Requirements on security personnel in the transport of radioactive materials of 4 June 1996 (Joint Ministerial Gazette (GMBI) 1996, No. 29, page 621 and No. 33, page 673)	I
3.65	Requirements on courses for imparting basic nuclear knowledge for responsible shift personnel in nuclear power plants – criteria for recognition – of 19 November 2014	I*
3.68	Safeguards for protecting nuclear facilities with Category III nuclear material of 20 April 1993 (Joint Ministerial Gazette (GMBI) 1993, No. 20, page 365) (without text)	I
3.69.1	Measurement programme for normal operation (routine measurement programme) of 28 July 1994 (Joint Ministerial Gazette (GMBI) 1994, page 930) Part I: Measurement programme for normal operation (routine measurement programme) of 28 July 1994 (Joint Ministerial Gazette (GMBI) 1994, No. 32, page 930), under revision	I*
3.69.2	Measurement programme for normal operation (routine measurement programme) of 28 July 1994 (Joint Ministerial Gazette (GMBI) 1994, page 930) Part II: Measurement programme for intensive operation (intensive measurement programme) of 19 January 1995 (Joint Ministerial Gazette (GMBI) 1995, No. 14, page 261), under revision	III*
3.71	Guideline relating to the technical qualification of responsible personnel in facilities for the production of fuel elements for nuclear power plants of 30 November 1995 (Joint Ministerial Gazette (GMBI) 1996, No. 2, page 29)	I*
3.73	Guide to the decommissioning, the safe enclosure and the dismantling of facilities or parts thereof as defined in § 7 of the Atomic Energy Act of 16 September 2021 (Federal Gazette (BAnz) xxx)	I

Docu- ment number	Title of the announcement of the BMU and the formerly competent BMI <i>[for German original titles see <a href="https://www.base.bund.de/DE/base/gesetzte-regelungen/rsh/3/3_node.html">https://www.base.bund.de/DE/base/gesetzte-regelungen/rsh/3/3_node.html</a>]</i>	Category
3.74.1	Guideline for conducting periodic safety reviews (PSRs) for nuclear power plants in the Federal Republic of Germany  - Fundamentals for periodic safety reviews for nuclear power plants  - Guideline safety status analysis  - Guideline probabilistic safety analysis Announcement of 18 August 1997 (Federal Gazette (BAnz) 1997, No. 232a)	I*
3.74.2	Guideline for conducting periodic safety reviews (PSRs) for nuclear power plants in the Federal Republic of Germany, under revision  - Guideline deterministic security analysis Announcement of 25 June 1998 (Federal Gazette (Banz) 1998, No. 153)	I*
3.74.3	Guideline for conducting safety reviews pursuant to § 19 of the Atomic Energy Act  - Guideline probabilistic safety analysis Announcement of 30 August 2005 (Federal Gazette (BAnz) No. 207)	III
3.75	Checklist for protecting other radioactive material and small amounts of nuclear fuel against diversion from installations and facilities of 3 April 2003, BMU circular of 10 July 2003 – RS I 6 13151-6/.18	I
3.76	Guideline on the physical protection of storage facilities against disruptive action or other interference by third parties (SEWD-Richtlinie Zwischenlager) of 4 February 2013 (Joint Ministerial Gazette (GMBI) 2013, No. 17, page 379) (without text)	III
3.79	Damage prevention not relating to design basis accidents, BMU circular of 15 July 2003 RS I 3 – 10100/00	II
3.80	Resolution of the Länder Committee for Nuclear Energy (LAA) on Decisions according to the Radiation Protection Ordinance taking effect beyond the territory of a country, BMU circular of 8 December RS I 1 – 17031/47	I
3.99	Announcement regarding the guideline for the protection of IT systems in nuclear Installations and facilities of physical protection categories I and II against disruptive action or other interferences by third parties (SEWD-Richtlinie IT), regarding the load assumptions for the design of nuclear installations and facilities against disruptive action or other interference by third parties by means of IT attacks (IT load assumptions) and the explanations for the assignment of the IT systems of nuclear power plants to IT protection requirements classes (explanatory notes) "of 8 July 2013 (Joint Ministerial Gazette (GMBI) 2013, No. 36, page 711) (without text)	I*

**KTA safety standards:**

<b>KTA safety standard No.</b>	<b>Title</b>	<b>Category</b>
<u>1200</u>	<u>General administration; organisation</u>	
1201	Requirements for the Operating Manual, 2015-11	I*
1202	Requirements for the Testing Manual, 2017-11	I*
1203	Requirements for the Emergency Manual, 2009-11	II*
<u>1300</u>	<u>Industrial safety</u>	
1301.1	Radiation Protection Considerations for Plant Personnel in the Design and Operation of Nuclear Power Plants; Part 1: Design, 2017-11	I*
1301.2	Radiation Protection Considerations for Plant Personnel in the Design and Operation of Nuclear Power Plants; Part 2: Operation, 2014-11	I
<u>1400</u>	<u>Quality assurance</u>	
1401	General Requirements Regarding Quality Assurance, 2017-11	I*
1402	Integrated Management Systems for the Safe Operation of Nuclear Power Plants, 2017-11	I*
1403	Ageing Management in Nuclear Power Plants, 2017-11	I*
1404	Documentation during the Construction and Operation of Nuclear Power Plants, 2013-11	I*
1408.1	Quality Assurance for Weld Filler Materials and Welding Consumables for Pressure and Activity Retaining Systems in Nuclear Power Plants; Part 1: Qualification Testing, 2017-11	III
1408.2	Quality Assurance for Weld Filler Materials and Welding Consumables for Pressure and Activity Retaining Systems in Nuclear Power Plants; Part 2: Manufacture, 2017-11	III
1408.3	Quality Assurance for Weld Filler Materials and Welding Consumables for Pressure and Activity Retaining Systems in Nuclear Power Plants; Part 3: Processing, 2017-11	III
<u>1500</u>	<u>Radiation protection and monitoring</u>	
1501	Stationary System for Monitoring the Local Dose Rate within Nuclear Power Plants, 2017-11	I*
1502	Monitoring Volumetric Activity of Radioactive Substances in the Inner Atmosphere of Nuclear Power Plants, 2017-11	I*
(1502.2)	Atmosphere of Nuclear Power Plants; Part 2: Nuclear Power Plants with High Temperature Reactors, 1989-06 (inactive safety standard)	III
1503.1	Monitoring the Discharge of Radioactive Gases and Airborne Radioactive Particulates; Part 1: Monitoring the Discharge of Radioactive Matter with the Stack Exhaust Air During Specified Normal Operation, 2016-11	I*
1503.2	Monitoring the Discharge of Radioactive Gases and Airborne Radioactive Particulates; Part 2: Monitoring the Discharge of Radioactive Matter with the Vent Stack Exhaust Air During Design- Basis Accident, 2017-11	II
1503.3	Monitoring the Discharge of Radioactive Gases and Airborne Radioactive Particulates; Part 3: Monitoring the Non-stack Discharge of Radioactive Matter, 2017-11	III

KTA safety standard No.	Title	Category
1504	Monitoring and Assessing of the Discharge of Radioactive Substances in Liquid Effluents, 2017-11	I
1505	Suitability Verification of the Stationary Measurement Equipment for Radiation Monitoring, 2017-11	I
1507	Monitoring the Discharge of Radioactive Substances from Research Reactors, 2017-11	I*
1508	Instrumentation for Determining the Dispersion of Radioactive Substances in the Atmosphere, 2017-11	I
<u>2100</u>	<u>Plant</u>	
2101.1	Fire Protection in Nuclear Power Plants; Part 1: Basic Requirements, 2015-11	I*
2101.2	Fire Protection in Nuclear Power Plants; Part 2: Fire Protection of Structural Components, 2015-11	I*
2101.3	Fire Protection in Nuclear Power Plants; Part 3: Fire Protection of Mechanical and Electrical Plant Components, 2015-11	I*
2103	Explosion Protection in Nuclear Power Plants with Light Water Reactors (General and Case-Specific Requirements), 2015-11	I*
<u>2200</u>	<u>External hazards</u>	
2201.1	Design of Nuclear Power Plants against Seismic Events; Part 1: Principles, 2011-11	I*
2201.2	Design of Nuclear Power Plants against Seismic Events; Part 2: Subsoil, 2012-11	I
2201.3	Design of Nuclear Power Plants against Seismic Events; Part 3: Structural Components, 2013-11	I
2201.4	Design of Nuclear Power Plants against Seismic Events; Part 4: Components, 2012-11	I
2201.5	Design of Nuclear Power Plants against Seismic Events; Part 5: Seismic Instrumentation, 2015-11	I
2201.6	Design of Nuclear Power Plants against Seismic Events; Part 6: Post-Seismic Measures, 2015-11	III
2206	Design of Nuclear Power Plants Against Damaging Effects from Lightning, 2019-11	I*
2207	Flood Protection for Nuclear Power Plants, 2004-11	I*
<u>2500</u>	<u>Civil engineering</u>	
2501	Structural Waterproofing in Nuclear Power Plants, 2015-11	I*
2502	Mechanical Design of Fuel Assembly Storage Pools in Nuclear Power Plants with Light Water Reactors, 2011-11	II*
<u>3000</u>	<u>General systems</u>	
<u>3100</u>	Reactor core and reactor control	all III
3101.1	Design of Reactor Cores of Pressurized Water and Boiling Water Reactors; Part 1: Principles of Thermohydraulic Design, 2016-11	
3101.2	Design of Reactor Cores of Pressurized Water and Boiling Water Reactors, Part 2: Neutron- Physical Requirements for Design and Operation of the Reactor Core and Adjacent Systems, 2012-11	

KTA safety standard No.	Title	Category
3101.3	Design of Reactor Cores of Pressurized Water and Boiling Water Reactors, Part 3: Mechanical and Thermal Design, 2015-11	
(3102.1)	Reactor Core Design for High Temperature Gas-Cooled Reactors; Part 1: Calculation of the Material Properties of Helium, 1978-06 (inactive safety standard)	
(3102.2)	Reactor Core Design for High Temperature Gas-Cooled Reactors; Part 2: Heat Transfer in Spherical Fuel Elements, 1983-06 (inactive safety standard)	
(3102.3)	Reactor Core Design for High Temperature Gas-Cooled Reactors; Part 3: Loss of Pressure through Friction in Pebble Bed Cores n, 1981-03 (inactive safety standard)	
(3102.4)	Reactor Core Design for High Temperature Gas-Cooled Reactors; Part 4: Thermohydraulic Analytical Model for Stationary and Quasi- Stationary Conditions in Pebble Bed Cores, 1984-11 (inactive safety standard)	
(3102.5)	Reactor Core Design for High Temperature Gas-Cooled Reactors; Part 5: Systematic and Statistical Errors in the Thermohydraulic Core Design of the Pebble Bed Reactor, 1986/-06 (inactive safety standard)	
3103	Shutdown Systems for Light Water Reactors, 2015-11	
(3104)	Determination of the Shutdown Reactivity, 1979-10	
3107	Nuclear Criticality Safety Requirements during Refuelling, 2014-11	
<u>3200</u>	<u>Primary and secondary circuits</u>	
3201.1	Components of the Reactor Coolant Pressure Boundary of Light Water Reactors; Part 1: Materials and Product Forms, 2017-11	III
3201.2	Components of the Reactor Coolant Pressure Boundary of Light Water Reactors; Part 2: Design and Analysis, 2017-11	III
3201.3	Components of the Reactor Coolant Pressure Boundary of Light Water Reactors; Part 3: Manufacture, 2017-11	III
3201.4	Components of the Reactor Coolant Pressure Boundary of Light Water Reactors; Part 4: In-service Inspections and Operational Monitoring, 2016-11	III
3203	Surveillance of the Irradiation Behaviour of Reactor Pressure Vessel Materials of LWR Facilities, 2017-11	III
3204	Reactor Pressure Vessel Internals, 2017-11	III*
3205.1	Component Support Structures with Non-integral Connections; Part 1: Component Support Structures with Non-integral Connections for Components of the Reactor Coolant Pressure Boundary of Light Water Reactors, 2018-10	III
3205.2	Component Support Structures with Non-integral Connections; Part 2: Component Support Structures with Non-Integral Connections for Pressure and Activity-Retaining Components in Systems Outside the Primary Circuit, 2018-10	III
3205.3	Component Support Structures with Non-Integral Connections for Pressure and Activity-Retaining Components in Systems Outside the Primary Circuit; Part 3: Series-Production Standard Supports, 2018-10	III
3206	Verification Analysis for Rupture Preclusion for Pressure Retaining Components in Nuclear Power Plants, 2014-11	III
3211.1	Pressure and Activity Retaining Components of Systems Outside the Primary Circuit; Part 1: Materials, 2017-11	III

KTA safety standard No.	Title	Category
3211.2	Pressure and Activity Retaining Components of Systems Outside the Primary Circuit; Part 2: Design and Analysis, 2013-11	III
3211.3	Pressure and Activity Retaining Components of Systems Outside the Primary Circuit; Part 3: Manufacture, 2017-11	III
3211.4	Pressure and Activity Retaining Components of Systems Outside the Primary Circuit; Part 4: In-service Inspections and Operational Monitoring, 2017-11	II
<u>3300</u>	<u>Heat removal</u>	all II
3301	Residual Heat Removal Systems of Light Water Reactors, 2015-11	*
3303	Heat Removal Systems for Fuel Assembly Storage Pools in Nuclear Power Plants with Light Water Reactors, 2015-11	
<u>3400</u>	<u>Containment</u>	*
3401.1	Steel Containment Vessels; Part 1: Materials, 1988-09	III
3401.2	Steel Containment Vessels; Part 2: Analysis and Design, 2016-11	III
3401.3	Steel Containment Vessels; Part 3: Manufacture, 1986-11	III
3401.4	Steel Containment Vessels; Part 4: In-service Inspections and Operational Monitoring, 2017-11	II
3402	Airlocks on the Reactor Containment of Nuclear Power Plants – Personnel Airlocks, 2014-11	II
3403	Cable Penetrations through the Reactor Containment Vessel, 2015-11	II
3404	Isolation of Operating System Pipes Penetrating the Containment Vessel in the Case of a Release of Radioactive Substances into the Containment Vessel of Nuclear Power Plants, 2017-11	II
3405	Leakage Test of the Containment Vessel, 2015-11	II
3407	Pipe Penetrations through the Reactor Containment Vessel, 2017-11	II
3409	Airlocks on the Reactor Containment of Nuclear Power Plants – Equipment airlocks, 2009-11	II
3413	Determination of Loads for the Design of a Full Pressure Containment Vessel against Plant- Internal Incidents, 2016-11	III
<u>3500</u>	<u>Instrumentation and reactor protection</u>	all II
3501	Reactor Protection System and Monitoring Equipment of the Safety System, 2015-11	
3502	Accident Measuring Systems, 2012-11	
3503	Type Testing of Electrical Modules for the Safety Related Instrumentation and Control System, 2015-11	
3504	Electrical Drive Mechanisms of the Safety System in Nuclear Power Plants, 2015-11	
3505	Type Testing of Measuring Sensors and Transducers of the Safety- Related Instrumentation and Control System, 2015-11	
3506	System Testing of the Instrumentation and Control Equipment Important to Safety of Nuclear Power Plants, 2017-11	



KTA safety standard No.	Title	Category
3507	Factory Tests, Post-repair Tests and Certification of Satisfactory Performance in Service of Modules and Devices of the Safety-Related Instrumentation and Control System, 2014-11	
<u>3600</u>	<u>Activity control and activity management</u>	
3601	Ventilation Systems in Nuclear Power Plants, 2017-11	I*
3602	Storage and Handling of Fuel Assemblies and Associated Items in Nuclear Power Plants with Light Water Reactors, 2003-11	II
3603	Facilities for Treating Radioactively Contaminated Water in Nuclear Power Plants, 2017-11	I
3604	Storage, Handling and Plant- internal Transport of Radioactive Substances in Nuclear Power Plants (with the Exception of Fuel Assemblies), 2020-12	I
3605	Treatment of Radioactively Contaminated Gases in Nuclear Power Plants with Light Water Reactors, 2017-11	I*
<u>3700</u>	<u>Energy and media supply</u>	
3701	General Requirements for the Electrical Power Supply in Nuclear Power Plants, 2014-11	II
3702	Emergency Power Generating Facilities with Diesel-Generator Units in Nuclear Power Plants, 2014-11	II
3703	Emergency Power Facilities with Batteries and AC/DC Converters in Nuclear Power Plants, 2012-11	I*
3704	Emergency Power Facilities with Static and Rotating AC/DC Converters in Nuclear Power Plants, 2013-11	II
3705	Switchgear Facilities, Transformers and Distribution Networks for the Electrical Power Supply of the Safety System in Nuclear Power Plants, 2013-11	II
3706	Ensuring the Loss-of-Coolant- Accident Resistance of Electrotechnical Components and of Components in the Instrumentation and Controls of Operating Nuclear Power Plants, 2000-06	II
<u>3900</u>	<u>Other systems</u>	
3901	Communication Means for Nuclear Power Plants, 2017-11	I*
3902	Design of Lifting Equipment in Nuclear Power Plants, 2020-12	I
3903	Inspection, Testing and Operation of Lifting Equipment in Nuclear Power Plants, 2020-12	I
3904	Control Room, Remote Shutdown Station and Local Control Stations in Nuclear Power Plants, 2017-11	II
3905	Load Attaching Points on Loads in Nuclear Power Plants, 2020-12	I

## 10. Appendix 3: Comments on application adapted to protection goals or partial application of the BMI/BMU announcements and KTA safety standards in decommissioning procedures

The following list contains comments e.g. on the protection-goal oriented adaptation or partial application of the rules marked with an \* in Appendix 2.

### Comments on the announcement of the BMU and the formerly competent BMI:

#### 3.0.1 Safety requirements for nuclear power plants as amended and promulgated on 3 March 2015 (Federal Gazette (BAnz) AT 30.03.2015 B2)

The safety requirements for nuclear power plants are to be applied as appropriate to the requirements of decommissioning in accordance with the progress of dismantling.

The defence-in-depth concept as presented in the safety requirements for nuclear power plants is not applicable to decommissioning. However, the technical requirements described are to be applied for compliance with the protection goals still relevant and for compliance with the radiological safety objectives, adapted to the events still to be postulated during the decommissioning stage so that these events can be avoided or controlled. If there are no more fuel assemblies and fuel rods in a facility, the protection goals "reactivity control" and "fuel cooling" are no longer relevant. In addition, the releasable activity potential decreases again by several orders of magnitude.

#### 3.0.2 Interpretations of the safety requirements for nuclear power plants of 22 November 2012 of 29 November 2013 (Federal Gazette (BAnz) AT 10.12.2013 B4) as amended and promulgated on 3 March 2015 (Federal Gazette (BAnz) AT 30.03.2015 B3)

The interpretations of the safety requirements refer only in a few cases to requirements that are still relevant during decommissioning and are significantly reduced after removal of the fuel assemblies (see comment on 3.0.1).

#### 3.4 Guidelines concerning the requirements for safety specifications for nuclear power plants of 27 April 1976 (Joint Ministerial Gazette (GMBI) 1976, No. 15, page 199)

In accordance with KTA 1201 and 1202, the safety specifications are included in the operating manual / testing manual including cross-references. Following final shutdown, the main points can be adapted to the changed condition of the facility during decommissioning. This adaptation can be carried out within the framework of the revision procedure or as part of the update of the operating manual.

#### 3.5 List of contents and structure of a standard safety analysis report for nuclear power plants with pressurized water reactor or boiling water reactor of 26 July 1976 (Joint Ministerial Gazette (GMBI) 1976, No. 26, page 418)

The information and data on the site and the facility should primarily include the changes occurred during the operating period and due to operation and should, in particular, characterise the radiological situation.

Information about the overall decommissioning project are to be presented with the application for a licence and possibly also in the safety report. This information serves to explain which application and licensing steps are to be used in the decommissioning procedure, taking into account the situations in which a licence shall be required according to § 7(3) AtG (decommissioning, safe enclosure, dismantling of the facility or parts thereof). This information is intended to enable assessing, in particular, whether further measures would be interfered with or prevented and whether provisions are made for an appropriate order of dismantling activities in terms of radiation protection.

The description of decommissioning actions has to include the intended techniques, the proceeding and the related radiation protection and safety aspects, as well as the intended final state of the facility.

Furthermore, it is important to outline what provisions have been made in terms of spent fuel and radioactive waste management and to provide details on physical protection measures as well as on organisation and staffing.

#### 3.6 Guideline for the protection of nuclear power plants against pressure waves from chemical reactions by means of the design of nuclear power plants with regard to strength and induced vibrations and by means of the adherence to safety distances of 13 September 1976 (Federal Gazette (BAnz) No. 179)

This standard is no longer applicable to existing buildings in decommissioning unless a reassessment is carried out as part of a decommissioning procedure.

If buildings for replacement systems are erected within the framework of decommissioning, the standard is to be applied.

### **3.7.2 Compilation of the data required for the building inspection of nuclear facilities of 6 November 1981 (Joint Ministerial Gazette (GMBI) 1981, No. 33, page 518)**

This standard is to be applied for modifications to structural facilities, changes of use of rooms/buildings, for the construction of auxiliary equipment/buildings and load changes due to auxiliary equipment which are associated with decommissioning.

In general, the level of detail of the documents corresponds to the requirements of general building regulations.

### **3.9.2 Requirements for the documentation at nuclear power plants of 5 August 1982 (Joint Ministerial Gazette (GMBI) 1982, No. 26, page 546)**

In accordance with the regulations, the requirements also apply to the decommissioning procedure and are to be regarded in the context of the principles for the applicant's/licensee's documentation of technical documents pertaining to the construction, operation and decommissioning of nuclear power plants of 19 February 1988. The requirements deal with the documentation of material and building inspections. They should only be applied to components of the activity confinement and documentation category C should, in general, not be exceeded.

### **3.10 Implementation of the Radiation Protection Ordinance (StrlSchV) and the X-ray Ordinance (RöV); reporting on special events of 30 March 2015 (Joint Ministerial Gazette (GMBI) 2015 page 306)**

Replaced by circular of the BMU of 20 August 2020 Implementation of the Radiation Protection Act (StrlSchG) and the Radiation Protection Ordinance (StrlSchV), reporting pursuant to § 110 StrlSchV on other relevant events pursuant to § 108 StrlSchV and pursuant to § 170 StrlSchV on loss, discovery and acquisition, and contaminated metal.

### **3.11 Safety requirements for nuclear fuel supply facilities; April 1997 and June 2004 BMU RS III 3**

Safety requirement No. 2.15 refers to decommissioning and removal and requires preparation of decommissioning well in advance of cessation of operation (see also comment on 3.0.1).

### **3.14 Design guidelines and reference data for iodine sorption filters for the separation of gaseous fission iodine at nuclear power plants of 25 February 1976 (Joint Ministerial Gazette (GMBI) 1976, No. 13, page 168)**

As long as iodine absorption filters are required in the facility, this rule is to be taken into account.

### **3.27 Guideline relating to the assurance of the necessary knowledge of the persons otherwise engaged in the operation of nuclear power plants of 30 November 2000 (Joint Ministerial Gazette (GMBI) 2001, No 8, page 153)**

The scope of knowledge to be demonstrated and the intervals for this demonstration can be adjusted to the altered potential hazard of the respective state of the facility.

### **3.33.2 Incident calculation bases for the guidelines for the assessment of the design of nuclear power plants with PWR according to § 28(3) StrlSchV of 18 October 1983 (Federal Gazette (BAnz) No. 245a), version of Chapter 4 on the calculation of radiation exposure of 29 June 1994 (Federal Gazette (BAnz) No. 222a of 26 November 1994), amendment of Chapter 4 on the calculation of radiation exposure according to § 49 StrlSchV of 20 July 2001 adopted at the 186th meeting of the Commission on Radiological Protection on 11 September 2003, published in the series of reports of the Commission on Radiological Protection, Issue 44, 2004**

The calculation bases for incidents and accidents are to be applied under consideration of the still relevant protection goals and hazard potentials in decommissioning.

### **3.43.1 Guideline for the protection against radiation of personnel during the execution of maintenance work in nuclear power plants with light water reactors: Part I: The precautionary protective measures to be taken during the planning of the plant – IWRS I of 10 July 1978 (Joint Ministerial Gazette (GMBI) 1978, No. 28, page 418)**

This regulation is not applicable to the decommissioning procedure.

Thus, it can only be applied for the construction of facilities necessary for decommissioning in the scope of § 7(1) AtG in accordance with the protection goals.

**3.54.1 Basic recommendation for remote monitoring of nuclear power plants of 12 August 2005 (Joint Ministerial Gazette (GMBI) 2005, No. 51, page 1049)**

**3.54.2 Recommendation for calculating the fee as defined in § 5 AtKostV for the remote monitoring of nuclear power plants of 21 January 1983 (Joint Ministerial Gazette (GMBI) 1983, No. 8, page 146)**

After cessation of operation or after complete removal of the nuclear fuel in the plant and fundamental safety functions of subcriticality and residual heat removal no longer have to be met, the hazard potential is considerably reduced so that the number of parameters which require monitoring and, if necessary, the measurement areas must be adjusted.

**3.57.1 Requirements relating to the physical protection service and physical protection officers in nuclear installations and facilities of 4 July 2008 (Joint Ministerial Gazette (GMBI) 2008, No. 39, page 810)**

This guideline is to be applied, adapted to the quantities of nuclear fuels or other radioactive substances still present in the facility.

**3.57.3 Guideline for protecting LWR nuclear power plants against disruptive action or other interference by third parties of 6 December 1995 (Joint Ministerial Gazette (GMBI) 1996, No. 2, page 32) (without text)**

The protection goals listed in the guideline (theft of nuclear material, loss of primary coolant, residual heat removal) are generally no longer relevant for a facility under decommissioning after removal of the nuclear fuel. The protection goal is to prevent unnoticed theft and release of other radioactive substances. The guideline is therefore only to be applied in this sense.

**3.59 Guideline on the control of radioactive waste with negligible heat generation that is not handed over to a Land collection facility of 16 January 1989 (Federal Gazette (BAnz) No. 63a of 4 April 1989), last amended on 14 January 1994 (Federal Gazette (BAnz), No. 19 page 725)**

The regulation was replaced by Guideline for the control of radioactive residues and radioactive wastes of 19 November 2008 in terms of contents (see 3.60), but not officially withdrawn.

**3.62 Guideline relating to measures for the protection of facilities of the nuclear fuel cycle and other nuclear facilities against disturbances or other interference by individuals entitled to access to the facility of 28 January 1991 (Joint Ministerial Gazette (GMBI) 1991, No. 9, page 228)**

Once the fuel assemblies and defective fuel rods have been removed, it is only necessary to take measures against theft or release of other radioactive substances. As the decommissioning project progresses, the requirements of § 61 StrlSchG and § 87 StrlSchV may be adequate.

**3.63 Guideline for the protection of radioactive substances against disruptive action or other interference by third parties during transportation of 4 December 2003 (Joint Ministerial Gazette (GMBI) 2004, No. 12, page 238) (without text)**

Replaced by Guideline for protection against malicious acts (SEWD) during transportation of nuclear fuel by road and rail (transport security guideline road/rail) and on load assumptions for the design against malicious acts during transportation of nuclear fuel (load assumptions nuclear fuel transports) of 15 May 2018 (Joint Ministerial Gazette (GMBI) 2018, page 437) and by the Guideline for protection against malicious acts during handling and transportation of other radioactive substances (security guideline on other radioactive substances) of 2 March 2020 (Joint Ministerial Gazette (GMBI) 2020, page 286).

**3.69.1 Measurement programme for normal operation (routine measurement programme) of 28 July 1994 (Joint Ministerial Gazette (GMBI) 1994, page 930)  
Part I: Measurement programme for normal operation (routine measurement programme) of 28 July 1994 (Joint Ministerial Gazette (GMBI) 1994, page 930)**

**3.69.2 Measurement programme for normal operation (routine measurement programme) of 28 July 1994 (Joint Ministerial Gazette (GMBI) 1994, page 930)  
Part II: Measurement programme for intensive operation (intensive measurement programme) of 19 January 1995 (Joint Ministerial Gazette (GMBI) 1995, page 261)**

Replaced by General administrative provision on the Integrated Measurement and Information System for monitoring radioactivity in the environment (IMIS) in accordance with the Precautionary Radiation Protection Act (AVV-IMIS) of 13 December 2006 (Federal Gazette (BAnz) 2006, No. 244a).

### 3.74.1 Guideline for conducting periodic safety reviews (PSRs) for nuclear power plants in the Federal Republic of Germany

- Fundamentals for periodic safety reviews for nuclear power plants
- Guideline safety status analysis
- Guideline probabilistic safety analysis

Announcement of 18 August 1997 (Federal Gazette (BAZ) 1997, No. 232a)

### 3.74.2 Guideline for conducting periodic safety reviews (PSRs) for nuclear power plants in the Federal Republic of Germany, under revision

- Guideline deterministic security analysis

Announcement of 25 June 1998 (Federal Gazette (BAZ) 1998, No. 153)

These guidelines can be referred to for periodic reviews of the safety of nuclear facilities in safe enclosure.

### 3.99 Announcement regarding the guideline for the protection of IT systems in nuclear Installations and facilities of physical protection categories I and II against disruptive action or other interferences by third parties (SEWD-Richtlinie IT), regarding the load assumptions for the design of nuclear installations and facilities against disruptive action or other interference by third parties by means of IT attacks (IT load assumptions) and the explanations for the assignment of the IT systems of nuclear power plants to IT protection requirements classes (explanatory notes) "of 8 July 2013 (Joint Ministerial Gazette (GMBI) 2013, No. 36, page 711)

As long as the nuclear facility is assigned to physical protection category I and II, the requirements of the guideline are to be complied with.

#### Comments on the technical qualification guidelines:

- 3.2 **Guideline concerning the proof of the technical qualification of nuclear power plant personnel of 24 May 2012 (Joint Ministerial Gazette (GMBI) 2012, No. 34, page 611)**  
Adaptation of proof of technical qualification of nuclear power plant personnel at nuclear power plants without authorisation for power operation, BMU circular of 21 May 2013 (file number R I 6 - 13831-1/1 and 13831-1/2) with Annex 1
- 3.38 **Guideline for the maintenance of technical qualification of responsible nuclear power plant personnel of 17 July 2013 (Joint Ministerial Gazette (GMBI) 2013, No. 36, page 712)**  
Adaptation of the maintenance of technical qualification of nuclear power plant personnel at nuclear power plants without authorisation for power operation, BMUB circular of 23 January 2014 (file number RS I 6 - 13831-1/3) with annex
- 3.39 **Guideline relating to the contents of the examination of the technical qualification of 24 May 2012 (Joint Ministerial Gazette (GMBI) 2012, No. 30, page 905)**  
Adaptation of the contents of the examination of the technical qualification of nuclear power plant personnel at nuclear power plants without authorisation for power operation, BMU circular of 21 May 2013 (file number RS I 6 - 13831-1/1 and 13831-1/2) with Annex 2

The applicability of the above-mentioned technical qualification guidelines and their respective adaptations for nuclear power plants without authorisation for power operation is determined by the state of the facility and, in particular, by the quantities of nuclear fuels still present in the facility. According to Guideline No. 3.2, Section 1.2, the competent supervisory and licensing authority decides on the application to facilities under decommissioning on a case-by-case basis.

For practical application, the following should be considered:

1. As long as there are nuclear fuels or other radioactive substances with comparable hazard potential in the facility, the requirements in terms of technical qualification apply as described in the adaptations for nuclear power plants without authorisation for power operation.
2. After removal of the nuclear fuel from the facility, changes in the operational organisation can be implemented due to the reduced hazard potential, which may have the effect that some of the responsible functions stated in Sections 1.3.1 to 1.3.7 of Guideline No. 3.2 are no longer permanently required (e.g. reactor operator). For the remaining responsible personnel, proof of technical qualification is still required.

3. After removal of the nuclear fuel from the facility, it is no longer necessary to include subjects exclusively related to reactor operation in the proof of the technical qualification of the remaining responsible personnel or those newly recruited.
4. Subjects to be included to a greater extent in staff training, proof of technical qualification and maintenance of technical qualification are to be selected in a dismantling-specific manner.
5. After removal of the nuclear fuel, a greater distinction can be made during the decommissioning procedure between requirements for existing staff and new staff regarding the proof of technical qualification.
6. The corresponding changes in the organisational plans, basic and advanced training schedules of the licence holder require the approval of the competent nuclear authorities.
7. Radiation protection supervisors [in 3.61 referred to as radiation protection officers] are still to be appointed taking into account Guideline No. 3.61. The question of the continuous presence of a radiation protection supervisor at the facility under decommissioning can be decided during the course of the licensing procedure. Depending on the progress of the decommissioning work, in particular if shift operation is changed or abandoned, an on-call system may be sufficient.
8. The competent nuclear authority has to decide whether, depending on the stage of decommissioning reached, shift leaders, reactor operators and control panel operators as well as training managers are still required as responsible persons.

**3.3 Guideline relating to the proof of the technical qualification of research reactor personnel of 16 February 1994 (Joint Ministerial Gazette (GMBI) 1994, No. 11, page 366)**

**3.53 Guideline relating to the contents of the examination of the technical qualification of responsible shift personnel in research reactors of 14 November 1997 (Joint Ministerial Gazette (GMBI) 1997, No. 42, page 794)**

See Guideline 3.39.

**3.61 Guideline for the technical qualification of radiation protection officers at installations for fission of nuclear fuels of 20 February 2014 (Joint Ministerial Gazette (GMBI) 2014, No. 13, page 289)**

In view of the decreasing scope at these stages, reference can be made to Section 4 according to which exceptions from the requirements may be made. In particular, the training content should be adapted to the tasks to be fulfilled then.

**3.65 Requirements on courses for imparting basic nuclear knowledge for responsible shift personnel in nuclear power plants – criteria for recognition – of 19 November 2014**

The requirements for the training courses on basic nuclear knowledge are to be adapted according to the state of the facility and the amount of nuclear fuel still in the facility, see guidelines 3.39 and 3.53.

**3.71 Guideline relating to the technical qualification of responsible personnel in facilities for the production of fuel elements for nuclear power plants of 30 November 1995 (Joint Ministerial Gazette (GMBI) 1996, No. 2, page 29)**

The contents of the specialist training mentioned in the guideline with regard to fire protection and occupational safety as well as the structure and function of the facility, the management of accidents and knowledge of the plant regulations of the operating manual are relevant for the entire stage of decommissioning.

**Comments on the KTA safety standards:****KTA 1201 Requirements for the Operating Manual**

The relevant parts of this standard are to be applied in the decommissioning procedure. To a large extent, the following parts are no longer relevant: Section 7 "Requirements Pertaining to the Operating Manual, Part 2" (operation of the overall plant), Section 8 "Requirements Pertaining to the Operating Manual, Part 3 (design basis accidents and Section 9 "Requirements Pertaining to the Operating Manual, Part 4" (systems operation).

Re: Section 6: The plant regulations are to be adapted according to the selected operational organisation. An additional waste and residue regulation is recommended.

Re: Section 7.2 "Safety-related Limit Values – SSp": This part is to be adapted to the special conditions of the decommissioning project. In particular, the safety-relevant limit values concerning the emission of radioactive substances via the water and air path, the reporting criteria and the obligations imposed by the authorities are to be included. The clearance criteria for radioactive substances are to be incorporated.

Re: Section 8: The design basis accidents to be considered are to be adapted to the special conditions of the decommissioning project.

Re: Section 9: Important additional systems are to be described in addition to the systems operated so far.

In general, the operating manual is to be adapted to the condition of the facility as decommissioning progresses.

**KTA 1202 Requirements for the Testing Manual**

This standard is also applicable during the decommissioning procedure. A testing manual is necessary as long as there are safety requirements to be applied to systems that continue to be operated during decommissioning actions and to new systems to be installed during the course of decommissioning.

In general, the testing manual is to be adapted to the condition of the facility as decommissioning progresses. Simplifications (e.g. for the operating status) are possible.

**KTA 1203 Requirements for the Emergency Manual**

The emergency manual is to be adapted to the event sequences that are still possible as decommissioning progresses and may be superseded in parts or completely by amendments in the manual for (residual) operation.

**KTA 1301.1 Radiation Protection Considerations for Plant Personnel in the Design and Operation of Nuclear Power Plants; Part 1: Design**

This standard applies to the planning of buildings and systems within the controlled area and the adjacent part of the sanitary tract. It is only applicable to comparable plant modifications and the construction of new parts of buildings and the facility. Here, the possibly lower activity inventory is to be taken into account. The aspects of design basis accidents to be considered (Section 9) are no longer relevant.

**KTA 1401 General Requirements Regarding Quality Assurance**

This standard applies to quality assurance from planning to the operation of stationary nuclear power plants and is to be applied during the decommissioning procedure, taking into account the respective activity inventory, for such systems/components that serve the purpose of activity confinement and activity monitoring.

**KTA 1402 Integrated Management Systems for the Safe Operation of Nuclear Power Plants**

This safety standard contains the requirements for the integrated management system, which are relevant for ensuring and continually improving safety. The management system is designed to promote safety culture. This results in the protection-oriented application of this standard also for the decommissioning of nuclear power plants.

**KTA 1403 Ageing Management in Nuclear Power Plants**

In the course of decommissioning procedures, the ageing management is to be adapted to changes in the condition of the facility and to the safety-relevant structures, systems and components still required. Ageing management is particularly important in the phase of safe enclosure.

**KTA 1404 Documentation during the Construction and Operation of Nuclear Power Plants**

This standard is also to be applied to the documentation that is drawn up during the decommissioning project for the licensing and supervisory procedures.

This applies, in particular, to the principles laid down in KTA 1404.

Sections 3 and 4 of the standards and the retention periods according to Tables 4 and 4-2 are applicable to decommissioning projects.

The documentation has to include a description of the condition of the facility changing during the decommissioning process in order to allow an assessment of the actual condition of the facility.

This documentation has to show that the legal prerequisites and legal principles are in place and complied with in a way which can be traced back and proven.

**KTA 1501 Stationary System for Monitoring the Local Dose Rate within Nuclear Power Plants**

The measuring range and the requirements for the measuring devices in the event of accidents as well as the number of measuring devices are to be adapted to the special conditions of the decommissioning procedure.

In accordance with the nature of the decommissioning actions, the local dose rate measurements are mainly to be performed by means of non-stationary measuring devices.

**KTA 1502 Monitoring Volumetric Activity of Radioactive Substances in the Inner Atmosphere of Nuclear Power Plants**

The requirements for the measuring devices in the event of design basis accidents as well as the number of measuring devices are to be adapted to the special conditions of the decommissioning procedure. Monitoring can then be reduced to the radioactive substances which may be present. Non-stationary devices are usually adequate when the facility is in the state of safe enclosure.

**KTA 1503.1 Monitoring the Discharge of Radioactive Gases and Airborne Radioactive Particulates; Part 1: Monitoring the Discharge of Radioactive Matter with the Stack Exhaust Air During Specified Normal Operation**

This standard is to be applied. Measurement can be limited to the radioactive substances still present given the state of the facility. The requirements in terms of redundancy and electricity supply can be adapted to the decommissioning progress.

**KTA 1507 Monitoring the Discharge of Radioactive Substances from Research Reactors**

Measurement can be limited to the radioactive substances still present given the state of the facility.

**KTA 2101.1 Fire Protection in Nuclear Power Plants; Part 1: Basic Requirements****KTA 2101.2 Fire Protection in Nuclear Power Plants; Part 2: Fire Protection of Structural Components****KTA 2101.3 Fire Protection in Nuclear Power Plants; Part 3: Fire Protection of Mechanical and Electrical Plant Components**

The requirements for protection of redundancies can be reduced.



**KTA 2103 Explosion Protection in Nuclear Power Plants with Light Water Reactors; (General and Case-Specific Requirements)**

The requirements of this standard are aimed at maintaining the function of safety-relevant parts of the facility where there are explosion hazards. The basic principles (3) and the general requirements (4) are to be applied but limited to the remaining parts of the facility that are still important for safety.

**KTA 2201.1 Design of Nuclear Power Plants against Seismic Events; Part 1: Principles<sup>1</sup>**

This standard is no longer applicable to existing buildings in decommissioning unless a reassessment is carried out as part of a decommissioning procedure.

If buildings for replacement systems are erected within the framework of decommissioning, the standard is to be applied.

**KTA 2206 Design of Nuclear Power Plants Against Damaging Effects from Lightning**

According to the event analysis for plants under decommissioning, lightning protection is relevant for all states of a facility and thus also for the in-service inspections. This also applies to modifications to the existing and already approved lightning protection of the facility.

**KTA 2207 Flood Protection for Nuclear Power Plants**

As the decommissioning actions progress, the protection goal becomes limited to the safe enclosure of the radioactive substances.

For the load combinations (Section 6), earthquakes generally do not have to be taken into account.

**KTA 2501 Structural Waterproofing in Nuclear Power Plants**

This standard is to be applied in the decommissioning project for structural modifications and new parts of structures. For the decommissioning actions, the protection goal is limited to the safe enclosure of the radioactive substances.

**KTA 2502 Mechanical Design of Fuel Assembly Storage Pools in Nuclear Power Plants with Light Water Reactors**

If the disassembly of components is to take place in the fuel pool, it is to be assessed whether further safety demonstrations are required beyond the existing design.

**KTA 3204 Reactor Pressure Vessel Internals**

This standard is applicable to load attachment points of reactor pressure vessel internals as well as to tools and equipment used for the installation, removal and putting down of components and subassemblies of reactor pressure vessel internals.

**KTA 3301 Residual Heat Removal Systems of Light Water Reactors**

The regulations of KTA 3301 apply with regard to the design and availability of the heat sink for residual heat removal and the power supply for the residual heat removal systems.

**KTA 3400 Containment**

If a ventilation concept is available which ensures the fundamental safety function "confinement of radioactive material" without pressure grading, the KTA safety standards of series 3400 can be treated as not relevant for decommissioning.

In cases where a ventilation concept with pressure grading is provided, safety standards KTA 3401.4 to 3409 are applicable with regard to the fundamental safety function "confinement of radioactive material".

KTA 3401.1 to 3401.3 are no longer relevant in decommissioning regardless of the ventilation concept.

**KTA 3601 Ventilation Systems in Nuclear Power Plants**

The general requirements of Section 3 are to be complied with.

After removal of the nuclear fuel, Air Conditioning Class 2 as specified in Section 4 is sufficient since the main focus of the decommissioning work is on the safe enclosure of the radioactive substances and on maintenance of specific humidity (corrosion protection). The negative pressure differentials and the air exchange rates are to be adapted to the requirements as decommissioning progresses. Redundant design and emergency power connection are generally not required.

**KTA 3605 Treatment of Radioactively Contaminated Gases in Nuclear Power Plants with Light Water Reactors**

This standard applies to systems for the collection, conduction and processing of radioactively contaminated gaseous wastes in nuclear power plants with pressurised water reactor and in nuclear power plants with boiling water reactor. The standard is relevant for the treatment of the radioactively contaminated gases still present during decommissioning given the state of the facility.

**KTA 3703 Emergency Power Facilities with Batteries and AC/DC Converters in Nuclear Power Plants**

For alarm and monitoring systems (e.g. fire alarm system, local dose rate measuring system, exhaust air monitoring), a secured power supply is required, for the requirements of which the aforementioned KTA safety standard can be referred to.

**KTA 3901 Communication Means for Nuclear Power Plants**

This standard is generally applicable in the decommissioning procedure. A redundant design of the alarm and personal paging system is not necessary. For the operation of safe enclosure, permanently installed means of communication are not required for internal communication.

### 11. Appendix 4: Application documents for decommissioning, safe enclosure and dismantling of nuclear facilities in the Federal Republic of Germany procedures

No.	Document	Reference	Content	Use/Remarks
1	Letter of application	§ 7(3) AtG § 2 AtVfV § 6 AtVfV	name and address of applicant; type of licence applied for; type and scope of facility and planned decommissioning actions	nuclear licensing authority, authorised experts; initiation of procedure; under certain circumstances announcement and public inspection
2	Safety report	§ 3(1)1 AtVfV § 6 AtVfV	description and drawing of facility and decommissioning actions; description and explanation decommissioning plan, safety-related principles; provisions to fulfil § 7(2)3 AtG, radiation protection measures; description of the surrounding area and its composition; discharges and releases of radioactive substances (§ 47 StrlSchV, § 50 StrlSchV); consequences of direct radiation and releases of radioactive substances	nuclear licensing authority, authorised experts; especially for third parties; under certain circumstances public inspection; no commercial secrets
3	Supplementary plans, drawings and descriptions of the facility and the planned decommissioning actions	§ 3(1)2 AtVfV	If required or requested by the nuclear licensing authority, the specific issues in the safety report are supplemented by explanatory reports.  - explanatory report on systems and equipment which are to be decommissioned, modified or newly constructed - documentation of the status of the facility - radiological (activity inventory, local dose rates, contamination of surfaces and rooms, quantities of wastes) - by mass - explanatory reports (where applicable) concerning: - structural measures - mechanical measures - ventilation measures - instrumentation and control measures - electrical measures - administrative or organisational measures	nuclear licensing authority, authorised experts;  commercial secrets to be identified as such
4	Report on physical protection	§ 3(1)3 AtVfV § 7(2)5 AtG	details on measures to prevent interference by third parties, responsibilities	nuclear licensing authority, authorised experts; separate submission; classified document
5	Trustworthiness and technical qualification	§ 3(1)4 AtVfV § 7(2)1 AtG	appointment of responsible persons, proof of technical qualification as defined in or according to the BMU guideline on technical qualification of nuclear power plant personnel;  details on trustworthiness	nuclear licensing authority, authorised experts;  commercial secrets to be identified as such
6	Knowledge and trustworthiness	§ 3(1)5 AtVfV § 7(2)2 AtG AtZüV	necessary knowledge and procedures for the transfer of knowledge to staff otherwise engaged;  details on trustworthiness; equally applicable to external staff	nuclear licensing authority, authorised experts;  commercial secrets to be identified as such

No.	Document	Reference	Content	Use/Remarks
7	List of safety-relevant measures	§ 3(1)6 AtVfV § 7(2)3 AtG § 104 StrlSchV	list of measures for the management of incidents and damage events (safety specifications);	nuclear licensing authority, authorised experts;  commercial secrets to be identified as such
8	Financial security measures	§ 3(1)7 AtVfV § 7(2)4 AtG § 12 AtDeckV	proposals for fulfilling compensation obligations	nuclear licensing authority, authorised experts;  commercial secrets to be identified as such
9	Radioactive residues	§ 3(1)8 AtVfV § 9a AtG	description of the radioactive residues arising;  measures for avoiding radioactive residues, for non-detrimental utilisation and disposal as waste	nuclear licensing authority, authorised experts;  commercial secrets to be identified as such
10	Overriding public interests, environmental impacts	§ 3(1)9 AtVfV § 7(2)6 AtG	list of proposed measures for protecting water, air and ground;  details on other environmental impacts	nuclear licensing authority in consultation with other relevant authorities, authorised experts;  commercial secrets to be identified as such
11	EIA documents	§§ 2a, 7(4) AtG §§ 1a, 3, 4, 19b AtVfV §§ 1, 9(1) UVPG § 16(1) UVPG §§ 8 et seq. AtVfV § 6 AtVfV	determination of relevant environmental impacts;  presentation of procedural alternatives;  documents of the project developer;  hearing	in the case of public participation and thus projects subject to environmental impact assessments
12	Brief description	§ 3(4) AtVfV § 6 AtVfV	summary description in accordance with safety report	nuclear licensing authority, authorised experts, third parties;  if public involvement is necessary: public inspection;  no commercial secrets
13	List of documents submitted	§ 3(4) AtVfV	listing	nuclear licensing authority, authorised experts;  documents containing commercial secrets should be identified
14	Adaptation of operating manual and testing manual		revision according to the new state of the facility;  dismantling manual	nuclear licensing authority, authorised experts
15	Details on licensing notices, conditions and permissions to be withdrawn or amended		list with explanations or justification	nuclear licensing authority, authorised experts;  commercial secrets to be identified as such
16	Documents required by building regulations	Land building code	details on building and demolition activities associated with decommissioning	nuclear licensing authority, as the case may be the legal board of construction
17	Documents required by the Federal Immission Control Act (BlmSchG)	§ 7(2)6 and § 8 AtG	documents on facilities subject to licensing according to § 4 BlmSchG	nuclear licensing authority, competent Land authority for immission control
18	Documents relating to water law	Federal Water Act (WHG) § 7(2)6 AtG	application for water licence and permit, if modification required	water authority, nuclear licensing authority