Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection

Baden-Württemberg
MINISTRY OF THE ENVIRONMENT, CLIMATE PROTECTION
AND THE ENERGY SECTOR

SH
Schleswig-Holstein
Ministry for Energy Transition,
Agriculture, Environment,
Nature and Digitalization

Advance Reference Material

IRRS Follow-up Mission 2023

Germany

Bavarian State Ministry of the
Environment and Consumer Protection

MV
Mecklenburg-Vorpommern
Ministerium für Klimaschutz,
Landwirtschaft, ländliche
Räume und Umwelt

HESSEN
Hessian Ministry of Environment,
Climate Protection, Agriculture
and Consumer Protection

Ministry for the Environment, Energy and
Climate Protection of the State of Lower Saxony

Ministry of Economic Affairs,
Industry, Climate Action and Energy
of the State of North Rhine-Westphalia

Federal Office
for the Safety of
Nuclear Waste Management

Contents

1 Introduction

From 9th to 16th October 2023, a Follow-up Integrated Regulatory Review Service (IRRS) mission will take place in Germany. A preparatory meeting for the follow-up IRRS mission was held from 25th to 26th April 2023 and the Terms of Reference (ToR) of the mission were agreed and signed by the team coordinator Mr. Shah and the German Liaison Officer Mr. Elsner. The preparatory documents (Advance Reference Material, ARM) according to section 9 of the ToR and Chapter 8 item 8.3.2 of the IRRS guidelines are presented and described in this report. In addition, the report presents a comprehensive description of the German nuclear regulatory system including changes since the IRRS mission 2019.

Chapter 2 of the report presents the scope and objective of the IRRS follow-up mission to Germany. The German nuclear regulatory system is described in Chapter 3. All authorities involved in the mission, as well as the German liaison officers and counterparts are introduced in Chapters 4 and 5, respectively. Chapter 6 gives an overview of the nuclear installations in Germany.

Chapter 7 of the report addresses the implementation of the recommendations and suggestions of the IRRS mission 2019, which led to the updated National Action Plan (NAcP). To this effect, both the NAcP and the process that has been followed for the implementation is presented. For each of the recommendations and suggestions, the actions taken and the status of its implementation are presented, respectively.

Chapter 8 introduces the policy issue to be discussed during the follow-up mission.

Chapter 9 of the report lists the further documentation given in full text in the electronic version of the ARM.

Chapters 10, Chapter 11 and Chapter 12 of the report consist of a list of abbreviations, a list of German organisations and institutions, and organisational charts of the involved authorities, respectively.

2 Objectives and Scope of the Follow-up Mission

In April 2019, a second IRRS mission of the International Atomic Energy Agency (IAEA) took place in Germany at the invitation of the Federal Republic of Germany, represented by the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV). Due to an ARTEMIS mission scheduled for the second half of 2019, Germany decided to extend the scope of the IRRS mission to include the regulatory framework related to decommissioning of nuclear facilities and installations and radioactive waste management.

The scope of the IRRS mission was the regulatory framework for nuclear safety and radiation protection covering nuclear power plants, research reactors as well as fuel cycle and waste management facilities. The scope of the mission also included the topics of special interest of decommissioning, emergency preparedness and response, and occupational radiation protection. The mission covered within IAEA's structured peer-review system all nine IRRS core modules with modules 5 to 9 focusing on nuclear power plants, research reactors, fuel cycle and waste management facilities, and decommissioning, as well as module 10 on emergency preparedness and response and partially module 11 with the focus on occupational radiation protection (IRRS Guideline 2013) .

To complete the second IRRS mission process and to be able to show the reviewers the continuous improvement of the Regulatory Body for nuclear safety and radiation protection in Germany, also as a result of the IRRS mission, Germany has decided to conduct an IRRS follow-up mission. On 18th August 2021, the German Federal Government requested the IAEA to organise an IRRS follow-up mission to Germany in the second half of 2023. The IRRS follow-up mission will focus on the implementation of suggestions and recommendations arising from the IRRS mission in 2019. Accordingly, the scope remains unchanged for the follow-up mission.

The safety of nuclear installations remains a top priority in Germany. During the IRRS mission 2019, specific areas for improvement were identified. Since then, significant progress has been made in the implementation of corresponding actions, which arose primarily from the recommendations and suggestions during the IRRS mission. This demonstrates a strong commitment to further strengthening the regulatory framework for nuclear safety and radiation protection, despite the phase-out of nuclear energy in Germany.

As explained in detail in the following chapter, Germany is composed of 16 federal states, called Länder. Therefore, the German Regulatory Body will be – as for the IRRS mission 2019 – represented by the competent licensing and supervisory authorities on the federal as well as the Länder level:

- The Federal Ministry for Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)
- The Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg (UM BW)
- The Ministry for Energy Transition, Climate Protection, Environment and Nature of the State of Schleswig-Holstein (MEKUN)
- The Bavarian State Ministry of the Environment and Consumer Protection (StMUV)
- The Ministry of Environment, Climate Protection, Agriculture and Consumer Protection of the State of Hesse (HMUKLV)
- The Ministry for Climate Protection, Agriculture, Rural Areas and the Environment of the State of Mecklenburg-Western Pomerania (LM MV)
- The Ministry for the Environment, Energy and Climate Protection of the State of Lower Saxony (MU)
- The Ministry of Economic Affairs, Industry, Climate Action and Energy of the State of North Rhine-Westphalia (MWIKE)
- The Federal Office for the Safety of Nuclear Waste Management (BASE)

The IRRS follow-up will mainly take place close to the BMUV headquarter in Bonn from 9th to 16th October 2023. The entrance meeting will take place on the premises of the BMUV and include a visit of the Federal Radiological Situation Centre (RLZ). The mission will include interviews with representatives of the regulatory body both at federal and Länder level.

The IRRS follow-up will also include a generic Policy Issue Discussion on “Changing the way of working – on the way to the ‘new normal’”. This will entail in particular the impact of the Covid 19 pandemic on the mode of operation of German authorities.

3 The Regulatory System in Germany

The aim of the nuclear and radiation protection licensing and supervisory authorities of the Federation and the Länder is to monitor whether the operators of all nuclear installations and facilities in Germany ensure the required safety.

A system of checks and balances is in place between the Federation and the Länder in the context of a distribution of tasks (federal executive administration, i.e. execution by the Länder on federal commission). This system, which has existed for many decades, is based on trust and control between the Federation and the Länder and forms the basis for the continued existence of high safety requirements.

In Germany, the independence of regulatory decision-making at both federal and Länder level is ensured by a clear functional separation. The safety-related tasks of nuclear licensing and supervision ("monitoring") as well as of radiation protection are generally performed by the Land ministries on behalf of the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV), whereas the energy industry and promotion fall within the competence of the Federal Ministry for Economic Affairs and Climate Action (principle of separation). In addition, safety-related tasks of licensing and supervision under nuclear and radiation protection law are performed by the Federal Office for the Safety of Nuclear Waste Management (BASE) and the Federal Office for Radiation Protection (BfS), established as supreme authorities within the portfolio of the BMUV.

To simplify matters, the term "nuclear" licensing and supervisory authorities of the Federation and/or the Länder (i.e. under nuclear law) is used in the following even if the respective authority is usually also the licensing and supervisory authority under radiation protection law.

3.1 Constitutional framework

Germany is a republic with a federal structure and is composed of 16 federal states (Länder). This is laid down in the Basic Law for the Federal Republic of Germany (Grundgesetz (GG)). Together with the Atomic Energy Act (AtG), the Basic Law forms the framework for nuclear safety in the Federal Republic of Germany.

According to the Basic Law, the Federal Chancellor determines the competence of the supreme federal authorities (ministries) by organisational decree. Accordingly, the responsibility for the nuclear safety of nuclear installations and radiation protection was transferred to the BMUV. The

Basic Law has assigned the legislative power for the peaceful use of nuclear energy to the Federation. As part of the Federal Government, the BMUV is regularly involved in legislation, either by introducing legislative initiatives or within the framework of technical formulation proposals requested from the parliamentary area. The Länder implement the Atomic Energy Act on behalf of the Federation (federal executive administration).

3.2 Responsibilities in the Federation and the Länder

Competent nuclear regulatory authority of the Federation

In addition to the responsibility for the nuclear safety of nuclear installations and radiation protection, the BMUV is also responsible for the organisation, staffing and resources of the federal nuclear licensing and supervisory authority. At the end of 2021, further responsibilities regarding nuclear safety and waste management research as well as safeguards were also transferred from the Federal Ministry for Economic Affairs and Climate Action to the BMUV.

Directorate-General S “Nuclear Safety, Radiological Protection” of the BMUV comprises three directorates. Directorate S I performs tasks in the field of nuclear safety. Directorate S II performs tasks in the field of radiation protection, including emergency preparedness and response. Directorate S III takes care of tasks relating to nuclear waste management. With regard to the tasks of the BASE, S III is responsible for the technical supervision. It is also stated in the Strategic Plan of Directorate-General S that the BMUV bears the nationwide governmental responsibility for the effective protection of man, the environment and property against nuclear hazards and risks as well as against the harmful effects of ionising and non-ionising radiation. Aware of this responsibility, a high safety culture is to be maintained and further developed.

The basic understanding of safety-oriented action of all nuclear and radiation protection authorities of the Federation and the Länder is furthermore laid down in the National Policy Paper “Nuclear Safety” (as of July 2021). This paper, jointly developed by the Federation and the Länder in 2021, pursues a holistic approach and sets out the German understanding of giving priority to and continuous improvement of nuclear safety.

Competent nuclear regulatory authorities of the Länder

In the Länder, the supreme Land authorities have been designated as competent nuclear licensing and supervisory authorities in accordance with the Atomic Energy Act.

Analogous to the federal level, there is also an effective separation at the Länder level between the tasks of the nuclear licensing and supervisory authorities and the competent authority for economic development. This ensures the effective independence of the nuclear licensing and supervisory authorities from the operators of nuclear installations and facilities in decision-making processes.

Within the framework of decisions on licences, the nuclear licensing and supervisory authorities of the Länder examine the fulfilment of the licensing requirements. The specific form and implementation of the licensing procedure under the Atomic Energy Act are regulated in detail in the Nuclear Licensing Procedure Ordinance (AtVfV).

Within the framework of supervision, the respective Land nuclear authority monitors, with the assistance of authorised experts, in particular,

- compliance with the provisions of the Atomic Energy Act, the Radiation Protection Act, the ordinances under nuclear and radiation protection law and other nuclear safety standards and guidelines,
- compliance with the provisions, obligations and ancillary provisions imposed in the licence notices, and
- fulfilment of supervisory orders issued.

In addition, the Land nuclear authority also monitors, with the assistance of authorised experts or through other authorities, among other things,

- compliance with the safety-relevant operating procedures,
- performance of in-service inspections and maintenance measures for safety-relevant components,
- the evaluation of special occurrences and the development and implementation of appropriate measures against recurrence of the event,
- the implementation of modifications to the installation or its operation,
- the dismantling of components and the treatment of radioactive waste,

- radiation protection monitoring of personnel in nuclear installations,
- the measures taken by the licensee for environmental monitoring of nuclear installations,
- compliance with the plant-specific authorised limits for the discharge of radioactive substances via air and water,
- the clearance of substances, objects, parts of buildings, etc.
- the measures against disruptive action or other interference by third parties,
- the reliability of the applicant,
- the technical qualification and the maintenance of qualification of the responsible persons as well as of the knowledge of personnel otherwise engaged in the installation, and
- the management system and the quality assurance measures.

Distribution of responsibilities

The distribution of responsibilities between the Federation and the Länder provides for independent administrative action by the licensing and supervisory authorities of the Länder within the framework of federal executive administration. The Länder thus have the competence for the subject matter and to execute duties.

In practice, the Länder carry out the tasks assigned to them on their own responsibility (see Fig. 3-1). However, the Federation has the right to issue directives within the framework of federal executive administration. The Federation only makes use of this option in exceptional cases, as a last resort. Before it comes to that, the BMUV strives to clarify different opinions through consultations. This can usually be achieved. If, however, an agreement is not possible, the Federation can instruct the Länder to take concrete administrative action or prescribe a decision (instruction). In doing so, it takes over the competence in the subject matter.

Communication with the operator, which includes any legally binding action, is performed by the Länder (competence to execute duties).

The essential processes of nuclear supervision of the Federation and the Länder as well as their interfaces in connection with the safety of nuclear power plants in power operation and in post-operation are described in a “Handbook on Cooperation between the Federation and the Länder in Nuclear Law” (Supervision Manual) (Handbuch über die Zusammenarbeit zwischen Bund und

Ländern im Atomrecht – AHB). Its scope was expanded to include plants in decommissioning and research reactors due to the recommendations and suggestions of the IRRS Mission 2019. In parallel, work was started on the development of processes in the field of nuclear waste management.

The essential tasks of the Federation and the Länder are described in Tab. 3-1.

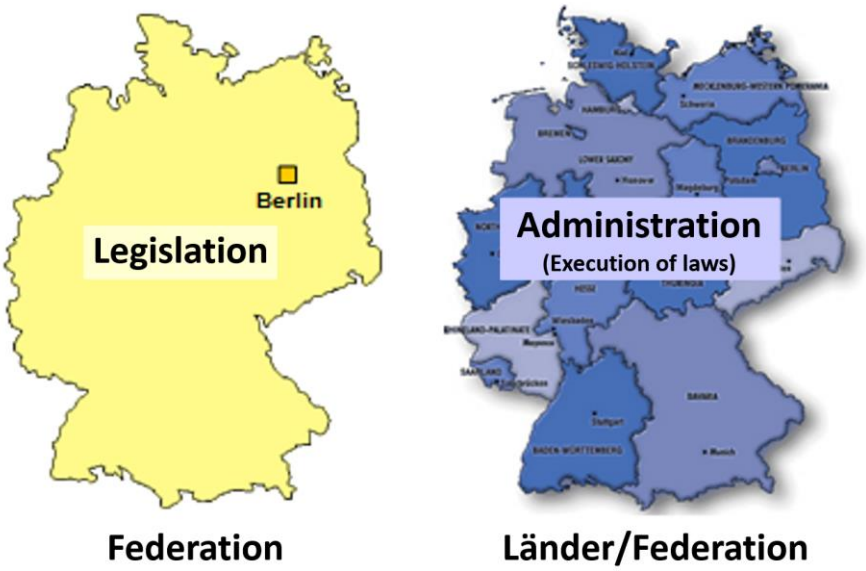

Fig. 3-1 Shared responsibility between the Federation and the Länder

Tab. 3-1 Shared responsibility between the Federation and the Länder

Key Regulatory Functions	Federal Level	Länder Level
Development of Guides and Regulations	**Responsible**	Participating
Regulatory Research	**Responsible**	Participating
International Cooperation	**Responsible**	Participating
Authorisation / Licensing	Supervising*	**Responsible**
Review and Assessment	Supervising	**Responsible**
Inspection and Enforcement	Supervising	**Responsible**
* Exceptions exist for: spent fuel storage facilities, existing disposal projects, the site selection process for a disposal for high level radioactive waste and for future disposal sites		

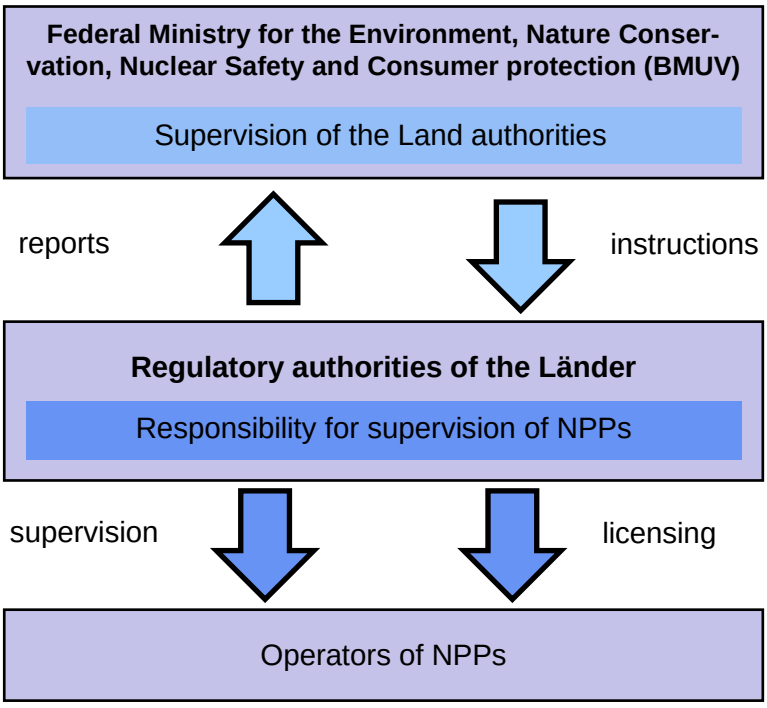

Fig. 3-2 Shared responsibility between the Federation and the Länder

In the case of facilities for the disposal of radioactive waste, state supervision is regulated differently from the division of tasks between the Federation and the Länder. The overall reorganisation of the nuclear waste management sector was initially due to the aim of implementing the site selection for a disposal facility for high-level radioactive waste efficiently. Accordingly, the BASE (initially “BfE”) was established in 2014 in particular as the central licensing and supervisory authority of the Federation in the field of waste management. The BASE monitors the implementation of the site selection procedure and organises the public participation, which is required by law. In addition, the BASE is the competent supervisory authority for the existing disposal projects for low- and intermediate-level radioactive waste, Konrad and ERAM. However, the responsibility for the Konrad disposal facility and ERAM with regard to licensing initially will rest with the Land authorities (Konrad: until commissioning, ERAM: until the plan approval decision for closure). Thereafter, this will become the responsibility of the BASE. The BASE is also responsible, among other things, for the supervision of the Asse II mine under nuclear and radiation protection law and for the licensing of storage facilities for spent fuel.

3.3 Committees and organisations

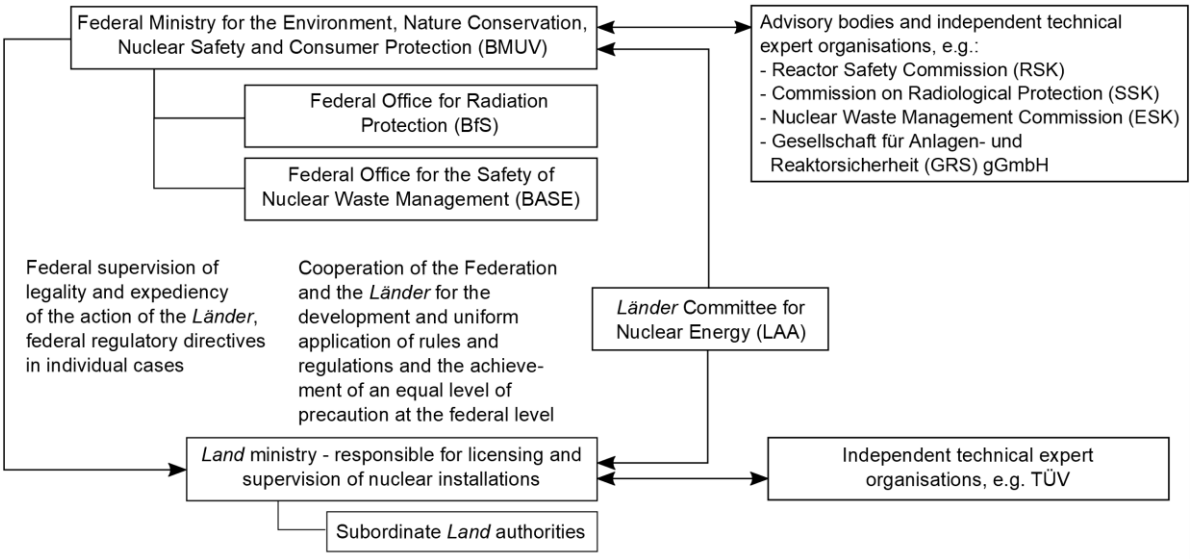

Fig. 3-3 Structure of the regulatory body

Subordinate authorities of the Federation

Belonging to the BMUV's portfolio are two subordinate authorities responsible for nuclear safety, radiation protection and nuclear waste management issues. Their tasks are defined in the corresponding establishment acts.

Federal Office for Radiation Protection (BfS)

The subordinate authority of the BMUV in the area of radiation protection is the BfS. The technical departments of the BfS deal in particular with the effects and risks of ionising and non-ionising radiation, medical and occupational radiation protection, radioactivity in the environment as well as emergency preparedness and response.

Federal Office for the Safety of Nuclear Waste Management (BASE)

As a subordinate authority of the BMUV, BASE performs statutory tasks in the areas of licensing for storage and transport, nuclear safety, tasks related to the search for and selection of a site for a disposal facility for high-level radioactive waste (site selection procedure), in task-related research and in the planning approval and licensing of disposal facilities, including approvals under mining law and permits under water law (it should be noted that this does not apply to the Asse – here the responsibility remains with the Land of Lower Saxony -–. for Konrad only from commissioning and for the ERAM only from the planning approval decision for closure; prior to this, the responsibility for these two facilities lies with the corresponding Land authorities) as well as the supervision of disposal under nuclear and radiation protection law. In the area of nuclear waste management, the BASE develops substatutory rules and regulations in consultation with the BMUV.

The BfS and BASE provide technical and scientific support to the BMUV and also perform federal tasks in the areas mentioned above on behalf of the BMUV.

Cooperation between the federal and Land authorities (regulatory body) – Länder Committee for Nuclear Energy (LAA)

In the federal German system, in which the tasks are shared between the Federation and the Länder, the coordination of tasks and joint action to increase nuclear safety has a very special role to play. To this end, the Federation and the Länder founded the “Länder Committee for Nuclear Energy” (LAA) already in 1958. The LAA is a permanent federal and Länder body composed of representatives of the nuclear licensing and supervisory authorities of the Länder and of the BMUV

(see also Process 12 “Länder Committee for Nuclear Energy” in the Supervision Manual of the Federation and Länder). It supports the Federation and the Länder in the execution of the Atomic Energy Act and Radiation Protection Act as well as in the preparation of amendments and the further development of legal and administrative provisions and of the substatutory rules and regulations. In particular, the LAA serves the mutual communication and exchange between the nuclear licensing and supervisory authorities of the Federation and the Länder as well as the coordination of activities. In the interest of a nationwide uniform enforcement of nuclear and radiation protection law, the competent nuclear licensing and supervisory authorities of the Länder and the Federation develop regulations in consensus for the uniform application of nuclear and radiation protection law. These are announced by the BMUV in the Federal Gazette. The BMUV chairs the LAA and manages its affairs. The Committee's decisions are usually made by mutual consent. The LAA has four technical committees for issues related to legal matters, nuclear safety, radiation protection as well as fuel cycle matters. Working groups for special tasks are assigned to the technical committees. If required, the technical committees may set up ad hoc working groups for special issues. The technical committees and the permanent working groups usually convene twice a year and more frequently if necessary. The Main Committee convenes once a year. The discussions in the LAA are an important instrument for the early and full involvement of the Länder and supplement the right of the Länder of participation in the legislative procedure of the Bundesrat.

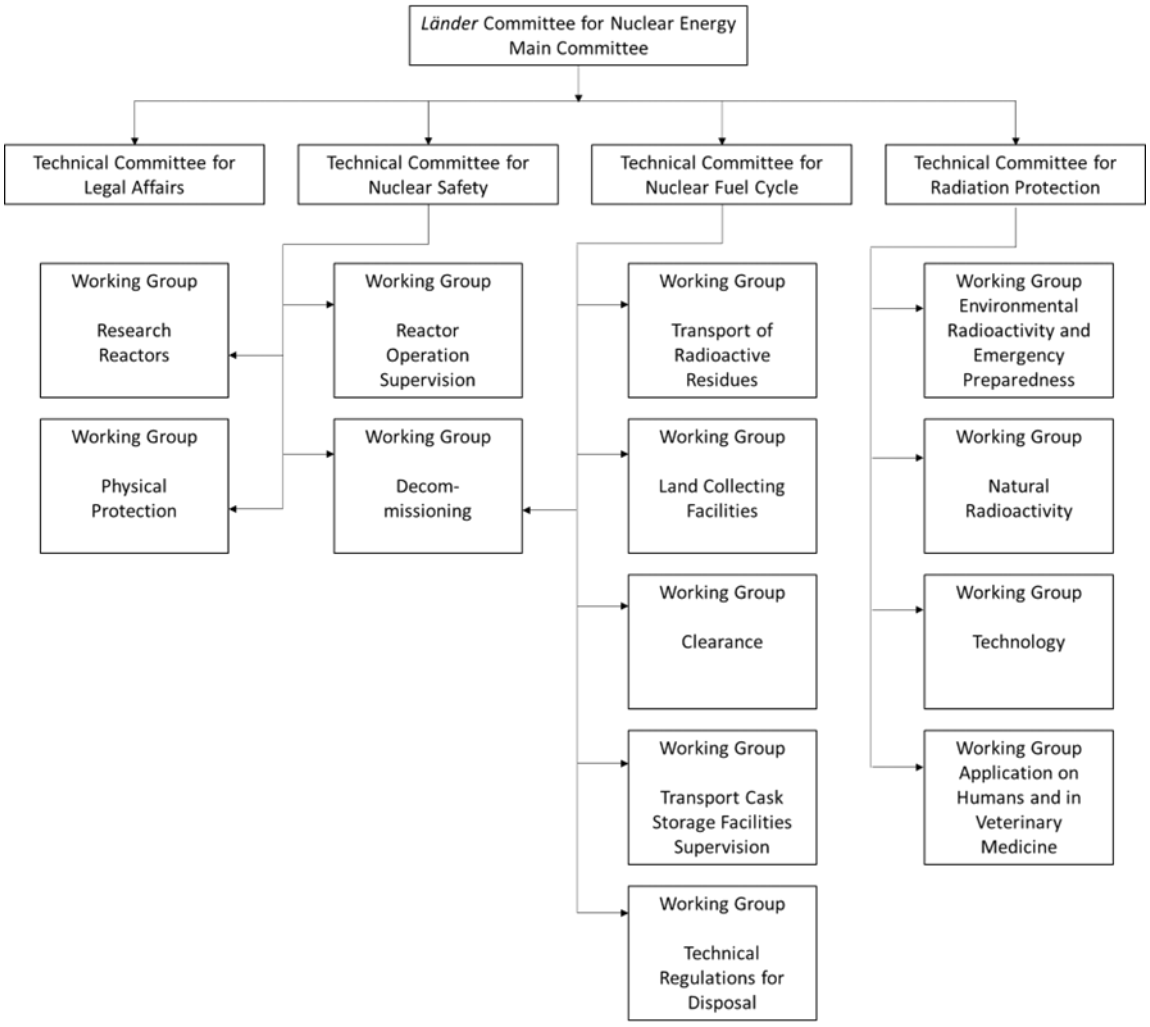

Fig. 3-4 Structure of the Länder Committee for Nuclear Energy (LAA)

Advisory bodies

The BMUV is regularly advised by the Reactor Safety Commission (RSK), the Commission on Radiological Protection (SSK) and the Nuclear Waste Management Commission (ESK). The latter also provides advice to the BASE. The RSK provides advice in matters of nuclear safety including matters with respect to the physical protection of nuclear installations. The SSK provides advice in matters of protection against ionising and non-ionising radiation, and the ESK in matters of nuclear waste management. Independence, qualification and reflection of the technical-scientific range of opinions is to be ensured in the commissions. The members are obliged by statutes to express their opinion in a neutral and scientifically sound manner and are appointed by the BMUV. The results of the commission's consultations are formulated in the form of general recommendations and statements on individual cases and published. For further information on the consultations of the

RSK and on how the authorities deal with the results of the consultations, see also Process 11 in the Supervision Manual of the Federation and Länder.

Authorized experts

According to § 20 AtG, the authorities in charge may consult authorised experts in the licensing and supervisory procedures. These can be both independent experts and independent technical expert organisations (hereinafter referred to as “authorised experts”). The authorised experts are contractually obliged to be impartial and independent from the economic interests of the nuclear licensees to be assessed as well as to provide technical qualification and continuous qualification maintenance for the personnel employed. Authorised experts are clearly mandated by the supervisory authorities and commissioned for specific activities. The authorised experts prepare test reports, statements and expert opinions. The authority's decision-making authority is not transferred to them. The nuclear licensing and supervisory authority is not bound by the results of the examinations of the authorised experts.

The BMUV draws on the external expertise of several technical expert organisations. In particular, these are the Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH, Brenk Systemplanung GmbH, Physikerbüro Bremen and Öko-Institut e.V..

As the competent licensing and supervisory authority, BASE commissions expert organisations such as the TÜVs (TÜV = Technischer Überwachungsverein, i.e. TÜV NORD, TÜV SÜD and TÜV Rheinland) e.g. within the framework of licensing procedures for the storage of spent fuel in storage and transport casks and the Bundesanstalt für Materialforschung und –prüfung (BAM). Furthermore, the BASE is involved in the research coordinated by BMUV.

The nuclear supervisory authorities of the Länder usually seek advice from the major technical expert organisations of the TÜVs). As a rule, framework agreements exist between the nuclear licensing and supervisory authorities of the Länder and the respective TÜV, which obliges the TÜV to perform certain tasks in the long term and to provide the necessary know-how including appropriately qualified personnel. This ensures that the relevant TÜV, as the technical expert organisation of the respective nuclear licensing and supervisory authority of the Land, is almost permanently present in the nuclear installation by carrying out individual inspections and test activities. In particular, the technical expert organisation can thus build up qualified knowledge of the entire plant from the various activities over a longer period of time. Authorised experts cannot take any sovereign measures, but they are contractually obliged to report immediately any facts or findings to the supervisory authority that require official action.

4 Involved Authorities

At the end of 2016, BMUV and the nuclear regulatory authorities of the Länder agreed which ministries and organisations will be involved in the IRRS mission to Germany with the aim to cover the full picture of the German regulatory system. Early in the self-assessment process, it was decided between BMUV and the involved Land authorities to distribute the responsibilities for the different thematic modules of the IRRS self-assessment system among the authorities. These responsibilities remain unchanged.

The following authorities were involved in the IRRS mission and will be involved in the follow-up mission:

Involved Authorities	IRRS module
Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection	• Module 1 – module 4 • Module 9 – module 10 and occupational radiation protection • Nuclear Power Plants
Baden-Württemberg MINISTRY OF THE ENVIRONMENT, CLIMATE PROTECTION AND THE ENERGY SECTOR	• Module 7 • Module 8 • Nuclear Power Plants (Aspects of Module 7 and 8)
SH Schleswig-Holstein Ministry for Energy Transition, Agriculture, Environment, Nature and Digitalization	• Module 5 • Module 6 • Nuclear Power Plants (Aspects of Modules 5 and 6)
Bavarian State Ministry of the Environment and Consumer Protection	• Research reactors

Involved Authorities	IRRS module
HESSEN Hessian Ministry of Environment, Climate Protection, Agriculture and Consumer Protection	• Decommissioning
MV Mecklenburg-Vorpommern Ministerium für Klimaschutz, Landwirtschaft, ländliche Räume und Umwelt	• Decommissioning
Ministry for the Environment, Energy and Climate Protection of the State of Lower Saxony	• Radioactive Waste management facilities (predisposal)
Ministry of Economic Affairs, Industry, Climate Action and Energy of the State of North Rhine-Westphalia	• Fuel Cycle Facilities
Federal Office for the Safety of Nuclear Waste Management	• Radioactive Waste management facilities (disposal)

5 Liaison Officers and Counterparts

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Module	**Counterpart** (per Module)	**Co-Counterpart** (per **R**ecommendation or **S**uggestion)	
Responsibilities and functions of the government (Module 1)	**Sebastian Kuhn** (BMUV) sebastian.kuhn@bmuv.bund.de +49 22899 305-2816	S1	**Tomislav Grgic-Paland** (BASE) tomislav.grgic-paland@base.bund.de +49 30 184321-1152 **Markus Pfaff** (BMUV) markus.pfaff@bmuv.bund.de +49 22899 305-2841
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		S3	**Volker Wild** (BMUV) volker.wild@bmuv.bund.de +49 22899 305-2850 **Dr. Anke Krause** (BMUV) anke.krause@bmuv.bund.de +49 22899 305-2934
		S4	**Dr. Jörg Ruppert** (BMUV) joerg.ruppert@bmuv.bund.de +49 22899 305-2860

Module	Counterpart (per Module)	Co-Counterpart (per Recommendation or Suggestion)	
Global nuclear safety regime (Module 2)	**Gisela Stoppa** (BMUV) gisela.stoppa@bmuv.bund.de +49 22899 305-2886	S5	See counterpart
Responsibilities and functions of the Regulatory Body (Module 3)	**Gisela Stoppa** (BMUV) gisela.stoppa@bmuv.bund.de +49 22899 305-2886	S6	**Dr. Jörg Ruppert** (BMUV) joerg.ruppert@bmuv.bund.de +49 22899 305-2860
		R1	**Dr. Jens Ulitzsch** (BMUV) jens.ulitzsch@bmuv.bund.de +49 22899 305-2858
Management system of the Regulatory Body (Module 4)	**Carolin Hoburg** (BMUV) carolin.hoburg@bmuv.bund.de +49 22899 305-2543	S7	**Dr. Jörg Ruppert** (BMUV) joerg.ruppert@bmuv.bund.de +49 22899 305-2860
		R2	**Tomislav Grgic-Paland** (BASE) tomislav.grgic-paland@base.bund.de +49 30 184321-1152
		S8	**Dr. Ronzon Mallick** (StMUV) ronzon.mallick@stmuv.bayern.de +49 89 9214-2328
		R3 and R4	See counterpart
Emergency preparedness and response (Module 10)	**Ralf Stegemann** (BMUV) ralf.stegemann@bmuv.bund.de +49 22899 305-2970	S24 and S25	**Dr. Tobias Schlummer** (BMUV) tobias.schlummer@bmuv.bund.de +49 22899 305-2936

Module	Counterpart (per Module)	Co-Counterpart (per Recommendation or Suggestion)	
Module 5 – 9 except waste management and decommissioning			
Authorization (Module 5)	**Dr. Hubertus von Raczeck** (MEKUN) hubertus.vonRaczeck@mekun.landsh.de +49 431 988-4281	No R or S	
Review and Assessment (Module 6)	**Dr. Hubertus von Raczeck** (MEKUN) hubertus.vonRaczeck@mekun.landsh.de +49 431 988-4281	S10 and S11	See counterpart
		R5	**Dr. Jens Ulitzsch** (BMUV) jens.ulitzsch@bmuv.bund.de +49 22899 305-2858
Inspection (Module 7)	**Thomas Wildermann** (UM BW) thomas.wildermann@um.bwl.de +49 711 126-2570	S12 and S13	**Dr. Oliver Mildenberger** (UM BW) oliver.mildenberger@um.bwl.de +49 711 126-1827
		R6	**Dr. Ronzon Mallick** (StMUV) ronzon.mallick@stmuv.bayern.de +49 89 9214-2328
		S14	**Dr. Claudia Schmidt** (BMUV) claudia.schmidt@bmuv.bund.de +49 22899 305-2896
		S15	**Julia Palmes** (BASE) julia.palmes@base.bund.de +49 30 184321-3408
Enforcement (Module 8)	**Thomas Wildermann** (UM BW) thomas.wildermann@um.bwl.de +49 711 126-2570	S16	**Dr. Oliver Mildenberger** (UM BW) oliver.mildenberger@um.bwl.de +49 711 126-1827
Regulations and Guides (Module 9)	**Dr. Claudia Schmidt** (BMUV) claudia.schmidt@bmuv.bund.de +49 22899 305-2896	S17 and S18	See counterpart
	Jens Uwe Büttner (BMUV) JensUwe.Buettner@bmuv.bund.de +49 22899 305-2976	S23	See counterpart

Module	Counterpart (per Module)	Co-Counterpart (per Recommendation or Suggestion)	
Module 5 – 9 regarding waste management and decommissioning			
Authorization (Module 5)	**Dr. Anke Krause** (BMUV) anke.krause@bmuv.bund.de +49 22899 305-2934	S9	**Jens Uwe Büttner** (BMUV) JensUwe.Buettner@bmuv.bund.de +49 22899 305-2976
Regulations and Guides (Module 9)	**Dr. Anke Krause** (BMUV) anke.krause@bmuv.bund.de +49 22899 305-2934	S19	**Markus Pfaff** (BMUV) markus.pfaff@bmuv.bund.de +49 22899 305-2841
		S20	See counterpart
		S21	**Jens Uwe Büttner** (BMUV) JensUwe.Buettner@bmuv.bund.de +49 22899 305-2976
		S22	See counterpart

6 Nuclear Installations in Germany

As a legal basis for the operation of the German nuclear installations, the Atomic Energy Act was amended in 2002 with the aim to phase out the use of nuclear energy for the commercial generation of electricity in a controlled and structured manner. The Act laid down the electricity production rights for each nuclear installation. With the amendment of the Atomic Energy Act of 6th August 2011 (13th Atomic Energy Act amendment), further operation of eight nuclear installations for electricity generation (power operation) was terminated, whereas additional dates for the latest possible termination of power operation were fixed for the remaining nine nuclear installations. With the amendment of the Atomic Energy Act of 4th December 2022 (19th Atomic Energy Act amendment) the shutdown dates of the last German NPPs (Isar-2, Neckarwestheim 2, Emsland) were fixed as to 15th April 2023.

Besides nuclear power plants several other nuclear facilities and installations are located in Germany such as research reactors, nuclear fuel cycle facilities and facilities for the treatment and disposal of radioactive waste.

Nuclear power plants

By mid of April 2023 the last three nuclear reactors were shut down. By that time six reactors were in post-operation (see Tab. 6-1). In the meantime, one of these reactors has received a decommissioning license and is being dismantled. For the remaining reactors the decommissioning license application has been submitted.

Tab. 6-2 lists the reactors that were licensed for decommissioning after the 13th Atomic Energy Act amendment in 2011. Immediate dismantling is the decommissioning strategy of choice with the final goal of release from regulatory control without restrictions. Tab. 6-2 also lists the additional on-going NPP decommissioning projects, which already started before the 13th Atomic Energy Act amendment in 2011. These include experimental and demonstration reactors under decommissioning.

Tab. 6-3 lists the already completed decommissioning projects at the Kahl, Großwelzheim, and Niederaichbach sites.

Research reactors

In 2022, six research reactors were in operation in Germany (see Tab. 6-4). The power level of these research reactors ranges from Milliwatts up to 20 MW_{th}. The latest research reactor that went in operation in 2004 is the FRM-II reactor in Garching near Munich.

Three research reactors are currently in post-operation (see Tab. 6-5). For six research reactors, the decommissioning license has been approved. These research reactors are at different stages in the decommissioning process (see Tab. 6-6). In addition, 31 other research reactors of different types have already completely been decommissioned and dismantled in Germany.

Fig. 6-1 shows an overview of the German NPPs (in post-operation, under decommissioning and fully dismantled), as well as the three largest research reactors (power of 100 kW and more) in operation.

Tab. 6-1 NPPs in post-operation

Name		Type	Power (MW_e)	First Criticality	Shutdown	Decom. application
In post-operation	Isar-2	PWR	1485	1988-01-15	2023-04-15	2019-07-01
	Emsland	PWR	1406	1988-04-14	2023-04-15	2016-12-22
	Grohnde	PWR	1430	1984-09-01	2021-12-31	2017-10-26
	Brokdorf	PWR	1480	1986-10-08	2021-12-31	2017-12-01
	Krümmel	BWR	1402	1983-09-14	2011-08-06	2015-08-24

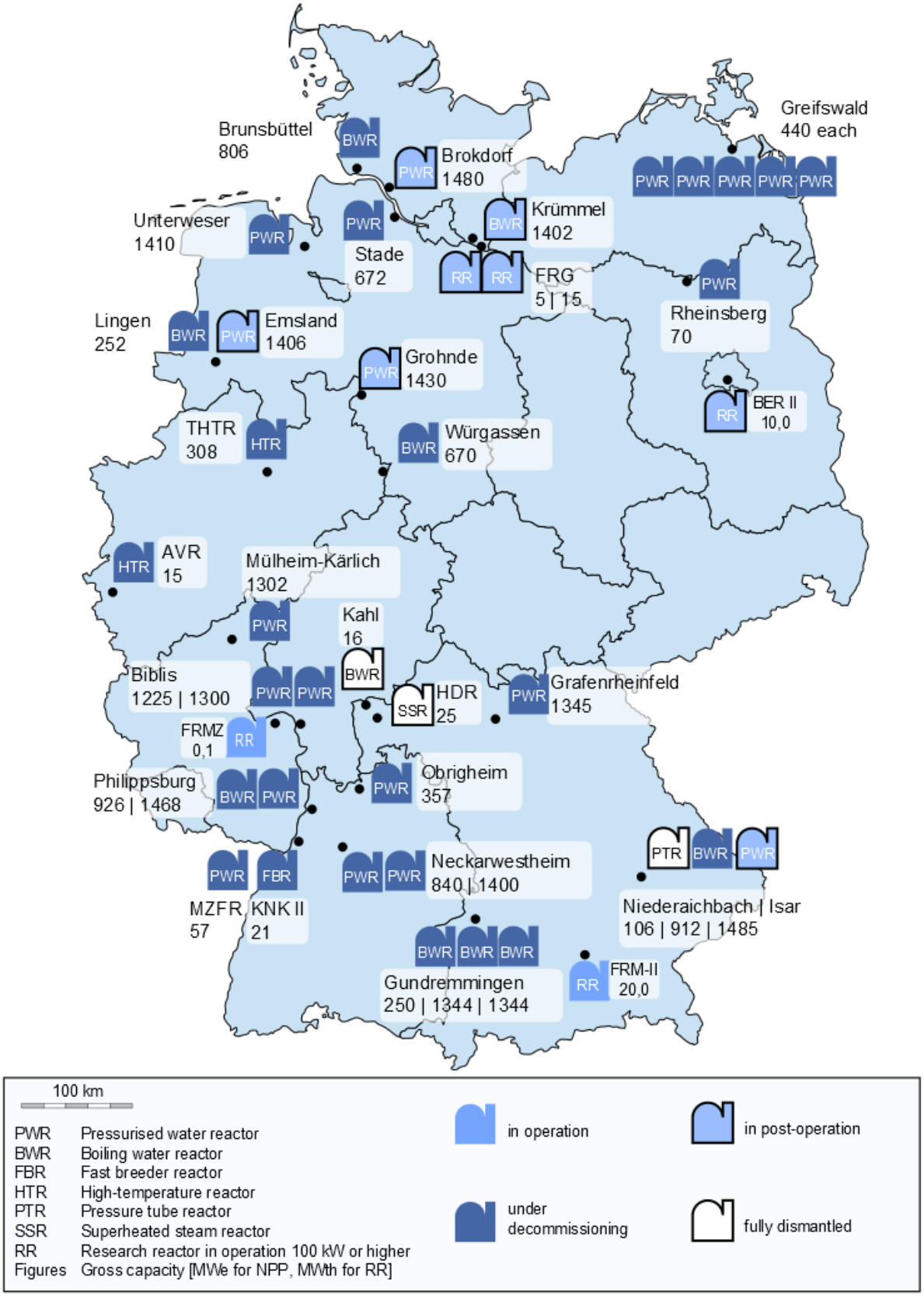


Fig. 6-1 Overview of the German NPPs (in post-operation, under decommissioning) and the larger three research reactors (in operation, in post-operation)

Tab. 6-2 NPPs in decommissioning

Name		Type	Power (MW_e)	First Criticality	Final Shutdown	Decom. licensed
	Brunsbüttel	BWR	806	1976-06-23	2011-08-06	2018-12-21
	Grafenrheinfeld	PWR	1345	1981-12-09	2015-06-27	2018-04-11
	Unterweser	PWR	1410	1978-09-16	2011-08-06	2018-02-05
	Philippsburg-1	BWR	926	1979-03-09	2011-08-06	2017-04-07
	Biblis-B	PWR	1300	1976-03-25	2011-08-06	2017-03-30
	Biblis-A	PWR	1225	1974-07-16	2011-08-06	2017-03-30
	Neckarwestheim-1	PWR	840	1976-05-26	2011-08-06	2017-02-03
	Isar-1	BWR	912	1977-11-20	2011-08-06	2017-01-17
	Gundremmingen-C	BWR	1344	1984-10-26	2021-12-31	2021-05-26
	Philippsburg-2	PWR	1468	1984-12-13	2019-12-31	2019-12-17
	Gundremmingen-B	BWR	1344	1984-03-09	2017-12-31	2019-03-19
	Neckarwestheim-2	PWR	1400	1988-12-29	2023-04-15	2023-04-04
licensed for decommissioning before the 13th Atomic Energy Act amendment in 2011	Lingen	BWR	252	1968-01-31	1977-01-05	1985-11-21 1988-03-30[1)] 2015-12-21
	Gundremmingen-A	BWR	250	1966-08-14	1977-01-13	1983-05-26
	Mehrzweck-forschungsreaktor	PWR (D_2O)	57	1965-09-29	1984-05-03	1987-11-17
	Mülheim-Kärlich	PWR	1302	1986-03-01	1988-09-09	2004-07-16
	THTR-300	HTR	308	1983-09-13	1988-09-29	1993-10-22 1997-05-21[1)]
	AVR	HTR	15	1966-08-26	1988-12-31	1994-03-09
	Greifswald-5	WWER	440	1989-03-26	1989-11-30	1995-06-30
	Greifswald-2	WWER	440	1974-12-03	1990-02-14	1995-06-30
	Greifswald-3	WWER	440	1977-10-06	1990-02-28	1995-06-30
	Rheinsberg	WWER	70	1966-03-11	1990-06-01	1995-04-28
	Greifswald-4	WWER	440	1979-07-22	1990-06-02	1995-06-30
	Greifswald-1	WWER	440	1973-12-03	1990-12-18	1995-06-30
	Kompakte natriumgekühlte Kernanlage	FBR	21	1977-10-10	1991-08-23	1993-08-26

	Würgassen	BWR	670	1971-10-22	1994-08-26	1997-04-14
	Stade	PWR	672	1972-01-08	2003-11-14	2005-09-07
	Obrigheim	PWR	357	1968-09-22	2005-05-11	2008-08-28
[1)] safe enclosure						

Tab. 6-3 NPPs completely decommissioned

Name	Type	Power (MW_e)	First Criticality	Final Shutdown	Released from Regulatory Control
Kahl	BWR	16	1960-11-13	1985-11-25	2010-05-17
Großwelzheim	SSR	25	1969-10-14	1971-04-20	1998-05-14
Niederaichbach	PTR (D_2O)	106	1972-12-17	1974-07-31	1994-08-17

Tab. 6-4 Research reactors in operation

Name	Type	Power (MW_{th})	First Criticality
SUR Stuttgart (SUR S)	Homogeneous/SUR-100	10^{-7}	1964-08-24 1969-06-12
Forschungsreaktor Mainz (FRMZ)	TRIGA MARK-II (Pool)	0.1	1965-08-03
SUR Ulm (SUR U)	Homogeneous/SUR-100	10^{-7}	1965-12-01
SUR Furtwangen (SUR FW)	Homogeneous/SUR-100	10^{-7}	1973-06-28
Ausbildungsreaktor (AKR-2)	Homogeneous/SUR-type	2×10^{-6}	1978-07-28 2005-03-22
Hochflussneutronenquelle München/Garching (FRM-II)	Pool-type, compact core, D_2O moderator	20	2004-03-02

Tab. 6-5 Research reactors in post-operation

Name	Type	Power (MW_{th})	First Criticality	Final Shutdown	Decom. application
Berliner Experimentier-Reaktor II (BER-II)	MTR (Pool)	10	1973-12-09	2019-12--11	2017-04-24
Geesthacht 1 (FRG-1)	MTR (Pool)	5	1958-10-23	2010-06-28	2013-03-21
Geesthacht 2 (FRG-2)	MTR (Pool)	15	1963-03-16	1993-01-28	2013-03-21

Tab. 6-6 Research reactors in decommissioning

Name	Type	Power (MW_{th})	First Criticality	Final Shutdown	Decom. licensed
Forschungsreaktor München (FRM)	MTR (Pool)	4	1957-10-31	2000-07-28	2014-04-03
Forschungsreaktor 2 (FR-2)	Tank-type / D_2O	44	1961-03-07	1981-12-21	1986-07-03 1996-11-20[1)]
DIDO (FRJ-2)	Tank-type / D_2O	23	1962-11-14	2006-05-02	2012-09-20
Forschungs- und Messreaktor Braunschweig (FRMB)	MTR (Pool)	1	1967-10-03	1995-12-19	2001-03-02 2005-07-28[2)]
Forschungsreaktor Neuherberg (FRN)	TRIGA MARK-III (Pool)	1	1972-08-23	1982-12-16	1983-05-30 1984-05-24[1)]
SUR Aachen (SUR AA)	Homog./SUR-100	10^{-7}	1965-09-22	2008	2020-06-26
[1)] safe enclosure [2)] released except storage					

Installations of the fuel cycle and waste storage

In addition to NPPs and research reactors, other nuclear installations such as nuclear fuel cycle facilities and facilities for the treatment and disposal of radioactive waste are located in Germany.

Operational fuel cycle facilities are the uranium enrichment plant at Gronau, the fuel assembly fabrication plant in Lingen, and the pilot conditioning plant in Gorleben (see Tab. 6-7). Several other nuclear fuel cycle facilities are currently in decommissioning phase or have already been decommissioned and released from nuclear regulatory control (see Tab. 6-8).

Facilities and installations of radioactive waste management in Germany consist of spent fuel storage facilities, storage facilities for radioactive waste with negligible heat generation, disposal facilities for nuclear waste, as well as installations for the conditioning of radioactive waste.

Spent fuel from the operation of power and research reactors and high-level radioactive waste (HLW) from reprocessing are stored in central storage facilities TBL Ahaus (TBL = transport cask storage facility), TBL Gorleben and the Nord storage facility in Rubenow near Greifswald, in decentralised storage facilities (cask storage facility of the “Arbeitsgemeinschaft Versuchsreaktor (AVR) Jülich”) and in decentralised storage facilities as on-site facilities at nuclear power plants (see Tab. 6-9).

Radioactive waste with negligible heat generation from nuclear power plants and the nuclear industry is stored in storage facilities that are located at NPP sites (see Tab. 6-10) and in central and decentralised storage facilities (see Tab. 6-11). For waste from the use and handling of radioisotopes in research, industry and medicine, Land collecting facilities operated by the Länder are available for storage (see Tab. 6-12). Further storage facilities of the nuclear and other industries, as well as examples of stationary installations for the conditioning of radioactive waste are listed in Tab. 6-13 and Tab. 6-14, respectively.

There are two disposal facilities for radioactive waste in Germany: the Morsleben disposal facility (ERAM) and the Konrad disposal facility (see Tab. 6-15). The ERAM disposal facility has been used in the past to dispose low and intermediate level radioactive waste. No further emplacement operations are planned for the ERAM disposal facility. The ERAM disposal facility is being prepared for closure.

In 1982, the application for a plan approval procedure to use the Konrad mine, a former iron ore mine in Lower Saxony, as a disposal facility for radioactive waste with negligible heat generation was filed. The plan approval decision was issued on 22nd May 2002. After the dismissal of all claims, a final and incontestable plan approval decision for the Konrad disposal facility has been available since 2007. After completion of the conversion work, this mine is to be commissioned as a disposal facility for radioactive waste with negligible heat generation.

The licensee of ERAM and of the Konrad disposal facility is the BGE Bundesgesellschaft für Endlagerung mbH (BGE). Nuclear and radiation protection supervision is exercised by BASE.

From 1967 until 1978 low-level and medium-level waste was emplaced in the Asse II mine. From 1st January 2009 on the Asse II mine is operated under atomic law, comparable to a disposal facility. According to an amendment of § 57b Atomic Energy Act with the Asse Act of 24th April 2013, decommissioning is to start following the retrieval of the radioactive waste. The BGE is responsible for decommissioning the Asse II mine safely under atomic law.

The sites of storage facilities for spent fuel and radioactive waste, as far as they have not been constructed at the locations of nuclear power plants that were in operation at the time of the construction of the storage facilities, as well as the sites of facilities for conditioning and disposal are shown in Fig. 6-2.

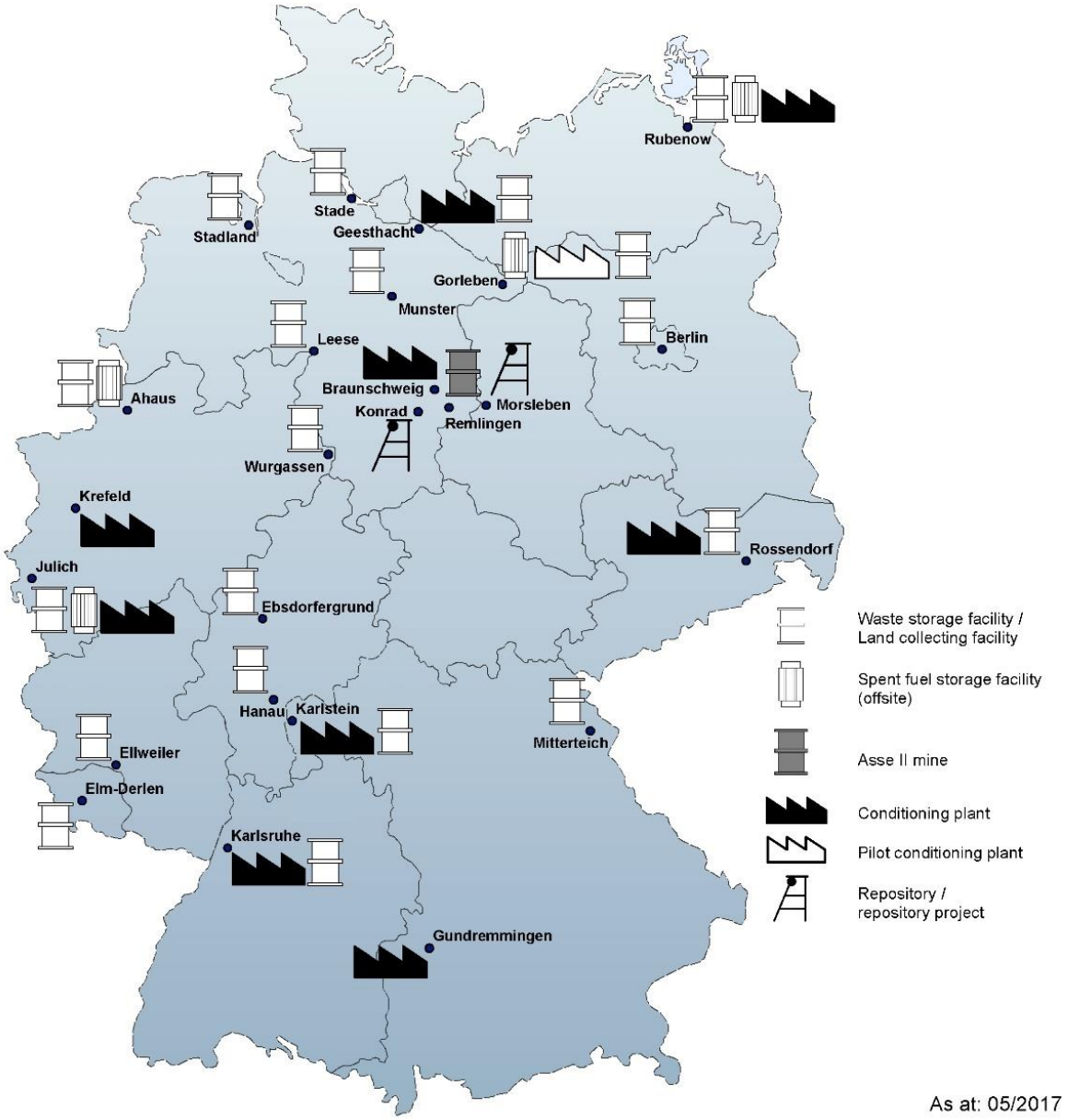


Fig. 6-2 Sites of facilities of spent fuel and radioactive waste management (without on-site facilities at nuclear power plants)

Tab. 6-7 Operational fuel cycle facilities

Name	Location	Purpose of the facility	Licence
Gronau Uranium enrichment plant (UAG)	Gronau (NW)	Uranium enrichment	3. partial licence of 04.06.1985 (operation licence)
ANF fuel element fabrication plant Lingen	Lingen (NI)	Fabrication of mainly LWR fuel elements of low-enriched uranium dioxide	Operation licence of 18.01.1979
Pilot conditioning plant (PKA)	Gorleben (NI)	Designed for conditioning of spent fuel assemblies; since June 2001 restriction to repair of defective containers and handling of other radioactive waste,	Acc. to § 7 Atomic Energy Act 1. partial licence of 30.01.1990 2. partial licence of 21.07.1994 (Subsequently imposed obligation of 18.12.2001) 3. partial licence: 19.12.2000 (includes operation licence)

Tab. 6-8 Fuel cycle facilities in the process of decommissioning, or decommissioning completed and released from nuclear regulatory control

Name	Location	Operator	Start of operation	End of operation	Status
HOBEG fuel fabrication Facility	Hanau (HE)	Oberg GmbH	1973	1988	Removed
NUKEM-A fuel fabrication facility	Hanau (HE)	RD Hanau GmbH (formerly Nukem GmbH)	1962	1988	Removed
Siemens fuel fabrication facility, uranium unit	Hanau (HE)	Siemens AG	1969	1995	Removed
Siemens fuel fabrication facility, MOX unit	Hanau (HE)	Siemens AG	1968	1991	Removed
Siemens fuel fabrication facility, Karlstein unit (SBWK)	Karlstein (BY)	Siemens AG	1966	1993	Continued conventional use
Karlsruhe reprocessing plant (WAK), including Karlsruhe vitrification plant (VEK)	BW	KTE	1971	1990	Dismantling[1)]

[1)] planned final status: removal

Tab. 6-9 Storage facilities for spent fuel and other heat generating waste as of 31.12.2022

Name		Cask storage positions licensed (occupied end of 2022)	Mass HM (tons)	Commissioning	Licensed until
Central storage facilities	Ahaus (BZA)	420 (61), 329 casks[1)]	3960	June 1992	2036-12-31
	Gorleben (BZG)	420 (113)	3800	April 1995	2034-12-31
	TBL / ZLN Rubenow	80 (74)	585	End of 1999	2039-10-31
	AVR-Behälterlager Jülich	158 (152)	0.225	August 1993	2013-06-30[2)]
On-site storage facilities	Biblis (BZB)	135 (108)	1400	May 2006	2046-05-18
	Brokdorf (BZF)	100(35)	1000	March 2007	2047-03-05
	SZL Brunsbüttel	80 (20)	450	Feb. 2006	n/a[3)]
	Grafenrheinfeld (BZR)	88 (54)	800	Feb. 2006	2046-02-27
	Grohnde (BZD)	100 (37)	1000	April 2006	2046-04-27
	Gundremmingen (BZM)	192 (115)	1850	August 2006	2046-08-25
	Isar (BZI)	152 (88)	1500	March 2007	2047-03-12
	Krümmel (BZK)	65 (42)	775	Nov. 2006	2046-11-14
	Lingen (BZL)	125 (47)	1250	Dec. 2002	2042-12-10
	Neckarwestheim (BZN)	151 (94)	1600	Dec. 2006	2046-12-06
	Philippsburg (BZP)	152 (92)	1600	March 2007	2047-03-19
	Unterweser (BZU)	80 (40)	800	June 2007	2017-06-18

[1)] 305 casks of the CASTOR THTR/AVR type are arranged in a way that only 48 licensed positions are occupied, 18 CASTOR MTR 2 casks are arranged in a way that only 7 positions are occupied
Storage of spent fuel is restricted to the eastern part of the hall (Lagerbereich II), as the western part (Lagerbereich I) is occupied for storage of NHGW (AZA)

[2)] The original license expired 2013. New licensing procedure is ongoing.

[3)] The license was rejected by a court decision. New licensing procedure is ongoing. The new licence application includes only 20 casks on 24 cask storage positions and a total mass of 200 t HM.

Tab. 6-10 Storage facilities for radioactive waste and operational buffer storage facilities in nuclear power plants

Name of facility and site	Capacity according to licence	Licence
NPP Biblis (Units A and B)	7,500 packages	§ 7 Atomic Energy Act, § 7 Radiation Protection Ordinance *)
NPP Biblis (AZB 1)	2,100 m^3	§ 7 Atomic Energy Act, § 7 Radiation Protection Ordinance *)
NPP Biblis (AZB 2)	8,000 m^3	§ 7 Radiation Protection Ordinance *)
NPP Brokdorf	560 m^3	§ 7 Atomic Energy Act
NPP Brunsbüttel	3,225 m^3 / 4,150 m^3 **)	§ 7 Radiation Protection Ordinance *)
NPP Brunsbüttel (AZT)	13,000 m^3	§ 7 Radiation Protection Ordinance *)
NPP Emsland	185 m^3	§ 7 Atomic Energy Act
NPP Grafenrheinfeld	Raw waste: 200 m^3 Conditioned waste: 200 m^3	§ 7 Atomic Energy Act
NPP Grafenrheinfeld (AZR)	6,000 m^3	§ 7 Radiation Protection Ordinance *)
NPP Grohnde	280 m^3	§ 7 Atomic Energy Act
NPP Gundremmingen Units B and C	300 m^3 conditioned waste 1,305 m^3 liquid waste	§ 7 Atomic Energy Act
NPP Isar 1	700 m^3	§ 7 Atomic Energy Act
NPP Isar 1 Transportbereitstellungshalle	3,300 m^3	Handling licence according to § 3 Radiation Protection Ordinance 1) of 7th July 1982
NPP Isar 1 and NPP Isar 2 KKI-BeHa	8,010 m^3	§ 12 Radiation Protection Act
NPP Isar 2	185 m^3	§ 7 Atomic Energy Act
NPP Krümmel	1,340 m^3	§ 7 Atomic Energy Act
NPP Neckarwestheim Units 1 and 2	2,322 m^3	§ 7 Atomic Energy Act
NPP Neckarwestheim (AZN)	12,000 m^3	§ 7 Radiation Protection Ordinance *)
NPP Philippsburg Units 1 and 2	3,970 m^3	§ 7 Atomic Energy Act
NPP Philippsburg (AZP)	15,000 m^3	§ 7 Radiation Protection Ordinance *)

NPP Unterweser	350 m^3	§ 7 Atomic Energy Act
NPP Greifswald (Units 1 – 5)	140 20' Container	§ 7 Atomic Energy Act
NPP Gundremmingen Unit A	1,678 m^3 conditioned waste 318 m^3 liquid waste	§ 7 Atomic Energy Act
THTR Hamm-Uentrop	1,160 m^3	§ 7 Atomic Energy Act
AVR Jülich	235 m^3	§ 7 Atomic Energy Act
NPP Lingen	170 m^3	§ 7 Atomic Energy Act
NPP Mülheim-Kärlich	43 m^3	§ 7 Atomic Energy Act
NPP Obrigheim (AZO)	3,817 m^3	§ 12 Radiation Protection Act
NPP Rheinsberg		§ 7 Atomic Energy Act
NPP Stade	100 m^3	§ 7 Atomic Energy Act
NPP Stade (AZS)	5,000 m^3	§ 7 Radiation Protection Ordinance *)
NPP Würgassen	4,600 m^3	§ 7 Atomic Energy Act

1) as amended on 13th October 1976 and 30th June 1989, respectively

*) of 20th July 2001, licences continue to apply according to § 197 StrlSchG

**) Hall I and II for keeping the waste ready for transport

Tab. 6-11 Storage facilities for radioactive waste with negligible heat generation

Name of facility and site		Capacity according to licence	Licence
Central storage facilities	Gorleben waste storage facility (AZG), Lower Saxony	200-l, 400-l drums, type III concrete containers, type I-II cast-iron containers, type I-IV containers with a total activity of up to $5x10^{18}$ Bq	Handling licences according to § 3 Radiation Protection Ordinance [1)] of 27th October 1983, 13th October 1987 and 13th September 1995
	Ahaus waste storage facility (AZA), North Rhine-Westphalia (western part of storage hall – Lagerbereich I)	Konrad containers, 20' containers and facility components; total activity for storage area no. I limited to $1.0x10^{17}$ Bq	Handling licences according to § 12 Radiation Protection Act of 17th July 2020
	Unterweser waste storage facility no 1 (AZU 1), Lower Saxony	200-l and 400-l drums, concrete containers, sheet steel containers, cast-iron containers with a total activity of up to $1.85x10^{15}$ Bq	Handling licences according to § 3 Radiation Protection Ordinance [1)] of 24th June 1981, 29th November 1991 and 6th November 1998
	Unterweser waste storage facility no 2 (AZU 2), Lower Saxony	Storage of conditioned waste packages destinated for the Konrad disposal facility; provision of transport or buffer storage of single components or waste in 20 ft-containers or in transport packages with a maximum activity of $2 \cdot 10^{17}$ Bq	Handling licences according to § 7 Radiation Protection Ordinance (2001) of 5th December 2018
	Storage facility of the EVU, Mitterteich, Bavaria	40,000 waste packages (200-l, 400-l drums or cast-iron containers)	Handling licences according to § 3 Radiation Protection Ordinance [1)] of 7th July 1982
	Zwischenlager Nord (ZLN), Rubenow/Greifswald, Mecklenburg-West Pomerania	165,000 m³	Handling licences according to § 3 Radiation Protection Ordinance [1)] of 20th February 1998
	Entsorgungsbetriebe (EB), Karlsruhe, Baden-Wuerttemberg	Handling (conditioning and storage) of radioactive residues and waste with contents of fissile material up to a total activity of $4.5x10^{17}$ Bq	Handling licence according to § 9 Atomic Energy Act of 25th November 1983, superseded by licence according to § 9 Atomic Energy Act of 29th June 2009
storage facilities in research institutions	Forschungs- und Messreaktor Braunschweig (FMRB)	Decommissioning waste from FMRB (174 m^3)	§ 7 Atomic Energy Act
	Research reactor Garching	FRM: 100 m^3 FRM2: 68 m^3	§ 7 Atomic Energy Act
	Helmholtz-Zentrum Hereon	145 m^2, 112 m^2, 226 m^2	§ 3 Radiation Protection Ordinance[1)], § 7 Radiation Protection Ordinance[3)]
	JEN mbH	11,470 drums and 780 Konrad containers	§ 3 Radiation Protection Ordinance[1)] §§ 6, 9 Atomic Energy Act[2)]
	VKTA Rossendorf	2,270 m³ (total gross storage volume)	§ 3 Radiation Protection Ordinance[1)]

[1)] as amended on 13th October 1976 and 30th June 1989, respectively
[2)] new licence applied for
[3)] of 20th July 2001, licences continue to apply according to § 197 StrlSchG

Tab. 6-12 Land collecting facilities

Name of facility and site	Capacity according to licence	Licence
Land collecting facility Baden-Wuerttemberg, Karlsruhe	No capacity limit stated (capacity EB: 78,664 m³)	§ 9 Atomic Energy Act
Land collecting facility Bavaria, Mitterteich	10,000 packages	§ 3 Radiation Protection Ordinance *)
Land collecting facility Berlin, Berlin	800 m³	§ 3 Radiation Protection Ordinance *)
Land collecting facility Hesse, Ebsdorfergrund	400 m³	§ 6 Atomic Energy Act § 3 Radiation Protection Ordinance *)
Land collecting facility Mecklenburg-Western Pomerania (also used by Brandenburg), Rubenow/Greifswald	20‘ containers	§ 3 Radiation Protection Ordinance *)
Land collecting facility North Rhine-Westphalia, Jülich	9,000 200-l drums	§ 3 Radiation Protection Ordinance *), § 9 Atomic Energy Act
Land collecting facility Rhineland-Palatinate, Hoppstädten-Weiersbach (Landkreis Birkenfeld)	α+β/γ activity limited to: $1.6x10^{13}$ Bq	§ 9 Atomic Energy Act, § 3 Radiation Protection Ordinance *)
Land collecting facility Saarland, Elm-Derlen	50 m³	§ 3 Radiation Protection Ordinance *)
Land collecting facility Saxony (also used by Saxony-Anhalt and Thuringia), Rossendorf/Dresden	300 m³	§ 3 Radiation Protection Ordinance *)
Land collecting facility of the four north German coastal Federal States (HB, HH, NI, SH), Geesthacht	68 m² storage area	§ 3 Radiation Protection Ordinance *)
Land collecting facility Lower Saxony***), Jülich	Hired storage capacity in Leese: 1,485 drums, 3,400 drums, max. 50 Konrad containers	§ 7 Radiation Protection Ordinance **)
Central collecting point of the German Federal Armed Forces, Munster	1,600 m³	§ 3 Radiation Protection Ordinance *)

*) as amended on 13th October 1976 or 30th June 1989 respectively

**) of 20th July 2001, licences continue to apply according to § 197 StrlSchG

***) acceptance of raw waste and conditioning is performed by the operator of the Land collecting facility GNS Gesellschaft für Nuklear-Service mbH on their premises in the Jülich research centre, storage of the radioactive waste takes place in the dedicated area in the storage facility of the company Eckert & Ziegler Nuclitec GmbH in Leese

Tab. 6-13 Storage facilities of the nuclear and other industries

Name of facility and site	Capacity according to licence	Licence
Nuclear industry		
Advanced Nuclear Fuels GmbH (ANF), Lingen	950 200-l drums	§ 7 Atomic Energy Act
Siemens, Karlstein	5,300 m^3 (2,100 m^3 according to § 9 Atomic Energy Act, 3,200 m^3 according to § 3 Radiation Protection Ordinance *))	§ 9 Atomic Energy Act, § 3 Radiation Protection Ordinance *)
Storage facility of DAHER NUCLEAR TECHNOLOGIES (formerly NCS), Hanau	1.: 1,250 Konrad containers 2.: 800 m^2	§ 7 Radiation Protection Ordinance **) § 3 Radiation Protection Ordinance *)
Urenco, Gronau	Storage facility: 220 m^2; up to 48 Konrad Type V containers; buffer storage facility 1: 150 200-l drums; buffer storage facility 2: 230 m^2, 84 200-l drums (double-stacked); 96 storage positions for “lost concrete shielding” (single-stacked)	§ 7 Atomic Energy Act
Other industry		
Eckert & Ziegler Nuclitec GmbH, Leese	13,620 200-l drums	§ 7 Radiation Protection Ordinance **)

*) as amended on 13th October 1976 or 30th June 1989 respectively

**) of 20th July 2001, licences continue to apply according to § 197 StrlSchG

Tab. 6-14 Examples of stationary installations for the conditioning of radioactive waste for own needs and third parties

Operator	Installation site	Installation name	Installation description
GNS Gesellschaft für Nuklear-Service mbH	Jülich	PETRA drying installation	Drying of waste in 200-l drums, 280-l drums or 400-l drums
		FAKIR high-pressure hydraulic press	High-pressure compaction of waste to pellets with the aid of metal cartridges or 200-l drums, waste volume reduction by up to factor 10
Eckert & Ziegler Nuclitec GmbH	Braunschweig	Drying installation	Drying of drums up to the specified residual humidity
		Compacting installation	Compaction of 200-l drums and scrunch drums, pressing power ≥ 30 MPa Capacity: 5,000 – 10,000 pressing sequences/a
		Decontamination cell	Decontamination of equipment parts (e.g. sandblasting); crushing of equipment parts (e.g. cutting, sawing), max. weight 1 Mg/piece
		Cementing installation	Immobilisation of wastewater with fixing materials, immobilisation of ion-exchange resins with fixing materials
		Shredding installation	Crushing of waste, segregation of solid and liquid constituents, homogenisation, sampling
EWN Entsorgungswerk für Nuklearanlagen GmbH, formerly Energiewerke Nord GmbH	Lubmin/ Rubenow	FAKIR high-pressure hydraulic press	High-pressure compaction of radioactive waste in 180-l press drums and 200-l drums as well as loose waste with the aid of metal cartridges
		PETRA drying installation and drying chamber	Drying of solid and liquid radioactive waste in 200-l drums, 280-l drums, 400-l drums or 580-l drums
		Hydraulic shears	Cutting up of metals (scrap shear MARS with pre-compaction)
		Dismantling rooms	Dismantling of metals by use of thermal processes, e.g. autogenous cutting and plasma cutting
		Evaporation facilities	Processing of radioactive liquid waste; throughput up to 3 m^3/h
		In-drum drying installation	Processing of evaporator concentrates; processing of up to eight 200-l drums simultaneously
		Chamber filtration installation	Separation of solids from radioactive liquids

Tab. 6-15 Disposal facilities and other storage facilities for radioactive waste

Name of facility and site	Capacity according to licence	Licence	Geological host formation
Asse II mine Remlingen, Lower Saxony	Between 1967 and 1978 approx. 124,500 LLW waste packages	Licence according to § 3 Radiation Protection Ordinance as amended on 15th October 1965 Handling licence according to § 7 Radiation Protection Ordinance (2001) and acquisition of facts according to § 9 Atomic Energy Act (2011) Retrieval of waste planned according to Article § 57b Atomic Energy Act	Rock salt
Konrad disposal facility Salzgitter, Lower Saxony	303,000 m^3 radioactive waste with negligible heat generation	Licence according to § 9b Atomic Energy Act, approval of the plan was granted on 22nd May 2002, decision is final since 26th March 2007	Coral oolite (iron ore) beneath a water-impermeable barrier from the cretaceous period
Morsleben disposal facility for radioactive waste (ERAM) Saxony-Anhalt	Disposal of 36,753 m^3 low and intermediate level waste in total, total activity of all radioactive waste emplaced in the order of magnitude of 10^{14} Bq, activity of alpha-sources in the order of magnitude of 10^{11} Bq.	22nd April 1986: Permanent operating licence granted. 12th April 2001: A statement is made to the effect that no further radioactive waste will be accepted for disposal	Rock salt

7 Implementation of the Recommendations and Suggestions of the IRRS Mission 2019, Updated National Action Plan

7.1 Overview, Process of implementation, Updated National Action Plan

The licensing and supervisory authorities of the Federation and the Länder see themselves as learning organizations that strive for continuous improvement. With the aim of continuous further development, they subjected themselves to a review by an international team of experts within the framework of the IRRS mission 2019. In the preparation of this IRRS mission, a substantial self-assessment on the basis of the IRRS questionnaire against the IAEA Safety Standards has been carried out. As a result of the self-assessment, improvement measures as part of an action plan were developed. This initial action plan was made available to the review team for the IRRS mission 2019, together with the answers to the IRRS questionnaire and further documents, as Advance Reference Material (ARM) to that mission.

As a result of the IRRS mission 2019, the IRRS review team identified possible improvements that are stated in the final report by the IAEA (IRRS report) in the form of recommendations and suggestions. Most of the recommendations and suggestions endorsed the actions of the initial action plan, but the review team also pointed out further potential for improvements. Based on the insights from the mission, the initial action plan was updated in order to take into account all recommendations and suggestions, leading to the updated National Action Plan (NAcP).

The entire IRRS process is represented in the illustration in Fig. 7-1. The implementation of recommendations, suggestions and actions is a continuous process and is therefore continuously monitored at regular meetings with all involved authorities. The ARM at hand for the upcoming follow-up mission represents a milestone in reporting on the implementation progress.

The following table shows the NAcP, as adopted by the Technical Committees and the Main Committee of the Länder Committee for Nuclear Energy (LAA, see Chapter 3.3), providing brief descriptions of the individual measures. The illustration following that table is an overview of the current state of implementation of the various actions in the form of a matrix. It also provides links of the individual measures of the NAcP with the recommendations and suggestions made as a result of the IRRS mission 2019. As described above, the implementation of the recommendations and suggestions is achieved by implementing the respective actions of the NAcP. Some individual actions of the NAcP concern several suggestions at the same time or, vice versa, several actions together lead to the implementation of a suggestion. However, as explained in more detail in the respective subchapters below, one suggestion (S2) of the IRRS mission 2019 has been implemented as part

of the implementation of the recommendations and suggestions of the ARTEMIS mission and reviewed during the ARTEMIS follow-up mission 2022. Furthermore, two suggestions (S22 and S23) do not require further actions.

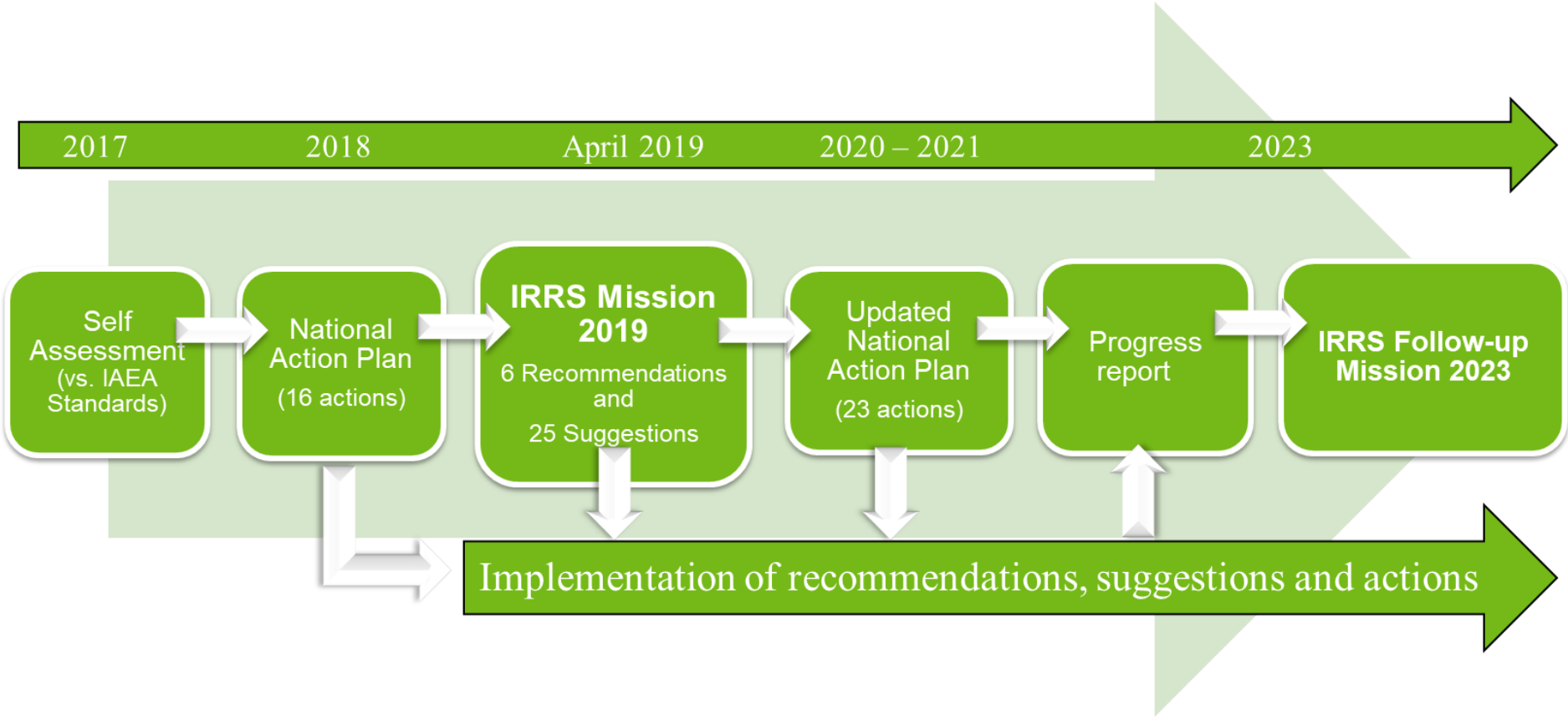


Fig. 7-1 IRRS process in Germany

Updated National Action Plan

Module 1 – Responsibilities and Functions of the Government			
Actions (No. 1.1 and 1.2 of the National Action Plan **prior to the mission**)			
Preliminary remark on No. 1.1 and 1.2 of the National Action Plan prior to the mission **Staff analysis / Training / Competence** – staff management is the responsibility of the individual licensing and supervisory authorities of the Federation and the Länder. The staff of the licensing and supervisory authorities of the Federation and the Länder who undertake tasks in the field of nuclear safety are obliged to acquire, maintain and develop their knowledge and skills in this field. This obligation arises from §61(2) Federal Civil Servants Act, which obliges civil servants of the federal government to take part in measures towards official qualifications for the maintenance or development of their knowledge and skills. This is implemented in the processes of all licensing and supervisory authorities. This obligation applies in the same way to civil servants of the Länder and employees in public service.			
1.1 Depending on their competencies/responsibilities and against a background of changing tasks in the field of nuclear safety the licensing and supervisory authorities of the Federation and the Länder assess necessary staffing needs. Suggestion S6 will be implemented under Action 1.1.			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
S6	**Suggestion**: The Federal authorities should consider measures to ensure there is a sufficient number of qualified staff with engineering expertise.	**BMUV** **S I 2 R** **BASE** **BfS**	In preparation of the Federal Government Strategy for Competence Building and the Development of Future Talent for Nuclear Safety (August 2020) technical needs analyses had been carried out. The BMU will take into account the findings of these analyses for the update of the Strategic Plan for the Directorate-General S as well as in job postings for the technical divisions of this Directorate-General, in order to ensure that the BMU mainly hires engineers and graduates with a Master of Science. This shall also apply to BASE / BfS. The competent authorities under the Atomic Energy Act (AtG) shall have adequate financial and personnel resources to fulfil their statutory responsibilities. This has now also been enshrined in §23 AtG.

1.2 The licensing and supervisory authorities of the Federation and the Länder assess the skills required on the basis of their future tasks, the programme and concept for skills development and for staff skills and competence retention. As needed regulations for staffing level, training and further training measures for personnel are implemented in the management system of the authorities.

Suggestion S4 will be implemented under Action 1.2.

Reference to the 2019 IRRS mission report		Authority	Implementation
S4	**Suggestion**: The Government should consider establishing a comprehensive plan, in consultation with relevant parties, for the project on German competence and financing needs during future decades.	**BMUV** **S I 2 R**	In August 2020, the federal cabinet adopted the Strategy for Competence Building and the Development of Future Talent for Nuclear Safety.

Suggestion S2 was made during the IRRS mission in module 1. The suggestion will be implemented as part of the implementation of the recommendations and suggestions of the ARTEMIS mission. Thus, no further action is required at this point.

Reference to the 2019 IRRS mission report		Authority
S2	**Suggestion**: BMU should consider making clear in the regulatory framework how the Site Selection Act will be implemented in a manner that will not compromise or conflict with BfE discharging its responsibility for regulating the safety of facilities and activities.	**BMUV AG S III 3**

Module 2 – The Global Safety Regime			
Actions (No. 2.1 of the National Action Plan **prior to the mission**)			
Preliminary remark on No. 2.1 of the National Action Plan prior to the mission Germany contributes actively to the worldwide improvement of nuclear safety by conveying its safety-related findings through participation of German experts in all bodies at international level. This is achieved mostly through representatives from the supreme federal authorities. Staff from the licensing and supervisory authorities of the Federation and the Länder often have expertise that is not available at the BMU as such but which is of great interest internationally.			
2.1 More active participation of all licensing and supervisory authorities of the Federation and the Länder in the fulfilment of international duties by the BMU in order to contribute the entire range of German expertise internationally. Suggestion S5 will be implemented under Action 2.1.			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
S5	**Suggestion**: The BMU should consider increasing international participation and involvement of staff from BfE, BfS and Länder to improve the regulatory experience and feedback to Germany and to the international community.	**BMUV** **S I 5** **Involved:** **S I 3** **AG S III 2**	The BMU will review internationally relevant processes with a view to the better inclusion of BASE, BfS and Länder staff and, if necessary, supplement the processes. An overview of all people representing Länder and offices who are involved in international cooperation will be drawn up for the follow-up mission.

Module 3 – Responsibilities and Functions of the Regulatory Body
Actions (No. 3.1 and 3.2 of the National Action Plan **prior to the mission**)
Preliminary remark on No. 3.1 and 3.2 of the National Action Plan prior to the mission The competent licensing and supervisory authorities of the Federation and the Länder carry out their tasks in a way that ensures their effective independence.
3.1 Personnel of a licensing and supervisory authority of the Federation or the Länder or their authorised experts that participate in an administrative procedure may not be prejudiced under §21 Administrative Procedure Act (VwVfG). In case of a change of employment of NPP staff and/or licensee to an authority, care must be taken that there is no conflict of interests in the person of the applicant. Related general provisions/processes are reviewed in the licensing and supervisory authorities of the Federation and the Länder and are further developed as required. 3.2 Further development of the information of the public by the licensing and supervisory authorities of the Federation and the Länder as set out in the obligations arising from AtG and Repository Site Selection Act (StandAG).

The IRRS team made neither a recommendation nor a suggestion for Actions 3.1 and 3.2. Nevertheless, the actions have been followed up on as follows:

3.1 – The licensing and supervisory authorities of the Federation and the Länder have reviewed the general provisions/processes. The existing regulations under the general administrative law and civil service law rule out conflicts of interest when NPP or operating staff change to an authority.

3.2 – The portal on nuclear safety jointly created by the Länder, BASE and BfS was and continues to be consistently developed to comprehensively inform the public about the licensing and supervisory tasks. Beyond that, the information platform on the site selection process is also being continuously updated as a central and official information service of the Federation for the search of a disposal site for high-level radioactive waste.

3.3 Development of a Safety Policy Paper Suggestion S7 leads to a **new action** that will be included in module 3.			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
S7	**Suggestion**: BMU should consider improving documentation of its safety policy by explicitly referring to applicable fundamental safety principles and approach to their implementation, leadership and management for safety, as well as commitment to continuous improvement. BfE, BfS and the Länder should consider whether similar improvements to their safety policies are needed.	**BMUV** **S I 2 R**	Based on existing documents, the BMU will develop a proposal for a Safety Policy Paper, serving as a basis for all supervisory authorities. The proposal will then be coordinated within the technical committees of the Länder Committee for Nuclear Energy (LAA) and the coordinated proposal will subsequently be submitted to LAA's main committee for approval.

Module 4 – Management System for the Regulatory Body
Actions (No. 4.1 and 4.2 of the National Action Plan **prior to the mission**)
Preliminary remark on No. 4.1 and 4.2 of the National Action Plan prior to the mission There are extensive parallels regarding the management systems of the nuclear licensing and supervisory authorities of the Federation and the Länder. The ascertainable differences are in the specifics of the mandatory undertaking of tasks as well as in the organisational and financial parameters of the individual authorities. As a consequence, the management systems of the licensing and supervisory authorities of the Federation and the Länder have different statuses as regards the documentation of the management system and their processes.
4.1 The licensing and supervisory authorities of the Federation and the Länder develop a joint understanding of safety culture.

LAA's main committee completed the action by adopting the jointly developed Position Paper "Safety culture in nuclear licensing and supervisory authorities" in 2019. A follow-up recommendation was made in the framework of the IRRS mission (see new action 4.3).

4.2 Depending on the area of responsibility and on a case-by-case basis, the licensing and supervisory authorities of the Federation and the Länder review their management systems with regard to whether any internal guidance have to be supplemented for licensing and supervision processes that are significant in the longer term. Suggestion S1 and recommendations R2 and R4 will be implemented under Action 4.2.			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
S1	**Suggestion**: BfE should consider requiring the project delivery organization (BGE) to have adequate organizational requirements including a management system to ensure high quality of site selection process, site assessment and confidence for future activities.	**BMUV** **AG S III 3** **BASE**	BASE will present the BMU with draft requirements for establishing such a management system.
R2	**Recommendation**: BfE should complete the establishment and implementation of its integrated management system.	**BASE**	Establishment and implementation of the IMS in BASE

R4	**Recommendation**: The regulatory body should conduct independent assessments of the management system regularly to evaluate its effectiveness and to identify opportunities for its improvement.	**BMUV** **S I 2 B** **BASE** **Länder**	Every authority will decide how to guarantee and conduct independent assessments for its own area of responsibility. They are free to establish suitable cooperation among different authorities.
4.3 Development of a joint procedure for a periodic assessment of leadership for safety and safety culture Recommendation R3 leads to a **new action** that is included in module 4.			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
R3	**Recommendation**: The regulatory body should regularly commission assessments of leadership for safety and of safety culture.	**BMUV** **S I 2 B** **BASE** **Länder**	Based on the jointly developed Position Paper “Safety culture in nuclear licensing and supervisory authorities”, BMU, BASE and the Länder will draw up a joint procedure for carrying out periodic assessments on safety culture and on leadership for safety. A four-stage procedure is to be followed: 1. Presenting the aspects of the Position Paper on safety culture in the supervisory authorities (e.g. seminars, workshops), 2. Introducing the topic “Safety culture assessment in supervisory authorities”, 3. Defining the assessment procedure and 4. Carrying out assessments.

Module 5 – Authorisation, Module 6 – Review and Assessment, Module 7 – Inspection

Actions (No. 5.1 of the National Action Plan **prior to the mission**)

Preliminary remark on No. 5.1 of the National Action Plan prior to the mission

The essential requirements of nuclear safety and the corresponding regulatory reviews and assessments are applicable to licences according to §7 AtG and licences according to §§6, 9 and 9b AtG and §7 Radiation Protection Ordinance (StrlSchV).
The Handbook on Cooperation between the Federation and the Länder in nuclear law describes the collaboration between the Federation and the Länder in matters related to power reactors with operating licences and the collaboration between the Federation and the Länder in nuclear procedures. The Supervision Manual (AHB) describes the important processes in the enforcement of the Atomic Energy Act by the Länder, including federal government oversight in the context of federal executive administration according to Article 85 of the Basic Law.

5.1 The licensing and supervisory authorities of the Federation and the Länder determine the need for an extension of the AHB to include processes in licensing areas other than those stated above.

Suggestions S3, S12 and S13 will be implemented under Action 5.1.

The competent technical committees should have in-depth discussions on the procedures and their compilation in a AHB for the area of responsibility of the technical committee on nuclear supply and disposal (FA VE) or on an extension of the existing AHB.

Reference to the 2019 IRRS mission report		Authority	Implementation
S3	**Suggestion**: BMU should consider extending the Handbook in order to cover all regulated facilities and activities and regulatory functions as well as all parts of the regulatory authority.	**BMUV** **S I 3**	The processes in the AHB will be reviewed for any necessary updates. The technical committee on nuclear safety (FA RS) has already decided to extend the AHB to its area of responsibility (e.g. decommissioning of nuclear installations and operation of research reactors).
		AG S III 2 **BASE**	FA VE will decide whether procedures of the Federation and the Länder should be drawn up for its area of responsibility. Processes that result from implementing S5 and S15, for example, will also be taken into account. Interface coordination should be provided.

Reference to the 2019 IRRS mission report		Authority	Implementation
S12	**Suggestion**: The supervisory authorities should consider modifying internal guidance to ensure that all results of inspections are forwarded to the authorised party.	**BW (Baden-Württemberg)**	Within the scope of the AHB, BW will draw up a proposal for a generic process on inspections that will describe the forwarding of inspection findings and the content of inspection reports. This process will then be coordinated in the technical committees and the Länder Committee for Nuclear Energy (LAA). The process will be included in the AHB. Individual supervisory authorities can refer to it in their regulations (management systems) and elaborate it, if necessary. In addition, BW will develop a detailed process description other supervisory authorities can adopt, if appropriate.
S13	**Suggestion**: Supervisory authorities should consider completing guidance on the content of inspection reports.	**BW**	Within the scope of the AHB, BW will draw up a proposal for a generic process on inspections that will describe the forwarding of inspection findings and the content of inspection reports. This process will then be coordinated in the technical committees and the LAA. The document will be included in the AHB. Individual supervisory authorities can refer to it in their regulations (management systems) and elaborate it, if necessary. In addition, BW will update its internal guidance on the content of inspection reports. Other supervisory authorities can adopt this guidance if appropriate.

5.2 Completion of the Supervision Manual for the research reactor FRM II including an inspection programme Suggestion S8 and recommendation R6 lead to a **new action** that is included in modules 5-7.			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
S8	**Suggestion**: The Land (StMUV) should consider finalizing the handbook as a priority. The other Länder should consider developing similar documents as appropriate.	**BY (Bavaria)** **Involved** **BMUV** **S I 3**	BY will complete the handbook on research reactor supervision and make it available to the other Länder with research reactors via the working group on research reactors.
R6	**Recommendation**: StMUV should develop a comprehensive inspection programme for FRM II research reactor by specifying inspection items, frequency for inspections and provisions for announced, unannounced and reactive inspections in accordance with the graded approach.	**BY** **Involved** **BMUV** **S I 3**	BY will develop/document an inspection programme for FRM II and integrate it into the AHB for FRM II.
5.3 Drawing up a comprehensive programme for inspections of all research reactors Suggestion S14 leads to a **new action** that is included in modules 5-7.			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
S14	**Suggestion**: BMU should consider developing a programmed approach to inspections for all research reactors in Germany.	**BMUV** **S I 3** **BY**	The Länder will discuss their inspection programmes in the working group on research reactors and include them in their documents such as the AHB (see S8).

5.4 Drawing up internal guidance for the review and assessment process

Suggestions S10 and S11 lead to a **new action** that is included in modules 5-7.

Reference to the 2019 IRRS mission report		Authority	Implementation
S10	**Suggestion**: The Federation and the Länder authorities should consider developing internal guidance for the review and assessment process.	**SH (Schleswig-Holstein)**	SH will draw up a proposal to complement the existing process Generic Supervision Procedure in the AHB. The proposal will describe the administrative process of the supervision procedure to review and assess plant operation and operator. The proposal will then be coordinated within the technical committees of the LAA and the coordinated proposal will subsequently be submitted to LAA's main committee for approval. Individual authorities can refer to it in their regulations (management systems) and elaborate it, if necessary.
S11	**Suggestion**: The Federation and Länder authorities should consider developing a process for integrated safety assessment in a systematic manner for all facilities and activities.	**SH**	SH will draw up a proposal within the scope of the AHB for a generic process on how to systematically carry out periodic and comprehensive safety assessments. The proposal will then be coordinated within the technical committees of the LAA and the coordinated proposal will subsequently be submitted to LAA's main committee for approval. This process will be included in the AHB. Individual supervisory authorities can refer to it in their regulations (management systems) and elaborate it for each facility, if necessary.

5.5 Drawing up a process on providing results of inspections for dry cask spent fuel storage facilities Suggestion S15 leads to a **new action** that is included in modules 5-7.			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
S15	**Suggestion**: The BMU should consider revising the regulatory framework to ensure that the supervisory authorities (Länder) provide results of inspections to the licensing authority (BfE) for dry cask spent fuel storage facilities.	**BASE** **Länder** **BMUV** **AG S III 2**	BASE/Länder/BMU will draw up a proposal for a process on providing results of inspections for dry cask spent fuel storage facilities which will then be coordinated within the technical committees of the LAA and subsequently submitted to LAA's main committee for approval.

Module 8 – Enforcement			
Actions prior to the mission - not applicable -			
8.1 Ensuring consistency in the enforcement policies and practices of the supervisory authorities Suggestion S16 leads to a **new action** that is included in module 8.			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
S16	**Suggestion**: The BMU should consider measures to ensure promoting the consistency in the enforcement policies and practices at the various regulatory authorities.	**BW**	BW will make a first proposal to ensure consistency in the enforcement policies and practices of the supervisory authorities and will then coordinate it in the technical committees and the Länder Committee for Nuclear Energy (LAA). This higher-level proposal aims to present the available tools for enforcing regulatory measures without pre-empting individual decisions of the authority. This document will be included in the Supervision Manual (AHB).

Module 9 – Guides and Regulations
Actions (No. 9.1 of the National Action Plan **prior to the mission**)
Preliminary remark on No. 9.1 of the National Action Plan prior to the mission The Safety Criteria for NPP (SiAnf) apply to installations that are used for the fission of nuclear fuels for the commercial generation of electricity (NPPs) and, mutatis mutandis ("graded approach") to research reactors. To identify potentially required changes to the national regulations, the requirements are reviewed periodically to ensure that they are up to date. In the case of the SiAnf, such a review is carried out every five years (Process 22, Supervision Manual).
9.1 Against the background of the new Radiation Protection Act and the phase-out of the use of nuclear energy, the BMU, together with the licensing and supervisory authorities of the Federation and the Länder, determine the necessary demand for a redevelopment and advancement of the substatutory regulations. This should be/is guided by the needs after 2022 in particular for research reactors, decommissioning and dismantling, and storage and disposal. Recommendations R1 and R5 and suggestions S9, S17, S18, S19, S20 and S21 will be implemented under Action 9.1.

Substatutory regulations – Decommissioning Guide			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
R1	**Recommendation**: BMU should include requirements for addressing public inputs during the process of termination of the decommissioning license.	**BMUV** **S I 3** **Involved** **AG S III 2**	BMU will draw up a proposal to complement the Decommissioning Guide, which will then be coordinated within the technical committees of the Länder Committee for Nuclear Energy (LAA) and subsequently be submitted to LAA's main committee for approval.
S9	**Suggestion**: The regulatory body should consider updating decommissioning guidance to identify and maintain all relevant data which must be preserved after termination of the license.	**BMUV** **S I 3** **Involved** **AG S III 2**	BMU will draw up a proposal to complement the Decommissioning Guide, which will then be coordinated within the technical committees of LAA and subsequently be submitted to LAA's main committee for approval.

R5	**Recommendation**: The regulatory body should establish requirements for the periodic review and update of safety assessments during immediate dismantling.	**BMUV** **S I 3** **Involved** **AG S III 2**	BMU will draw up a proposal to complement the Decommissioning Guide, which will then be coordinated within the technical committees of LAA and subsequently be submitted to LAA's main committee for approval.
S21	**Suggestion**: The regulatory body should consider revising decommissioning guidance to address interdependences among multiple facilities and authorised parties at the same site when implementing dismantling projects.	**BMUV** **S I 3** **AG S III 2**	BMU will draw up a proposal to complement the Decommissioning Guide, which will then be coordinated within the technical committees of the LAA and subsequently be submitted to LAA's main committee for approval (see R1, R5 and S9). This complementary proposal should also consider the interdependences between nuclear power plants to be dismantled and other nuclear facilities at the same site.

Substatutory regulations – PSR guidance			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
S17	**Suggestion**: BMU should consider updating its PSR guidance to address all safety factors with a graded approach in view of its future application for all nuclear facilities.	**BMUV** **S I 3** **Involved:** **AG S III 2**	BMU will draw up a proposal on adapting the existing requirements for research reactors in line with the suggestion, which will then be discussed in the LAA and its technical committees. Nuclear Waste Management Commission (ESK) guidance for the performance of PSR and on technical ageing management of storage facilities for spent fuel and heat-generating radioactive waste is available. A concrete procedure should be laid down in the Supervision Manual (AHB) as to how bodies such as BASE are to be informed about PSR findings. Specific deadlines should be adopted by which the information must be provided following completion of the PSR, and the scope of the information defined.

Substatutory regulations – research reactors			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
S18	**Suggestion**: The regulatory authority should consider specifying the aspects in the regulations and/or guides on how to apply a graded approach to design, operation, authorization, review and assessments for research reactors.	**BMUV** **S I 3**	BMU will draw up a draft working paper on the implementation of the graded approach for research reactors. The draft and its inclusion into the AHB will then be discussed in the technical committees and in the LAA.

Substatutory regulations –storage and disposal			
Reference to the 2019 IRRS mission report		**Authority**	**Implementation**
S19	**Suggestion**: The regulatory body should consider the revision of safety requirements/guidance documents for the development, operation and closure of disposal facilities for radioactive waste with negligible heat generation, taking account of the state of the art in science and technology.	**BMUV** **AG S III 3**	S III 2 will review whether guidance documents for disposal facilities are required. If necessary, BASE will be involved in drawing up these documents.
S20	**Suggestion**: The regulatory body should consider updating the guidance on the predisposal of radioactive waste to ensure they reflect the interdependences between the steps of predisposal management and the possibility of extended storage periods.	**BMUV** **AG S III 2**	The further handling of the guidance on conditioning waste with negligible heat generation published by the ESK is currently being discussed in the technical committees on nuclear fuel cycle and nuclear safety. The proposal for implementation will reflect the jointly agreed procedure. Drawing up a new Federal/Länder guideline is an option.

Module 10 – Emergency Preparedness and Response
Actions (No. 10.1 to 10.5 of the National Action Plan **prior to the mission**)
Preliminary remark on No. 10.1 to 10.5 of the National Action Plan prior to the mission Despite the decision to phase out nuclear energy until 2022, radiological emergency preparedness remains an important task for the German federal and Land authorities. The part of the new Radiation Protection Act (StrlSchG) relating to radiological emergencies came into force in autumn of 2017. The StrlSchG prescribes a range of innovations and improvements to the emergency preparedness and response system in Germany. These include i.a. the establishment of the Radiological Situation Centre of the Federation (RLZ), which consists of the main stakeholders BMU, BfS and GRS, and which is responsible in transregional emergencies for consistent situation assessments and overviews as well as for the national and international coordination of emergency response. Furthermore, the StrlSchG prescribes the preparation of new detailed emergency response plans of the Federation and the Länder.
10.1 According to §98 StrlSchG, the BMU prepares the federal general emergency response plan, which is agreed by the Federal Government with consent of the Bundesrat as a binding administrative regulation for all authorities of the Federation and the Länder. As a core element, the federal general emergency response plan contains a catalogue of different postulated events and related scenarios, which serves as a basis for the Federation and the Länder in the planning for possible emergencies in Germany or abroad. Furthermore, the federal general emergency response plan contains an optimised protection strategy for each of these emergency scenarios. Until the issuing of the federal general emergency and special emergency plans, the documents specified in Appendix 4 StrlSchG apply as the provisional federal emergency plans. 10.2 According to §99 StrlSchG, the federal ministries responsible for the respective areas compile a range of special federal emergency response plans which supplement and specify the federal general emergency plan. They represent the emergency planning and response (EP&R) for the specific and legal areas affected in an emergency (such as waste disposal, drinking water supply, traffic etc.). The special federal emergency response plans are likewise adopted as a binding administrative regulation by the Federal Government with the consent of the Bundesrat. 10.3 According to §100 StrlSchG, the Länder prepare general and special emergency response plans, which supplement the corresponding federal plans. These specify the emergency precautions for the area and the authorities of each Land. Until the issuing of the emergency response plans of the Länder, the relevant documents existing at Land level apply as provisional emergency response plans for the Länder. 10.4 According to §101 StrlSchG, the disaster control authorities of the Länder prepare or update external emergency response plans for the surroundings of installations with special hazard potential (such as nuclear installations). These site-specific external emergency response plans specify the emergency protection precautions and the emergency response plans of the Federation and the Länder with consideration of the local conditions and on-site emergency preparedness. 10.5 The BMU prepares the ordinances prescribed in the emergency protection part of the StrlSchG, if these are necessary and have not already been considered in the first article ordinance of the StrlSchG. Suggestions S24 and S25 will be implemented under Actions 10.1-10.5.

Reference to the 2019 IRRS mission report		Authority	Implementation
S24	**Suggestion**: The regulatory body should consider developing general and special emergency plans based on the reference scenarios defined according to the Radiation Protection Act (to replace the existing provisional plans).	**BMUV** **AG S II 5,** **S II 6** **Länder**	BMU will draw up the general emergency plan and, within the scope of its responsibility, special emergency plans and will support other competent ministries to develop their own special emergency plans through coordination and radiological expertise. The Länder will prepare general and special emergency plans, which supplement and substantiate the corresponding federal plans.
S25	**Suggestion**: BMU should consider evaluating the extent of resources needed to prepare for and respond to emergencies at foreign nuclear power plants affecting Germany or emergencies at other nuclear facilities in Germany and, if necessary, secure funding of those resources after the phase out.	**BMUV** **AG S II 5** **Länder** (particularly the highest disaster control authorities and highest Land authorities responsible for general emergency plans)	As part of further emergency planning, BMU and the competent authorities of the Federation and the Länder will examine the resources required for radiological emergency preparedness beyond nuclear phase-out, including the anticipated funding situation. The review will place particular focus on possible emergencies at foreign nuclear power plants close to the border or at other nuclear installations in Germany. Measures to secure funding will be adopted.

Module 11 – Occupational Radiation Protection
Actions (No. 11.1 and 11.2 of the National Action Plan **prior to the mission**)
Preliminary remark on No. 11.1 and 11.2 of the National Action Plan prior to the mission Against a background of the new radiation protection law, the organisation of radiation protection and the further regulations that relate to radiation protection are reviewed.
11.1The BMU prepares a general administrative provision (AVV) concerning activities for the prospective and retrospective calculation of exposure of the population, considering all relevant sources, and publishes this in the Federal Gazette. 11.2The BMU prepares a general administrative provision concerning radiation passbook with the particular intention of EU-wide use of radiation passbook and publishes this in the Federal Gazette.

The IRRS Team did not make any recommendations or suggestions directly linked to Actions 11.1 and 11.2. The implementation of these actions has been followed up on independently of the outcome of the IRRS mission. The two general administrative provisions came into effect in summer 2020, thus implementing the actions.

The recommendations made in the framework of the IRRS mission (S22 and S23) will not be followed up on for the following reasons:

Reference to the 2019 IRRS mission report		**Authority**	**Reasoning – no follow-up**
S22	**Suggestion**: The regulatory body should consider developing guidance on decommissioning for facilities which are regulated under the Radiation Protection Act.	**BMUV** **AG S III 2**	Decommissioning of facilities which are regulated under the Radiation Protection Act has to be decided on a case-to-case basis as they vary widely, particularly with regard to the inventory and intended application. It is felt that implementing this in a general guidance would be ineffective. Moreover, not all facilities operated according to the Radiation Protection Act were included in the scope of the IRRS mission. However, BMU will discuss a possible process development for decommissioning projects in the technical committee on nuclear

			supply and disposal and, if appropriate, initiate the development of a guidance or amendment of guidance. Clarification: In our view, the reviewers focused primarily on the storage facilities for radioactive waste with negligible heat generation that were or will be constructed on the sites of nuclear power plants to be decommissioned and that have a handling license according to §3 or §7 Radiation Protection Ordinance (StrlSchV, former version) or §12 Radiation Protection Act.
S23	**Suggestion**: The regulatory body should consider establishing regulatory requirements to mandate provision of relevant exposure records to workers employed by a licensee, not only upon request.	**BMUV** **S II 3,** **S II 1**	Provision is possible at all times, upon request. Due to the large number of licences in radiation protection, a notification obligation of the operator towards the employee would lead to an unnecessarily higher administrative burden. §64(3) StrlSchV generally regulates that every occupationally-exposed person has to be informed in writing, upon request, of the occupational exposure received. This obligation does not apply when a radiation passport has been issued for this person. In case of suspected exceedance of dose limits, the person has to be informed about their determined body dose without delay (§65(3) StrlSchV). In addition, according to §66(5) StrlSchV a person may request a dosimeter which can be used to measure the personal dose and determine it at any time. A general obligation to automatically provide all supervised staff with their exposure data at all times would lead to a disproportionate administrative burden, especially since the majority of supervised staff were never subject to an exposure above the detection limit. Against this background, it is to be expected that a large share of the supervised staff considered such mandatory information to be dispensable. No significant advantage can be seen. No similar claims were made when the Radiation Protection Act was amended. BMU will observe the new technologies (database, automation, in-house email incl. encryption options, e-files etc.) to ascertain whether simpler ways are likely to be developed in the medium term to appropriately implement this suggestion without a higher administrative burden.

Implementation of Recommendations and Suggestions, Updated National Action Plan

Module	1				2	3		4					5	6			7					8	9							10	
Recom.							R1		R2		R3	R4				R5			R6												
Sugg.	S1	S2	S3	S4	S5	S6		S7		S8			S9	S10	S11		S12	S13		S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
Actions																															
Action 1.1						x																									
Action 1.2				x																											
Action 2.1					x																										
Action 3.1	Implemented (no R or S)																														
Action 3.2	Implemented (no R or S)																														
Action 3.3								x																							
Action 4.1	Implemented (no R or S)																														
Action 4.2	x								x			x																			
Action 4.3											x																				
Action 5.1			x														x	x													
Action 5.2										x									x												
Action 5.3																				x											
Action 5.4														x	x																
Action 5.5																					x										
Action 8.1																						x									
Action 9.1							x						x			x							x	x	x	x	x				
Action 10.1																														x	
Action 10.2																														x	
Action 10.3																														x	
Action 10.4																														x	
Action 10.5																														x	
Action 11.1	Implemented (no R or S)																														
Action 11.2	Implemented (no R or S)																														

Implemented | in progress, implemented until FU | in progress | not implemented

Fig. 7-2 State of implementation of the recommendations, suggestions and actions

7.2 Module 1 – Responsibilities and Functions of the Government

Suggestion S1

(1) ***BASIS:*** *GSR Part 1 Requirement 2, para. 2.5 (6) states that "The government shall promulgate laws and statutes to make provision for an effective governmental, legal and regulatory framework for safety. This framework for safety shall set out the following:*
…
(6) Provision for assigning legal responsibility for safety to the persons or organizations responsible for the facilities and activities, and for ensuring the continuity of responsibility where activities are carried out by several persons or organizations successively;"

(2) ***BASIS:*** *SSR 5 Requirement 25, para. 5.22 states that "An appropriate management system that integrates quality assurance programmes will contribute to confidence that the relevant requirements and criteria for site selection and evaluation, design, construction, operation, closure and safety after closure are met. The relevant activities, systems and components have to be identified on the basis of the results of systematic safety assessment. The level of attention assigned to each aspect has to be commensurate with its importance to safety. The management system is required to comply with the relevant IAEA Safety Standards on management systems [13, 14]."*

S1 ***Suggestion:*** *Suggestion: BfE should consider requiring the project delivery organization (BGE) to have adequate organizational requirements including a management system to ensure high quality of site selection process, site assessment and confidence for future activities.*

Statement:

1. Implementation

The review team had found that BGE lacked guidance on a management system to be established in the area of site selection. It was recommended that BASE provide guidance to BGE in this area.

Since the implementation of the IRRS mission in 2019, the BMUV and BASE have initiated a process that enables BASE, in coordination with the BMUV, to draw up a regulatory framework in the field of disposal facilities and to specify them for BGE.

Based on this process, BASE has prepared a draft of requirements for an integrated management system for BGE. This draft takes into account that a management system always addresses the entire organisation. It takes into account that BGE already has requirements for a management system in areas of the existing disposal projects and additionally specifies how a management system has to be designed in the area of site selection as well. This covers all areas of BGE's business, including site selection.

The document was forwarded to the responsible working group S III 3 at the BMUV and coordinated with AG S III 3. Finalisation of the revised draft (status: 20th October 2022) is in progress at BASE.

The next step will be a presentation of the approach in the ESK and a consultation of the ESK, followed by a hearing of the operator BGE.

2. Assessment

Suggestion S1 is expected to be completed by the time of the follow-up mission.

3. Documents

Draft BASE document "General requirements for the management system of Bundesgesellschaft für Endlagerung GmbH (BGE)"

4. Reference to the measure(s) of the National Action Plan

Suggestion S1 is being implemented under Action 4.2 of the National Action Plan.

"Depending on the area of responsibility and on a case-by-case basis, the licensing and supervisory authorities of the Federation and the Länder review their management systems with regard to whether any internal guidance have to be supplemented for licensing and supervision processes that are significant in the longer term."

Suggestion S2

(1) ***BASIS:*** *GSR Part 1 Requirement 4, para. 2.9 states that "No responsibilities shall be assigned to the regulatory body that might compromise or conflict with its discharging of its responsibility for regulating the safety of facilities and activities."*

S2 ***Suggestion:*** *BMU should consider making clear in the regulatory framework how the Site Selection Act will be implemented in a manner that will not compromise or conflict with BfE discharging its responsibility for regulating the safety of facilities and activities.*

Statement:

1. Implementation

From the point of view of the review team, it was not made sufficiently clear that the content of the site proposal is the sole responsibility of the BGE as the project implementer (§ 18 StandAG) and that BASE only examines the BGE proposal but does not submit its own. In addition, due to the wording "consideration of all private and public concerns" in § 19(1) StandAG, there was concern that political arguments could also influence the evaluation of the BGE's siting proposal and that safety would no longer be the top priority as a result. In the sense of "lessons learned", the legal allocation of responsibilities in the site selection procedure will be communicated in a more comprehensible way to stakeholders – irrespective of the already clarified Suggestion S2 (e.g. on the information platform on the search for a repository, https://www.endlagersuche-infoplattform.de).

2. Assessment

The content of Suggestion S2 was discussed with the relevant review team during the ARTEMIS mission conducted in autumn 2019, and the concerns expressed were allayed during the ARTEMIS mission (see ARTEMIS report, p. 13 there).

3. Documents

None

4. Reference to the measure(s) of the National Action Plan

The suggestion has been implemented as part of the implementation of the recommendations and suggestions of the ARTEMIS mission.

Suggestion S3

(1) ***BASIS:*** *GSR Part 1 Requirement 7, states that "Where several authorities have responsibilities for safety within the regulatory framework for safety, the government shall make provision for the effective coordination of their regulatory functions, to avoid any omissions or undue duplication and to avoid conflicting requirements being placed on authorized parties."*

S3 ***Suggestion:*** *BMU should consider extending the Handbook in order to cover all regulated facilities and activities and regulatory functions as well as all parts of the regulatory authority.*

Statement:

1. Implementation

The Handbook on Cooperation between the Federation and the Länder in Nuclear Law (Handbuch über die Zusammenarbeit zwischen Bund und Ländern im Atomrecht – AHB), last updated in June 2019) was first developed after the IRRS follow-up mission in 2011 to describe and document the cooperation between the federal government and the Länder in connection with power reactors with operating licences and the cooperation between the federal government and the Länder in nuclear law procedures. The scope of the AHB was limited to cooperation with regard to aspects of supervision of the operation of nuclear power plants. During the last IRRS mission in 2019, the following observation was made:

"The scope of the Handbook does not cover all regulated facilities and activities and regulatory functions. Also, BfE [now BASE] is not reflected in the Handbook (for example, coordination of the transition of licensing of the disposal facility for radioactive waste with negligible heat generation from the Land authority to BfE [now BASE] at commissioning is not included)".

As a consequence, the reviewers have proposed to expand the existing AHB to cover all regulated facilities and activities, all supervisory functions as well as all parts of the supervisory authority.

The existing processes in the AHB were expanded to include nuclear power plants in decommissioning and research reactors in operation and decommissioning. The process descriptions for the operation of nuclear power plants were expanded to include the relevance of the respective process with regard to the decommissioning of nuclear power plants, research reactors in operation and research reactors in decommissioning. It was also necessary to develop new processes. Thus, the following processes, which are relevant either exclusively for the decommissioning or the operation of research reactors, were newly described:

- procedure for dismantling measures,

- licensing procedure pursuant to § 7(3) AtG,
- incidents reported in the Incident Reporting System for Research Reactors (IRSRR) – IRSRR
- Consultations of the Nuclear Waste Management Commission (ESK) on the decommissioning of nuclear power plants and research reactors and handling of its consultation results
- Working Group on Decommissioning and
- Working Group on Research Reactors.

Furthermore, to thoroughly implement this recommendation, the FA VE has decided to expand the existing manual so that the field of waste management is also covered.

In 2020, the BMUV commissioned BASE to develop the structure and coordinate the creation of processes for the waste management section of the AHB together with the Länder.

Initially, processes on the subject of storage facilities pursuant to §6 AtG were worked on, showing clear interfaces between the federal government and the Länder. For this purpose, a working group was set up with representatives of the BMUV, BASE and the Länder having a stake in the storage facilities. The following processes were drawn up and adopted by the LAA-HA in June 2023:

- Procedure for new licences pursuant to § 6 AtG for the storage of nuclear fuel (storage facilities)
- Procedure for modification licences pursuant to § 6 AtG for the storage of nuclear fuel (storage facilities)
- Communication between licensing authority and nuclear supervisory authorities on the storage of nuclear fuel pursuant to § 6 AtG
- Reportable events according to the Nuclear Safety Officer and Reporting Ordinance (AtSMV) during storage according to § 6 AtG and their classification according to INES (International Nuclear and Radiological Event Scale)
- Technical Committee for Nuclear Fuel Cycle (FA VE)

- Fulfilment of international obligations under the international Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (JC).

Furthermore, other processes are in progress and are to be adopted in the near future (see Suggestions S10, S11, S12, S13 and S16):

- Review and assessment in the supervisory procedure for licences for storage facilities pursuant to § 6 AtG
- Supervisory process integrated safety assessment for storage facilities according to § 6 AtG
- On-site inspection for storage facilities pursuant to § 6 AtG
- Enforcement of measures for storage facilities pursuant to § 6 AtG
- Consultations of the Nuclear Waste Management Commission (ESK) on conditioning, storage and transport of radioactive materials and waste, disposal in deep geological formations and handling of its consultation results.

Generic processes without a clear interface between the federal government and the Länder in the waste management sector are also to be mapped in summary form in the waste management section of the AHB. A RACI matrix (Responsibility Assignment Matrix) is to accompany the text in order to clearly show the responsibilities of various actors from the federal government and the Länder.

One of these overview processes has already been prepared and adopted by the LAA-HA in June 2023:

- Site selection and participation in accordance with the StandAG

The following overview processes are in progress:

- State collection facilities pursuant to §9a(3) AtG
- Storage facility for low and medium level radioactive waste according to §12 StrlSchG
- Disposal facility and Asse II mine pursuant to § 9a(3) AtG

2. Assessment

The extension of the AHB to the topics of decommissioning of nuclear power plants and research reactors as well as the operation of research reactors has been implemented and was adopted by the LAA-HA in June 2023.

The implementation of the suggestion has also been essentially closed for the area of waste management. The processes that have a clear interface between the federal government and the Länder were also adopted by the LAA-HA in June 2023.

3. Documents

Handbook on Cooperation between the Federation and the Länder in Nuclear Law (as at June 2023)

- Excerpt chapter 0. Introduction
- Excerpt process 23 Review and assessment in the licensing and supervisory procedure
- Excerpt process 24 Supervisory process integrated safety assessment
- Excerpt process 25 On-site inspection
- Excerpt process 26 Enforcement of measures

Handbook on Cooperation between the Federation and the Länder in Nuclear Law (as at June 2018)

Handbook on Cooperation between the Federation and the Länder in Nuclear Law – Waste Management Part, status summer 2023

- Excerpt process 1. Procedure for new licences pursuant to § 6 AtG for the storage of nuclear fuel (storage facilities)
- Excerpt process 2. Procedure for modification licences pursuant to § 6 AtG for the storage of nuclear fuel (storage facilities)
- Excerpt process 3. Communication between licensing authority and nuclear supervisory authorities on the storage of nuclear fuel pursuant to § 6 AtG (storage facilities)
- Excerpt process 4. Reportable events pursuant to the Nuclear Safety Officer and Reporting Ordinance (AtSMV) during storage pursuant to § 6 AtG and their classification according to INES (International Nuclear and Radiological Event Scale) (storage facilities)
- Excerpt process 5. Technical Committee for Nuclear Fuel Cycle (FA VE)

4. Reference to the measure(s) of the National Action Plan

Suggestion S3 has been implemented under Action 5.1 in the National Action Plan.

"*5.1 The licensing and supervisory authorities of the Federation and the Länder determine the need for an extension of the AHB to include processes in licensing areas other than those stated above."*

Suggestion S4

(1) ***BASIS:*** *GSR Part 1 Requirement 11, para. 2.34 states that "As an essential element of the national policy and strategy for safety, the necessary professional training for maintaining the competence of a sufficient number of suitably qualified and experienced staff shall be made available"*

(2) ***BASIS:*** *GSR Part 1 Requirement 18, para. 4.13 states that "A process shall be established to develop and maintain the necessary competence and skills of staff of the regulatory body, as an element of knowledge management. This process shall include the development of a specific training programme on the basis of an analysis of the necessary competence and skills. The training programme shall cover principles, concepts and technological aspects, as well as the procedures followed by the regulatory body for assessing applications for authorization, for inspecting facilities and activities, and for enforcing regulatory requirements"*

S4 ***Suggestion:*** *The Government should consider establishing a comprehensive plan, in consultation with relevant parties, for the project on German competence and financing needs during future decades.*

Statement:

1. Implementation

The review team noted that the BMUV has started a project on competence maintenance and financing needs in the coming decades, but that a comprehensive plan for competence maintenance in the field of nuclear safety and a list of financing needs in the coming decades are missing. The lack of such a concept and of a list of financing requirements was addressed in Suggestion S4.

In order to develop a concept, the project team "Perspective maintenance of expertise and capacities in the field of nuclear safety and radiation protection" was set up at the BMUV for the period from 15th May 2019 to 14th May 2020 with experts from the BMUV (all Directorates of Department S), BASE, BfS, BGE and BGZ. In order to be able to actively shape the maintenance of competence in the field of nuclear safety, needs analyses were first carried out in order to then plan concrete measures in advance. These measures are derived from a consideration of the measures already applied ("as-is") and those to be applied in the future ("to-be").

The needs analyses were carried out in a staged approach, with the first stage being the identification of needs at the federal level (BMUV, BASE, former BfE; BfS; BGE; BGZ). In the second stage, needs beyond the federal level were identified (e.g. Länder, advisory bodies, expert organisations, associations). The queries were made by means of questionnaires.

The results of the project team's work are concrete needs analyses and recommendations for action in the fields of "Safety of nuclear installations", "Radiation protection" and "Safety in

nuclear waste management". Länder, expert organisations, BMUV advisory bodies, operators and training institutions were involved. In parallel to the internal BMUV process, the BMUV began work at departmental level in spring 2019 with the BMWK and BMBF to prepare a draft for an overall concept. The interdepartmental concept was adopted by the Federal Government on 26 August 2020. In particular, it contains catalogues of measures for the following fields of action:

- training and teaching;
- further and continuing qualification;
- research and development;
- knowledge retention, committee work and networks;
- international networking and cross-border activities;
- career prospects and recognition in the social environment.

2. Assessment

Suggestion S4 has been implemented and fulfilled through the elaboration and adoption of the Strategy for Competence Building and the Development of Future Talent for Nuclear Safety of 26th August 2020, its implementation process including the establishment of funding requirements for the next decades.

3. Documents

Strategy for Competence Building and the Development of Future Talent for Nuclear Safety of 26th August 2020

Needs analysis for the safety of nuclear facilities

Needs analysis for the maintenance and expansion of radiation protection competence in Germany

Needs analysis for the safety of nuclear waste management

4. References to the measure(s) of the National Action Plan

Suggestion S4 has been implemented under Action 1.2 in the National Action Plan.

“The licensing and supervisory authorities of the Federation and the Länder assess the skills required on the basis of their future tasks, the programme and concept for skills development and for staff skills and competence retention. As needed regulations for staffing level, training and further training measures for personnel are implemented in the management system of the authorities.”

7.3 Module 2 – Global Safety Regime

Suggestion S5

(1) ***BASIS:*** *GSR Part 1 Requirement 14, states that "The government shall fulfil its respective international obligations, participate in the relevant international arrangements, including international peer reviews, and promote international cooperation and assistance to enhance safety globally."*

(2) ***BASIS:*** *GSR Part 1 Requirement 15, states that "The regulatory body shall make arrangements for analysis to be carried out to identify lessons to be learned from operating experience and regulatory experience, including experience in other States, and for the dissemination of the lessons learned and for their use by authorized parties, the regulatory body and other relevant authorities."*

S5 ***Suggestion:*** *The BMU should consider increasing international participation and involvement of staff from BfE, BfS and Länder to improve the regulatory experience and feedback to Germany and to the international community.*

Statement:

1. Implementation

The review team has noted that BMUV should consider greater involvement of representatives of the subordinate level as well as the Länder in international activities in order to improve the exchange of supervisory experience and mutual feedback between Germany and the international community.

To implement suggestion S5, the first step was to identify the processes of the AHB and to examine in which bodies licensing and supervisory authorities of the Federation and the Länder are represented.

According to the AHB, the essential processes for international cooperation and collaboration are:

- Process 19 (Multilateral Cooperation) and
- Process 20 (Bilateral Commissions).

In addition, according to GSR Part 1 Requirement 14 ("The government shall fulfil its respective international obligations, participate in the relevant international arrangements, including international peer reviews, and promote international cooperation and assistance to enhance safety globally."), there are the following processes:

- Process 17 (Preparation and implementation of IAEA regulations and guides)

- Process 18 (Preparation and implementation of Western European Nuclear Regulators' Association (WENRA) documents)
- Process 21 (CNS)

According to initial evaluations, staff of BASE, BfS and the Länder or TSOs of the Länder are already represented in more than 40% of the committees.

In order to intensify participation and to be able to ensure the inclusion of the above-mentioned authorities and organisations in other events as well, such as e.g. technical meetings or conferences of the IAEA, the relevant organisational units of the BMUV provide information on corresponding vacancies in committees or on relevant events. The respective e-mail distribution list for the technical committees of the LAA (FA RS, FA VE, FA S and FA R) serves as communication channel. In special cases, additional e-mail distribution lists may be set up as required. Nominations are made via the BMUV.

There is no urgent need to adapt the processes of the AHB. However, the following sentence could be added to the processes mentioned:

“The Federal Ministry for the Environment regularly informs about relevant events via the distribution lists of FA RS, FA VE, FA S and FA R and accepts nominations.”

2. Assessment

Suggestion S5 is implemented and fulfilled through the already practised involvement of subordinate authorities and the Länder, but is to be further improved through targeted information on relevant committees/events by the relevant organisational units of the BMUV.

3. Documents

None

4. Reference to measure(s) of the National Action Plan

Suggestion S5 has been implemented under Action 2.1 in the National Action Plan.

“More active participation of all licensing and supervisory authorities of the Federation and the Länder in the fulfilment of international duties by the BMU in order to contribute the entire range of German expertise internationally.”

7.4 Module 3 – Responsibilities and Functions of the Regulatory Body

Suggestion S6

(1) ***BASIS:*** *GSR Part 1 Requirement 18, states that "The regulatory body shall employ a sufficient number of qualified and competent staff, commensurate with the nature and the number of facilities and activities to be regulated, to perform its functions and to discharge its responsibilities."*

(2) ***BASIS:*** *GSG-12, para. 6.4 states that "In addition to depending on the employment of sufficient staff with suitable qualifications and expertise, the effectiveness of the regulatory body will also depend on the status of its staff in comparison with those of the authorized parties and other involved organizations. Staff of the regulatory body should be appointed at such grades and with such salaries and conditions of service as would facilitate their interactions with authorized parties and reinforce the independence and authority of the regulatory body staff in conducting their work."*

(3) ***BASIS:*** *GSR Part 1 Requirement 20, para 4.22 states that "The obtaining of advice and assistance does not relieve the regulatory body of its assigned responsibilities. The regulatory body shall have adequate core competence to make informed decisions. In making decisions, the regulatory body shall have the necessary means to assess advice provided by advisory bodies and information submitted by authorized parties and applicants."*

S6 ***Suggestion:*** *The Federal authorities should consider measures to ensure there is a sufficient number of qualified staff with engineering expertise.*

Statement:

1. Implementation

The review team noted that the federal authorities should undertake efforts to ensure that there are sufficient staff with engineering expertise. This was addressed in Suggestion S6. A legal clarification to ensure the staffing needs of the federal authorities was made with the amendment of § 23 AtG of 7th December 2020, where it is legally stipulated that the authorities responsible for the execution of the Act have adequate staffing and financial resources to fulfil their statutory tasks.

Furthermore, detailed needs analyses were conducted as part of the development of the Strategy for Competence Building and the Development of Future Talent for Nuclear Safety. The needs analyses are part of the basis for implementation in the federal authorities and are taken into account in the authorities' actions. The "Needs analysis for the safety of nuclear facilities" and "Needs analysis for the safety of nuclear waste management" explicitly refer to the IRRS mission and Suggestion 6 on p. 11 and p. 9, respectively, and the resulting need for action. The "Needs analysis for the maintenance and expansion of radiation protection competence in Germany" also addresses the importance of engineering competence for radiation protection (p. 3 and p. 5, respectively).

When new positions are advertised, care is taken to ensure that the job profiles are designed in such a way and that the selection is made in such a way – always taking into account the principle of selection of the best – that new employees have the necessary expertise to perform their tasks and also have the ability to familiarise themselves with new developments. Depending on the specific task, this also includes requirements for engineering and scientific knowledge and the ability to familiarise oneself with the advancing state of the art in science and technology also in the future.

The collective bargaining law of the civil service, the civil service and career law and the principle of selection of the best, which is laid down at constitutional level, ensure in the application procedure that this knowledge and expertise can be demonstrated both in the higher intermediate and in the higher civil service at least by engineering or scientific university degrees or corresponding degrees from universities of applied sciences, the quality of which has also become better comparable internationally through the implementation of the Bologna Process within the European Union. If applicants have relevant professional experience, this will be taken into account in the further application procedure.

In addition to the continuous documentation and transfer of knowledge within the authorities, especially in the case of changes in tasks and generations, the maintenance and regular updating of knowledge in existing jobs is also carried out by means of further training that is oriented towards the requirements of the specific tasks and tailored to needs. It should also be taken into account that both engineering and scientific knowledge and skills are often considered to be interrelated in training and professional practice and that many employees who have studied natural sciences also possess or have developed in-depth knowledge of engineering through their main fields of study, research, development and/or professional experience.

2. Assessment

Suggestion S6 has been implemented and fulfilled through the legal clarification as well as the needs analyses that has been carried out.

3. Documents

Needs analysis for the safety of nuclear facilities

Needs analysis for the maintenance and expansion of radiation protection competence in Germany

Needs analysis for the safety of nuclear waste management

4. References to the measure(s) of the National Action Plan

Suggestion S6 has been implemented under Action 1.1 in the National Action Plan.

"A*gainst a background of changing tasks in the field of nuclear safety, the licensing and supervisory authorities of the Federation and the Länder assess necessary staffing needs."*

Recommendation R1

(1) ***BASIS:*** *GSR Part 6 Requirement 15 states that "On the completion of decommissioning actions, the licensee shall demonstrate that the end state criteria as specified in the final decommissioning plan and any additional regulatory requirements have been met. The regulatory body shall verify compliance with the end state criteria and shall decide on termination of the authorization for decommissioning."*

(2) ***BASIS:*** *GSR Part 6 Requirement 15, para. 9.6 states that "Inputs from the public shall be addressed before authorization for decommissioning is terminated."*

(3) ***BASIS****: SSG 47, para 7.44. states that "In accordance with paras 7.16 and 9.6 of GSR Part 6 [1], interested parties are required to be involved in the licensing process for decommissioning, as well as in the process for termination of the authorization for decommissioning, and are required to be given an opportunity to provide comments before decisions are taken by the regulatory body and prior to the granting or termination of an authorization for decommissioning."*

R1 ***Recommendation:*** *BMU should include requirements for addressing public inputs during the process of termination of the decommissioning license.*

Statement:

1. Implementation

The review team had noted that after the termination of decommissioning, the release of a site from regulatory control under nuclear and radiation protection law is carried out by an administrative act of the competent licensing and supervisory authority of the Land, without additional consultation of the public. The lack of public consultation on the termination of decommissioning was addressed in Recommendation R1.

Recommendation R1 has been implemented and fulfilled by supplementing the Decommissioning Guide.

The BMUV has drawn up a proposal to supplement the Decommissioning Guide, which was subsequently agreed on in the LAA technical committees and adopted in the LAA-HA in July 2021.

The corresponding addition in Chapter 4.3 of the Decommissioning Guide reads:

"In addition, the authority shall work towards ensuring that the licensee 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."

2. Assessment

Recommendation R1 has been implemented via an addition in the Decommissioning Guide.

3. Documents

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 16th September 2021 (Decommissioning Guide).

4. Reference to the measure(s) of the National Action Plan

Recommendation R1 has been implemented under Action 9.1 in the National Action Plan.

"Against the background of the new Radiation Protection Act and the phase-out of the use of nuclear energy, the BMU, together with the licensing and supervisory authorities of the Federation and the Länder, determine the necessary demand for a redevelopment and advancement of the substatutory regulations. This should be/is guided by the needs after 2022 in particular for research reactors, decommissioning and dismantling, and storage and disposal."

7.5 Module 4 – Management System for the Regulatory Body

Suggestion S7

(1) ***BASIS:*** *GSR Part 1 Requirement 1, para. 2.3 states that "In the national policy and strategy, account shall be taken of the following: "…*
(a)The fundamental safety objective and the fundamental safety principles established in the Fundamental Safety Principles [1];
(g) The promotion of leadership and management for safety, including safety culture".

(2) ***BASIS:*** *GSR Part 2 Requirement 4, states that "Senior management shall establish goals, strategies, plans and objectives for the organization that are consistent with the organization's safety policy."*

S7 ***Suggestion:*** *BMU should consider improving documentation of its safety policy by explicitly referring to applicable fundamental safety principles and approach to their implementation, leadership and management for safety, as well as commitment to continuous improvement. BfE, BfS and the Länder should consider whether similar improvements to their safety policies are needed.*

Statement:

1. Implementation

The review team found that the strategic plan and associated federal and Länder documents contain most of the elements of a safety policy. However, the applicable fundamental safety principles and the approach to their implementation, safety leadership and management, and commitment to continuous improvement were not explicitly defined.

The licensing and supervisory authorities of the Federal Government and the Länder have taken up the recommendation and documented the nuclear safety policy in Germany in the National Policy Paper "Nuclear Safety". The document National Policy Paper "Nuclear Safety" was jointly prepared by the Federal Government and the Länder and adopted at the meeting of the Main Committee of the Länder Committee for Nuclear Energy on 1st/2nd July 2021. It sets out the understanding in Germany of the primacy of nuclear safety and its continuous improvement and describes how the legal mandate for the effective protection of people, the environment and property against nuclear hazards and risks and against the harmful effects of ionising radiation in these areas is implemented in Germany. It outlines the tasks and responsibilities of the various licensing and supervisory authorities under nuclear and radiation protection law. It also provides an overview of how nuclear safety in Germany is continuously improved in the current situation and under the given framework conditions. In this safety policy, safety culture is listed as a fundamental principle of responsible performance of tasks.

Federal and Land authorities have referenced or made adjustments to this National Policy Paper “Nuclear Safety” in their management systems where necessary. For example, BASE reviewed the topic area of safety policy and added to its management system manual to further elaborate on BASE safety policy messages.

As another example, the supervision concept of the Ministry of the Environment of Baden-Wuerttemberg referred to the National Policy Paper “Nuclear Safety” in the introduction. The supervision concept itself presents the principles and strategies for the activities of the Ministry of the Environment Baden-Wuerttemberg mentioned in the policy paper in detail and concretely.

2. Assessment

Suggestion S7 has been implemented and fulfilled through the formulation and adoption of the National Policy Paper “Nuclear Safety”.

3. Documents

National Policy Paper “Nuclear Safety” of 1st/2nd July 2021

Excerpt from the BASE Management System Manual (BASE-MMH)

Excerpt (contents and introduction) from the supervision concept of the Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg

4. References to the measure(s) of the National Action Plan

Suggestion S7 has been implemented under Action 3.3 in the National Action Plan.

“Development of a Safety Policy Paper”

Recommendation R2

(1) ***BASIS:*** *GSR Part 1 Requirement 19 states that "The regulatory body shall establish, implement, and assess and improve a management system that is aligned with its safety goals and contributes to their achievement."*

(2) ***BASIS:*** *GSR Part 2 Requirement 3. states that "Senior management shall be responsible for establishing, applying, sustaining and continuously improving a management system to ensure safety."*

R2 ***Recommendation:*** *BfE should complete the establishment and implementation of its integrated management system.*

Statement:

1. Implementation

During the 2019 IRRS mission, the BfE (now BASE) was in the set-up phase. The reviewer team had noted that the management system had been developed at the time of the mission but had not yet been fully implemented.

Documentation of the integrated management system of the BASE has been continuously developed since the 2019 IRRS mission. In particular, the management system manual has been updated, and relevant documents have been developed in line with international standards (in particular, work instructions, flowcharts, and process profiles for internal audits and management review).

All elements of a continuous improvement process have been installed.

The staff with competences in the area of management systems and audits has been expanded at the BASE, the task of management systems has meanwhile been placed with the President of the BASE, thus further emphasizing the importance of the subject area.

Annual audit planning is carried out and audits have begun. Recently, the installation of environmental management as part of BASE's integrated management system was completed with the validation by an EMAS environmental consultant.

During the implementation and operation of the integrated system, attention has been and will continue to be paid to the appropriate consideration of international standards.

2. Assessment

Recommendation R2 has been met and will continue to be pursued.

3. Documents

Excerpt from the BASE Management System Manual (BASE-MMH)

4. Reference to the measure(s) of the National Action Plan

Recommendation R2 has been implemented under Action 4.2 in the National Action Plan.

“Depending on the area of responsibility and on a case-by-case basis, the licensing and supervisory authorities of the Federation and the Länder review their management systems with regard to whether any internal guidance have to be supplemented for licensing and supervision processes that are significant in the longer term.”

Suggestion S8

(1) ***BASIS:*** *GSR Part 2 Requirement 8, states that "The management system shall be documented. The documentation of the management system shall be controlled, usable, readable, clearly identified and readily available at the point of use."*

(2) ***BASIS:*** *GSR Part 2 Requirement 8, para 4.16, states that "The documentation of the management system shall include as a minimum: policy statements of the organization on values and behavioural expectations; the fundamental safety objective; a description of the organization and its structure; a description of the responsibilities and accountabilities; the levels of authority, including all interactions of those managing, performing and assessing work and including all processes; a description of how the management system complies with regulatory requirements that apply to the organization; and a description of the interactions with external organizations and with interested parties."*

(3) ***BASIS:*** *GSR Part 2 Requirement 10, para. 4.28 states that "Each process shall be developed and shall be managed to ensure that requirements are met without compromising safety. Processes shall be documented and the necessary supporting documentation shall be maintained."*

(4) ***BASIS:*** *GSG-13, para. 161 states that "In order to provide assurance that all topics significant to safety will be covered consistently with submissions for similar facilities or activities, review and assessment should be carried out by means of a systematic and formalized process implemented through specific procedures."*

S8 ***Suggestion:*** *The Land (StMUV) should consider finalizing the handbook as a priority. The other Länder should consider developing similar documents as appropriate.*

Statement:

1. Implementation

The review team had welcomed the preparation of a manual for the supervision of the High Flux Neutron Source Munich in Garching (FRM II; Supervision Manual) and the already existing draft of the Supervision Manual. It was suggested to the representatives of the StMUV that the completion of the draft of the Supervision Manual be given priority.

Suggestion S8 has been implemented and fulfilled through the completion of the draft Supervision Manual.

The Supervision Manual contains all the skills and processes required for the topics important in the supervision of FRM II in 13 main chapters and three appendices. The following are the main chapters:

- Table of contents
- Mission Statement and Principles
- Introduction

- Aim of the Supervision Manual
- Objectives of supervision
- Tasks of nuclear supervision
- Principles of nuclear supervision
- Legal basis
- Participants in the supervisory procedure
- Responsibilities
- Enforcement strategy
- Supervisory activities at FRM II
- List of cited legal provisions, abbreviations and definitions used

On the basis of these chapters and the skills and processes described therein (Chapter XII), especially new employees in the unit responsible for supervision in Department 8 of the StMUV can carry out all supervisory activities at FRM II in a comprehensible manner.

The draft of the FRM II Supervision Manual of the StMUV has already been presented at the last meetings of the Federation-Länder Working Group “Research Reactors”. The discussion on the implementation of similar supervision manuals for the research reactors located in the other Länder is an ongoing process and will continue in the working group.

2. Assessment

Suggestion S8 has been implemented and fulfilled through the revision of the draft Supervision Manual.

3. Documents

Handbook for state supervision on the high flux neutron source Munich in Garching (FRM II) – Supervision Manual, 15.06.2023 (in German)

- Excerpt table of content, chapter XI. enforcement strategy, chapter XII. Supervisory activities at FRM II

4. Reference to the measure(s) of the National Action Plan

Suggestion S8 has been implemented under Action 5.2 in the National Action Plan.

“*Completion of the Supervision Manual for the research reactor FRM II including an inspection programme*”

Recommendation R3

(1) ***BASIS:*** *GSR Part 2 Requirement 14, states that "Senior management shall regularly commission assessments of leadership for safety and of safety culture in its own organization."*

R3 ***Recommendation:*** *The regulatory body should regularly commission assessments of leadership for safety and of safety culture.*

Statement:

1. Implementation

The review team noted that the Federal Government and the Länder have initiated a process to develop and strengthen a common understanding of safety culture within the supervisory and licensing authorities, but a safety culture assessment has not yet been conducted for all authorities. Recommendation R3 addresses that supervisory and licensing authorities have to conduct regular safety culture assessments.

The Federation and the Länder have developed a common understanding of safety culture and adopted the "Policy paper on the safety culture in nuclear licensing and supervisory authorities" of 14th March 2019. It specifies and explains the principles of this jointly developed understanding of safety culture.

Furthermore, at the LAA-HA meeting on 1st/2nd July 2021, the Federal Government and the Länder adopted the National Policy Paper "Nuclear Safety", which takes an integrated approach. In this paper, safety culture is defined as a fundamental principle of the responsible performance of tasks.

To implement the recommendation, a set of concrete measures has been carried out.

To raise awareness of the issue of safety culture among staff of the Federation and the Länder, the BMUV had a factsheet prepared based on the "Policy paper on the safety culture in nuclear licensing and supervisory authorities" and a seminar for authorities was held from 15th to 17th June 2021. A follow-up seminar with more in-depth content took place from 21st – 22nd June 2023.

The Baden-Wuerttemberg Ministry of the Environment conducted a pilot self-assessment of their regulatory safety culture from December 2021. In an online questionnaire, the staff indicated the extent to which the statements from the "Policy paper on the safety culture in nuclear licensing and supervisory authorities" were perceived as well implemented. In subsequent group discussions, the staff discussed the survey results in 2022, especially the indications of possible

weaknesses. Building on this, the management decided on activities related to the safety culture principle of “learning and improvement”, which were carried out in the form of workshops in 2023. The experiences from this pilot self-review were incorporated into the joint implementation process of the Federation and the Länder.

As a kick-off to these joint activities, an event was held on 23rd June 2022 at the invitation of the BMUV with the Länder at the top management level of the participating nuclear licensing and supervisory authorities, highlighting the importance of conducting regular assessments of the safety culture and discussing concrete steps. In particular, the internationally renowned expert Dr Schöbel (University of Basel) was invited to give a lecture followed by a discussion. Dr Schöbel was a member of a team of advisors to the IAEA and developed a measurement tool/methodology for safety culture for them. An ad-hoc Federation-Länder working group on “Self-assessment of the regulatory safety culture in Germany” was established, which met on 14th September, 2nd December 2022, 1st March and 27th March 2023. This group developed a proposal for suitable procedures for self-review, including quantitative and qualitative instruments as well as supporting documents. It was taken into account that the set of instruments includes appropriate instruments for the different structures and sizes of the individual authorities. The methodology is based on recommendations from the IAEA (e.g. TECDOC 1895), academia (e.g. Fleming et al. (2022)) and the OECD NEA (e.g. Green Booklet No. 7535 “Methods for Assessing and Strengthening the Safety Culture of the Regulatory Body”).

The core of the modular set of instruments is a list of 40 particularly relevant statements (practices) on regulatory safety culture, which were extracted from the “Policy paper on the safety culture in nuclear licensing and supervisory authorities” and which comprehensively map the various aspects of regulatory safety culture. They serve as a basis for all subsequent modules. The modules include quantitative and qualitative methods of self-assessment. The quantitative module is a questionnaire survey in which the participants are asked for two responses (actual and ideal implementation) for each practice. This allows for a target-performance comparison. The qualitative modules provide for group discussions.

The set of instruments developed by the working group was reported on in the technical committees in spring 2023 and to the LAA-HA on 29th/30th June 2023. After the LAA-HA, the BMUV made the set of instruments available to all authorities via the Nuclear Safety Portal (PNS) and invited all authorities to conduct self-assessments based on the set of instruments.

In September, the BMUV will conduct a general survey among all employees of the entire BMUV (about 1300 employees) on a broad variety of topics in the context of authority culture, especially leadership, cooperation and communication as well as continuous improvement. The results,

which will also be evaluated and presented department-specific, serve as a baseline to conduct an in-depth survey among the staff of the Department of Nuclear Safety, Radiation Protection in November-December, using the questionnaire developed with the specific focus on safety culture. After the evaluation of the survey, the results will be discussed in more detail in group discussions to enable for possible improvements.

2. Assessment

Recommendation R3 has been implemented and fulfilled through the following activities:

- the elaboration of a modular set of instruments, including safety culture practices developed on the basis of the "Policy paper on the safety culture in nuclear licensing and supervisory authorities" of 14th March 2019,
- the provision of supplementary documents for use in the authorities, and
- the self-assessment in various authorities, using quantitative or qualitative methods.

3. Documents

Policy paper on the safety culture in nuclear licensing and supervisory authorities of 14th March 2019

National Policy Paper "Nuclear Safety" of 1st/2nd July 2021

Framework paper on the set of instruments for the self-audit of the regulatory safety culture

- Lists of 40 practices for the self-assessment of the regulatory safety culture
- Questionnaire on regulatory safety culture

4. References to the measure(s) of the National Action Plan

Recommendation R3 has been implemented under Action 4.3 in the National Action Plan.

"Development of a joint procedure for a periodic assessment of leadership for safety and safety culture"

Recommendation R4

(1) ***BASIS:*** GSR Part 1 Requirement 3 (or rather GSR Part 2 Req.13 para 6.4), states that "Independent assessments and self-assessments of the management system shall be regularly conducted to evaluate its effectiveness and to identify opportunities for its improvement. Lessons and any resulting significant changes shall be analysed for their implications for safety."

R4 ***Recommendation:*** The regulatory body should conduct independent assessments of the management system regularly to evaluate its effectiveness and to identify opportunities for its improvement.

Statement:

1. Implementation

The review team noted that no regular assessments are carried out for existing management systems of the nuclear licensing and supervisory authorities. Recommendation R4 addresses that the nuclear licensing and supervisory authorities conduct regular assessments of the management system.

Due to the overall importance of carrying out regular, independent assessments of the management system, a kick-off event was held at the invitation of the BMUV on 23.06.2022 at high management level of the participating federal and Länder nuclear licensing and supervisory authorities, so that the decision-making level of the department heads responsible for the management system was directly involved. Since implementation is the responsibility of each individual authority at federal and Länder level, the establishment of a pool of auditors from different nuclear regulatory authorities at federal and Länder level and the other options of independent implementation by individual authorities were discussed as options.

For the establishment of a pool of auditors, a core team of the Federation and the Länder was founded at the follow-up meeting on 14th September 2022. At further meetings (on 18th October, 26th October, 1st December 2022 and 24th February 2023), the core team prepared a framework paper on options for the independent assessment of the management system of German supervisory and licensing authorities of nuclear facilities and rules of procedure for the formation and work of a pool of auditors. These papers were presented and discussed at a meeting of the Federation and the Länder on 8th February 2023. The framework paper presents the process of an audit in general and lists the different options from which each nuclear licensing and supervisory authority can choose. These are, in particular, the assessment by external contractors, by the internal audit department of the respective authority, and the assessment within the framework of the pool solution by appropriately trained persons who are made

available for the pool by other authorities. Rules of procedure were agreed for such a pool of auditors from the nuclear licensing and supervisory authorities at Länder and federal level for peer reviews. The framework paper and the rules of procedure were presented to the technical committees in spring 2023 and to the Main Committee of the Länder Committee for Nuclear Energy on 29th/30th June 2023. Following the Main Committee, the BMUV invited all nuclear supervisory and licensing authorities to participate in the auditing pool in writing.

The following first measures were taken to establish and use a pool of auditors from the nuclear licensing and supervisory authorities at the Länder and federal level for peer reviews: On the one hand, staff of the participating authorities were trained as auditors. On the other hand, a first audit in the sense of a pilot project was carried out at the Baden-Wuerttemberg Ministry of the Environment, Climate Protection and the Energy Sector by auditors/observers from the BASE and the Lower Saxon Ministry for the Environment, Energy, Building and Climate Protection in June 2023.

In addition to the establishment of an auditing pool, the BASE, for example, pursues an independent performance of audits. The BASE has arranged for internal audits to be carried out by its Division PB 3 in the presidential area in order to guarantee the independence of the audits from the organisational units concerned with specialist tasks. Regulations for conducting internal audits have been drawn up and laid down as part of the BASE's management system.

Internal audits are carried out at the BASE in accordance with the international standard DIN EN ISO 19011 “Guideline for the auditing of management systems” and also as integrated audits. In 2022, internal audits were carried out with a focus on the BASE's environmental management system. Work is currently underway on an evaluation in accordance with the European EMAS regulation. The staff in the management systems task area at PB 3 have both adequate training and practical experience in the area of auditing management systems. The number of staff in the management systems task area has been further increased since the 2019 mission.

2. Assessment

Recommendation R4 has been implemented by the following measures:

- the adopted framework paper and the establishment of a pool of auditors from the nuclear licensing and supervisory authorities at the Länder and federal level on the basis of specific rules of procedure,

- the performance of initial audits (within the framework of the pool of auditors and independent audits by individual authorities) and

- further planned audits.

3. Documents

Framework paper on the independent assessment of the management system of licensing and supervisory authorities under nuclear and radiation protection law at federal and supreme Länder level

Rules of procedure for the auditing pool for licensing and supervisory authorities under nuclear and radiation protection law at federal and supreme Land level

4. Reference to the measure(s) of the National Action Plan

Recommendation R4 has been implemented under Action 4.2 in the National Action Plan.

"*Depending on the area of responsibility and on a case-by-case basis, the licensing and supervisory authorities of the Federation and the Länder review their management systems with regard to whether any internal guidance have to be supplemented for licensing and supervision processes that are significant in the longer term.*"

7.6 Module 5 – Authorization

Suggestion S9

(1) ***BASIS:*** *GSR Part 6 Requirement 5, para 3.3 states that "Establishing requirements for the collection and retention of records and reports relevant to decommissioning, and for preserving information about the activities that have been conducted at the site;"*

(2) ***BASIS:*** *GSR Part 6 Requirement 9 Para 9.7. states that "A system shall be established to ensure that all records are maintained in accordance with the requirements for retention of records specified in the integrated management system and with the regulatory requirements. This system shall ensure that the new users of the site after its release from regulatory control are informed about the presence of a facility on the site in the past, and about the nature of the activities that were conducted at the site."*

(3) ***BASIS:*** *SSG 47, para. 3.19 states that "Certain records developed during the decommissioning project will be important for legal purposes after the facility's licence has been terminated. Such records should be identified and preserved, and the responsibility for their retention should be assigned clearly."*

S9 ***Suggestion:*** *The regulatory body should consider updating decommissioning guidance to identify and maintain all relevant data which must be preserved after termination of the license.*

Statement:

1. Implementation

The review team had noted that the nuclear regulations do not include requirements for identifying all relevant data that must be retained after the termination of decommissioning, nor how this data should be collected and retained. The lack of such regulations was addressed in Suggestion S9.

Suggestion S9 has been implemented and fulfilled by supplementing the Decommissioning Guide.

The BMUV has drawn up a proposal to supplement the Decommissioning Guide, which was subsequently agreed on in the LAA technical committees and adopted in the LAA-HA in July 2021.

The corresponding addition in Section 5.2 of the Decommissioning Guide reads:

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

2. Assessment

Suggestion S9 has been implemented and fulfilled through an addition in the Decommissioning Guide that addresses requirements for the identification, collection and retention of all relevant data that must be retained after decommissioning has been terminated.

3. Documents

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 16th September 2021 (Decommissioning Guide).

4. Reference to the measure(s) of the National Action Plan

Suggestion S9 has been implemented under Action 9.1 in the National Action Plan.

“Against the background of the new Radiation Protection Act and the phase-out of the use of nuclear energy, the BMU, together with the licensing and supervisory authorities of the Federation and the Länder, determine the necessary demand for a redevelopment and advancement of the substatutory regulations. This should be/is guided by the needs after 2022 in particular for research reactors, decommissioning and dismantling, and storage and disposal.”

7.7 Module 6 – Review and Assessment

Suggestion S10

(1) ***BASIS:*** *GSG 13, para. 3.72. states that "In order to ensure a systematic and consistent approach, the regulatory body should develop internal guidance on the processes and procedures to be followed to carry out the regulatory functions in an effective and efficient manner as well as on the safety objectives to be met."*

(2) ***BASIS:*** *GSG 13, para. 3.192. states that "The regulatory body should provide internal guidance for its own staff on the procedures to be followed in the review and assessment process and on the safety objectives to be met. Internal guidance on specific topics for review and assessment should also be provided, as necessary."*

(3) ***BASIS:*** *GSG 13, para. 3.193. states that "The regulatory body should develop internal guidance on reporting on its review and assessment activities and on how it reaches its regulatory decisions. The regulatory body's internal guidance on review and assessment should be made available to other regulatory authorities worldwide."*

S10 ***Suggestion:*** *The Federation and the Länder authorities should consider developing internal guidance for the review and assessment process.*

Statement:

1. Implementation

The review team had found that the procedure within the authority for verifying whether the facility or the activity at a facility complies with the requirements of the regulations and existing licences was not adequately presented.

Suggestion S10 has been implemented as an internal process through an addition in the AHB, in which it is described generically for the entire life cycle of the facilities how the inspection and assessment is basically planned, carried out and documented.

Process 23 "Review and assessment in the licensing and supervisory procedure" to supplement the AHB was discussed in the LAA technical committees and adopted by the LAA-HA in June 2023. It describes in detail:

- Purpose and objectives
- Basic fundamentals
- Working steps (preparation, implementation, documentation, communication, evaluation, conclusion of the procedure)

– Relation to other Processes of the AHB

The documents to be submitted by the applicant/operator in licensing and supervisory procedures are defined by the legal provisions and substatutory regulations as well as the respective licence under nuclear law or radiation protection law. These include, e.g., licensing documents, documents on the fulfilment of obligations, applications for modifications and maintenance, (safety) analyses, test instructions, preliminary inspection documents, notification forms, reports, notifications.

The licensing and supervisory authority of the Land systematically reviews and evaluates the documents on the basis of the legal, substatutory and assessment standards specified in the licence. As a rule, the licensing and supervisory authority of the Land calls in authorised experts pursuant to § 20 AtG for the technical review of the submitted documents and, in particular, also for the verification of the technical conditions in the facility. The basic principles of cooperation between the authority and the authorised experts are usually regulated in detail in framework agreements. If necessary, competent (technical) authorities are involved.

The licensing and supervisory authority of the Land regularly conducts supervisory or technical discussions with the applicant/operator and thereby receives feedback on the review and assessment carried out as well as on the success of the implementation of the regulatory review and assessment results. If necessary, the licensing and supervisory authority of the Land and the applicant/operator determine how to optimise future procedures.

For the section of the AHB on waste management, another process is being worked on by the Technical Committee for Nuclear Supply (FAVE), “Review and assessment in the supervisory procedure for licences for storage facilities pursuant to § 6 AtG”, which covers the topic of the storage of spent nuclear fuel pursuant to § 6 AtG (see S3). This process is to be finalised in the near future and to be adopted by circulation in the FA VE. In the meantime, according to the decision in the LAA-HA from June 2023, the process “Review and assessment in the licensing and supervisory procedure” in the AHB applies analogously and with due regard to the respective specifics also for storage facilities pursuant to § 6 AtG.

2. Assessment

Suggestion S10 has been fulfilled and implemented with the creation of Process 23 in the AHB.

3. Documents

Process 23 in the AHB

4. Reference to the measure(s) of the National Action Plan

Suggestion S10 has been implemented under Action 5.4 in the National Action Plan.

"*Drawing up internal guidance for the review and assessment process"*

Suggestion S11

(1) ***BASIS:*** *GSR Part 1 Requirement 26, para. 4.46. states that "For an integrated safety assessment, the regulatory body shall first organize the results obtained in a systematic manner. It shall then identify trends and conclusions drawn from inspections, from reviews and assessments for operating facilities, and from the conduct of activities where relevant. Feedback information shall be provided to the authorized party. This integrated safety assessment shall be repeated periodically, with account taken of the radiation risks associated with the facility or activity, in accordance with a graded approach."*

S11 ***Suggestion:*** *The Federation and Länder authorities should consider developing a process for integrated safety assessment in a systematic manner for all facilities and activities.*

Statement:

1. Implementation

The review team found that the systematic performance of integrated safety assessments of all facilities and activities was not presented in a process-oriented manner.

Suggestion S11 has been implemented as an internal process through an addition in the AHB, describing how a regular, systematic and comprehensive safety assessment is planned, carried out and documented.

Process 24 "Supervisory process integrated safety assessment" to supplement the AHB was discussed in the LAA technical committees and adopted by the LAA-HA in June 2023. It describes in detail:

- Purpose and objectives
- Basic fundamentals
- Working steps (preparation, implementation, documentation, communication, evaluation, conclusion of the procedure)
- Relation to other processes of the AHB

The process description for an integrated safety assessment shows how an independent, systematic and comprehensive assessment of the safety of a facility leads to a conclusion on the overall safety level and, if necessary, regulatory measures. The supervisory authority of the Land obtains a more complete picture through the integral assessment than through the assessment of individual operations. The focus of the integrated safety assessment is on identifying overarching developments and changes in the facility and in the safety culture. Based

on the results of this assessment, the supervisory authority of the Land can also, if necessary, adapt or further develop its supervisory planning.

For the waste management part of the AHB, another process is being developed by the Technical Committee for Nuclear Supply (FAVE), “Supervisory process integrated safety assessment for storage facilities according to § 6 AtG”, which covers the topic of the storage of spent nuclear fuel according to § 6 AtG (see S3). This process is to be finalised in the near future and to be adopted by circulation in the FA VE. In the meantime, according to the decision in the LAA-HA from June 2023, the process “Supervisory process integrated safety assessment” in the AHB applies analogously and with due regard to the respective specifics also for storage facilities pursuant to § 6 AtG.

2. Assessment

Suggestion S11 has been fulfilled and implemented through the creation of Process 24 in the AHB.

3. Documents

Process 24 in the AHB

4. Reference to the measure(s) of the National Action Plan

Suggestion S11 has been implemented under Action 5.4 in the National Action Plan.

“*Drawing up internal guidance for the review and assessment process*”

Recommendation R5

(1) ***BASIS:*** *GSR Part 1 Requirement 26, para. 4.39A states that "The regulatory body shall ensure, adopting a graded approach, that authorized parties routinely evaluate operating experience and periodically perform comprehensive safety reviews of facilities, ..."*

(2) ***BASIS:*** *GSR Part 4 Requirement 24 states that "The safety assessment shall be periodically reviewed and updated."*

(3) ***BASIS:*** *GSR Part 4 Requirement 12 states that "The safety assessment shall cover all the stages in the lifetime of a facility or activity in which there are possible radiation risks."*

(4) ***BASIS:*** *WS-G-5.2, para. 2.4 states that "The safety assessment for decommissioning should be reviewed and updated, as appropriate, to ensure that it remains an accurate representation of the physical, chemical and radiological state of the facility as the decommissioning activities proceed."*

R5 ***Recommendation:*** *The regulatory body should establish requirements for the periodic review and update of safety assessments during immediate dismantling.*

Statement:

1. Implementation

The review team had noted that there is no requirement in the nuclear regulations for a periodic safety review during immediate dismantling. The lack of such a requirement was addressed in Recommendation R5.

Recommendation R5 has been implemented and fulfilled by supplementing the Decommissioning Guide.

The BMUV has drawn up a proposal to supplement the Decommissioning Guide, which was subsequently agreed on in the LAA technical committees and adopted in the LAA-HA in July 2021.

The corresponding addition to Chapter 5 of the Decommissioning Guide reads:

"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."

2. Assessment

Recommendation R5 has been implemented and fulfilled by an addition to the Decommissioning Guide that requires periodic safety reviews during immediate dismantling.

3. Documents

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 16th September 2021 (Decommissioning Guide).

4. Reference to the measure(s) of the National Action Plan

Recommendation R5 has been implemented under Action 9.1 in the National Action Plan.

"Against the background of the new Radiation Protection Act and the phase-out of the use of nuclear energy, the BMU, together with the licensing and supervisory authorities of the Federation and the Länder, determine the necessary demand for a redevelopment and advancement of the substatutory regulations. This should be/is guided by the needs after 2022 in particular for research reactors, decommissioning and dismantling, and storage and disposal."

7.8 Module 7 – Inspection

Suggestion S12

(1) ***BASIS:*** *GSR Part 1, para. 4.51 states that "The regulatory body shall record the results of inspections and shall take appropriate action (including enforcement actions as necessary). Results of inspections shall be used as feedback information for the regulatory process and shall be provided to the authorized party."*

(2) ***BASIS:*** *GSG-13, para. 3.287 states that "Inspection reports should be distributed, or made available electronically, in accordance with established procedures in order to provide the following:*
(a) A basis for future regulatory action;
(h) A means of passing information to interested parties or governmental bodies;"

S12 ***Suggestion:*** *The supervisory authorities should consider modifying internal guidance to ensure that all results of inspections are forwarded to the authorised party.*

Statement:

1. Implementation

The review team had found that the internal regulations of the supervisory authorities did not explicitly provide for the communication of inspection results to the supervised party.

So far, there has been no regulation in the AHB on "On-site inspection". The federal and Land authorities have therefore decided to include a process description in the AHB which contains the most important requirements. The individual authorities can then adopt these aspects in their regulations or refer to the AHB. By supplementing the AHB and adapting the regulations in the individual supervisory authorities, Suggestion S12 has been implemented and fulfilled.

For this purpose, the UM BW has prepared a proposal for the "On-site inspection" process to supplement the AHB, which was subsequently discussed in the LAA technical committees and adopted by the LAA-HA in June 2023. The process in the AHB contains the generic specifications for planning, implementation, documentation, communication (internal and external) and periodic evaluation as well as for the follow-up of findings identified in the process and takes into account corresponding recommendations of IAEA GSG-13 "Functions and Processes of the Regulatory Body for Safety".

The "On-site inspection" process contains the following stipulation regarding the communication of inspection results addressed in S12:

"If there are any findings, they will be communicated to the operator no later than at the end of the inspection."

For the waste management part of the AHB, another process is being worked on by the Technical Committee for Nuclear Fuel Supply (FA VE), “On-site inspection for storage facilities pursuant to § 6 AtG”, which covers the topic of the storage of spent nuclear fuel pursuant to § 6 AtG (see S3). This process is to be finalised in the near future and to be adopted by circulation in FA VE. In the meantime, according to the decision in the LAA-HA from June 2023, the process “On-site-inspection” in the AHB applies analogously and with due regard to the respective specifics also for storage facilities pursuant to § 6 AtG.

2. Assessment

Suggestion S12 has been implemented and fulfilled through an addition in the AHB and adjustments in the regulations of the supervisory authorities.

3. Documents

Process 25 in the AHB and some inspection reports from BW and other Länder

4. Reference to the measure(s) of the National Action Plan

Suggestion S12 has been implemented under Action 5.1 in the National Action Plan.

“*The licensing and supervisory authorities of the Federation and the Länder determine the need for an extension of the AHB to include processes in licensing areas other than those stated above*.”

Suggestion S13

(1) ***BASIS:*** *GSR Part 1, para. 4.51 states that "The regulatory body shall record the results of inspections and shall take appropriate action (including enforcement actions as necessary). Results of inspections shall be used as feedback information for the regulatory process and shall be provided to the authorized party."*

(2) ***BASIS:*** *GSG-13, para. 3.286 states that "The inspection report should typically contain:*
c) Reference to applicable requirements
d) Criteria used for assessment of safety performance

S13 ***Suggestion:*** *Supervisory authorities should consider completing guidance on the content of inspection reports.*

Statement:

1. Implementation

The review team had found that the internal regulations of the supervisory authorities for the preparation of inspection reports are not complete and, in particular, the definition of the criteria for review and inspection to be applied as well as the definition of criteria used for the safety-related assessment are missing.

Up to now, there has been no regulation in the AHB on the content of inspection reports. The federal and Land authorities have therefore decided to include a process description for "On-site inspection" (see S12) in the AHB, which also contains, among other things, the most important requirements for the preparation of inspection reports. The individual authorities can then incorporate these aspects into their regulations or refer to the AHB. Through the addition to the AHB and the adjustments to the regulations at the individual supervisory authorities, Suggestion S13 has been implemented and fulfilled.

For this purpose, the UM BW has prepared a proposal for the process "On-site inspection" to supplement the AHB, which was subsequently discussed in the LAA technical committees and adopted by the LAA-HA in June 2023. The process in the AHB contains the generic specifications for planning, implementation, documentation, communication (internal and external) and periodic evaluation as well as for the follow-up of findings identified in the process and takes into account corresponding recommendations of IAEA GSG-13 "Functions and Processes of the Regulatory Body for Safety".

For the completion of the inspection reports addressed in S13, the process "On-site inspection" contains the following specification:

"The content should include, in particular, the object of inspection, the method used (interview, workplace monitoring, inspection of documents) and the assessment criteria used, before proceeding with the assessment of the inspection and any necessary measures in the event of findings (see GSG-13 para. 3.286)."

For the waste management part of the AHB, another process is being worked on by the Technical Committee for Nuclear Fuel Supply (FA VE), "On-site inspections for storage facilities pursuant to § 6 AtG", which covers the topic of the storage of spent nuclear fuel pursuant to § 6 AtG (see S3). This process is to be finalised in the near future and to be adopted by circulation in the FA VE. In the meantime, according to the decision in the LAA-HA from June 2023, the process "On-site-inspection" in the AHB applies analogously and with due regard to the respective specifics also for storage facilities pursuant to § 6 AtG.

2. Assessment

Suggestion S13 has been implemented and fulfilled by a supplementation in the AHB.

3. Documents

Process 25 in the AHB and some inspection reports from BW and other Länder

4. Reference to the measure(s) of the National Action Plan

Suggestion S13 has been implemented under Action 5.1 in the National Action Plan.

"The licensing and supervisory authorities of the Federation and the Länder determine the need for an extension of the AHB to include processes in licensing areas other than those stated above."

Recommendation R6

(1) ***BASIS:*** *GSR Part 1 Requirement 28 states that "Inspection of facilities and activities shall include programmed inspections and reactive inspections both announced and unannounced."*

(2) ***BASIS:*** *GSR Part 1 para. 4.50 states that "The regulatory body shall develop and implement a programme of inspection of facilities and activities to confirm compliance with regulatory requirements and with any conditions specified in the authorization, In this program, it shall specify the types of regulatory inspections(including scheduled inspections and unannounced inspections), and shall stipulate the frequency of inspections and the areas and the programmes to be inspected, in accordance with the graded approach."*

R6 ***Recommendation:*** *StMUV should develop a comprehensive inspection programme for FRM II research reactor by specifying inspection items, frequency for inspections and provisions for announced, unannounced and reactive inspections in accordance with the graded approach.*

Statement:

1. Implementation

The review team had found that the Bavarian supervisory authority should develop its own inspection programme for FRM II, despite established walkdowns related to 18 subject areas at the high flux neutron source Munich in Garching by the expert TÜV SÜD Industrie Service GmbH consulted in accordance with § 20 AtG. This inspection programme should specify inspection items, frequency of inspections and provisions for announced, unannounced and reactive inspections in accordance with the graded approach.

Recommendation R6 has been implemented and fulfilled by the development of an inspection programme and its inclusion in Chapter XII.4 "On-site inspections/walkdowns – Inspection programme" of the "Handbook for state supervision on the high flux neutron source Munich in Garching (FRM II) – Supervision Manual". Chapter XII.4 is divided into 4.a. Inspections/walkdowns by the supervisory authority and 4.b. Inspections/walkdowns by the authorised expert / subordinate authority.

One focus of the inspection programme of the supervisory authority is on personnel and administrative-organisational matters. To be mentioned here are:

- reviews for compliance with licensing conditions and provisions of the safety specifications, in particular the operating regulations,
- checks on the general behaviour (e.g. safety awareness) of the staff,
- review of work processes,
- checks in connection with the technical qualification of the responsible personnel,

- checks on the general condition of the facility,
- control of control room staffing.

The supervisory authority carries out e.g. inspections on the qualification of the operating personnel. These include:

- Technical qualification and maintenance of technical qualification of the reactor shift personnel, the radiation protection officers and the plant management, other executives, training managers, nuclear safety officers and functional positions subject to approval.
- Participation in the walkdowns of the authorised expert as part of the authority's own inspection programme on a random basis in order to check, in the sense of higher-level supervision, whether the authorised expert is properly fulfilling the assigned tasks in terms of the scope and quality of the checks and in order to obtain knowledge of the inspected matters itself.

In addition to the above-mentioned topics, there are other occasions for inspections/walkdowns by the StMUV:

- inspection of the operating documentation,
- participation in in-service inspections,
- maintenance shutdown / refuelling,
- loading and unloading of containers, and
- participation in emergency exercises.

These inspection/walkdowns can be announced or unannounced, for a given reason or without a specific reason and at any time. Inspections/walkdowns are generally announced. As a rule, unannounced inspections do not take place. For the inspections/walkdowns, no specific inspection programme with dates throughout the year is defined. As a rule, the authority accompanies the authorised expert during the walkdowns, or dates are agreed with the operator on an ad hoc basis.

The inspections/walkdowns are documented internally in the form of a file note after they have been carried out.

2. Assessment

Recommendation R6 has been implemented and fulfilled by the development of an inspection programme and its inclusion in Chapter XII.4 “On-site inspections/walkdowns – Inspection programme” of the “Handbook for state supervision on the high flux neutron source Munich in Garching (FRM II) – Supervision Manual”.

3. Documents

Chapter XII.4 “On-site inspections/walkdowns – Inspection programme” of the “Handbook for state supervision on the high flux neutron source Munich in Garching (FRM II) – Supervision Manual“

4. Reference to the measure(s) of the National Action Plan

Recommendation R6 has been implemented under Action 5.2 in the National Action Plan.

“Completion of the Supervision Manual for the research reactor FRM II including an inspection programme”

Suggestion S14

(1) ***BASIS:*** *GSR Part 1 Requirement 28 states that "Inspection of facilities and activities shall include programmed inspections and reactive inspections both announced and unannounced."*

(2) ***BASIS:*** *GSR Part 1 para. 4.50 states that "The regulatory body shall develop and implement a programme of inspection of facilities and activities to confirm compliance with regulatory requirements and with any conditions specified in the authorization, In this program, it shall specify the types of regulatory inspections(including scheduled inspections and unannounced inspections), and shall stipulate the frequency of inspections and the areas and the programmes to be inspected, in accordance with the graded approach."*

S14 ***Suggestion:*** *BMU should consider developing a programmed approach to inspections for all research reactors in Germany.*

Statement:

1. Implementation

The review team had suggested that the BMUV develop a programmed approach to inspections of all research reactors. The BMUV has intensively discussed the topic of inspection programmes with the supervisory authorities of the Länder in the Working Group on Research Reactors of the Federation/Länder body. As a result, a document was prepared in which the common understanding on inspection programmes for research reactors between the Federation and the Länder was set out. Among other things, this document defined the types of the regulatory inspections (including scheduled and unannounced inspections) and the areas to be inspected.

Reference is additionally made to the new process No. 25 "On-site inspection" in the AHB for the implementation of Suggestion S13, which generally addresses the contents of an inspection programme for research reactors and nuclear power plants, adopted in the LAA-HA in June 2023.

2. Assessment

Suggestion S14 has been implemented and fulfilled by defining the contents of an inspection programme in the "Common understanding between the Federation and the Länder on inspection programmes for research and teaching reactors in Germany".

Furthermore, Suggestion S14 has been additionally implemented by introducing process No. 25 "On-site inspection" in the AHB for the implementation of Suggestion S13, which generally addresses the contents of an inspection programme for research reactors and nuclear power plants.

3. Documents

Common understanding between the Federal Government and the Länder on inspection programmes for research and training reactors in Germany

Process 25 in the AHB

4. Reference to the measure(s) of the National Action Plan

Suggestion S14 has been implemented under Action 5.3 in the National Action Plan.

“Drawing up a comprehensive programme for inspections of all research reactors”

Suggestion S15

(1) ***BASIS:*** *GSR Part 1, para. 4.51 states that "The regulatory body shall record the results of inspections and shall take appropriate action (including enforcement actions as necessary). Results of inspections shall be used as feedback information for the regulatory process and shall be provided to the authorized party."*

(2) ***BASIS:*** *GSR Part 1 Requirement 7 states that "Where several authorities have responsibilities for safety within the regulatory framework for safety, the government shall make provision for the effective coordination of their regulatory functions, to avoid any omissions or undue duplication and to avoid conflicting requirements being placed on authorized parties".*

(3) ***BASIS:*** *GSG-13, para 3.287 states that "Inspection reports should be distributed, or made available electronically, in accordance with established procedures in order to provide the following:*
a) A basis for future regulatory action;
d) Information to other staff of the regulatory body, for example those staff responsible for the development of regulations and guides, for review and assessment, and for the development of requirements for authorization;"

S15 ***Suggestion:*** *The BMU should consider revising the regulatory framework to ensure that the supervisory authorities (Länder) provide results of inspections to the licensing authority (BfE) for dry cask spent fuel storage facilities.*

Statement:

1. Implementation

The review team had noted the following in the final report on the IRRS mission in Germany 2019, Chapter 7.5. Inspection of waste management facilities, p. 70:

"Even though the IRRS team has been informed that in the state of practice communications exist between BfE and Länder authorities, there are no provisions in the regulations to ensure, that for dry cask spent fuel storage facilities, the licensing authority (BfE) is informed by the supervising authority (Länder) of the outcomes and findings from inspections. Considering that the period of operation of dry cask storage facilities could last over 40 years, given the real possibility that the operators will have to apply for extension of the authorized storage period, it is considered important to include provisions in the regulatory system such that the licensing authority is properly informed of the outcomes and finding from inspections carried out by the supervising authority."

To implement the suggestion, a process for forwarding results from the supervisory activities of the Länder on the dry cask spent fuel storage facilities to BASE as the licensing authority is being implemented in the Handbook on Cooperation between the Federation and the Länder in Nuclear Law (AHB) – Waste Management Part. The waste management part of the AHB is

currently being developed for the implementation of Suggestion S3 by a Federation/Länder working group set up for this purpose in the FAVE. BASE coordinates this work.

With regard to storage facilities for spent nuclear fuel pursuant to § 6 AtG, for the waste management part of the AHB, the processes “Procedure for new licences pursuant to § 6 AtG for the storage of nuclear fuel (storage facilities)”, “Procedure for modification licences pursuant to § 6 AtG for the storage of nuclear fuel (storage facilities)” and “Communication between licensing authority and nuclear supervisory authorities on the storage of nuclear fuel pursuant to § 6 AtG” were adopted by the LAA-HA in June 2023.

With regard to the forwarding of results from the supervisory activities of the Länder on the dry cask spent fuel storage facilities to BASE as the licensing authority, the process “Communication between licensing authority and nuclear supervisory authorities on the storage of nuclear fuel pursuant to § 6 AtG” is particularly relevant.

With regard to the exchange between the competent nuclear supervisory authority of the storage facility and BASE as licensing authority, the processes for the new and modification licensing procedures describe the already applied practice of participation of the authorities. Where applicable, this is carried out in accordance with the procedural regulations of the Nuclear Licensing Procedure Ordinance (AtVfV) in parallel with public participation. Moreover, in each licensing procedure, a hearing of the concerned authorities is carried out in accordance with the general provisions of the Administrative Procedures Act (VwVfG) at the end of the licensing procedure on the basis of the draft of the licensing notice.

The process “Communication between licensing authority and nuclear supervisory authorities on the storage of nuclear fuel pursuant to § 6 AtG” describes, beyond the formal procedural requirements, supplementary communication steps between the supervisory and licensing authorities as already established in the practice of the procedures. These serve to provide mutual information and the exchange of statements on matters relevant with regard to the procedures of the other authority, including invitations to procedural and technical discussions related to the issues. The respective content to be forwarded is specified by the authorities involved according to what information is needed. In addition, the process describes the exchange of technical information on container loading within the framework of the exchange of experience with BASE in the context of KOBAF as well as the exchange of information on relevant developments in the state of the art in science and technology, which takes place with the involvement of the BMUV.

2. Assessment

Considering the interaction of the processes adopted, Suggestion S15 can be regarded as implemented.

3. Documents

Handbook on Cooperation between the Federation and the Länder in Nuclear Law (AHB) – Waste Management Part, status summer 2023; relevant processes for the implementation of this suggestion:

- "Procedure for new licences pursuant to § 6 AtG for the storage of nuclear fuel (storage facilities)"
- "Procedure for modification licences pursuant to § 6 AtG for the storage of nuclear fuel (storage facilities)"
- "Communication between licensing authority and nuclear supervisory authorities on the storage of nuclear fuel pursuant to § 6 AtG"

4. Reference to the measure(s) of the National Action Plan

Suggestion S15 has been implemented under Action 5.5 in the National Action Plan.

"Drawing up a process on providing results of inspections for dry cask spent fuel storage"

7.9 Module 8 – Enforcement

Suggestion S16

(1) ***BASIS:*** *GSR Part 1 Requirement 30 states that "The regulatory body shall establish and implement an enforcement policy within the legal framework for responding to noncompliance by authorized parties with regulatory requirements or with any conditions specified in the authorization".*

(2) ***BASIS:*** *GSG-13, para 3.26 states that "The regulatory body is required to establish a regulatory system for safety that includes: (d) Enforcement of regulatory requirements; the regulatory body should adopt clear administrative procedures and guidelines governing the use and implementation of enforcement actions."*

S16 ***Suggestion:*** *The BMU should consider measures to ensure promoting the consistency in the enforcement policies and practices at the various regulatory authorities.*

Statement:

1. Implementation

The review team had found that there is no overarching common enforcement strategy for all nuclear licensing and supervisory authorities in Germany to ensure consistent application of enforcement practices at different licensees.

So far, there has been no regulation in the AHB on a uniform procedure for enforcement policies and practices. The authorities of the Federation and the Länder have therefore decided to include a general process description on "Enforcement of measures" in the AHB, which, on the one hand, defines the underlying philosophy/strategy and, on the other hand, the most important boundary conditions for the enforcement of practices. The approach of the individual Länder will thus be standardised and strengthened. The individual authorities can then incorporate these aspects into their regulations or refer to the AHB. Through the addition of process No. 26 "Enforcement of measures" to the AHB and the adjustments to the regulations at the individual supervisory authorities, Suggestion S16 has been implemented and fulfilled.

For this purpose, the UM BW prepared a proposal for the process "Enforcement of measures" for facilities pursuant to § 7 AtG to supplement the AHB, which was subsequently discussed in the LAA technical committees and adopted by the LAA-HA in June 2023. The process in the AHB contains the generic specifications on types, selection and application of enforcement practices and takes up the recommendation of IAEA GSG-13 "Functions and Processes of the Regulatory Body for Safety", para. 3.26 (d).

In order to standardise and strengthen the enforcement policies and practices addressed in S16, the process “Enforcement of measures” contains in particular the following specifications:

- What types of enforcement measures are available.
- What decision-making criteria are used when selecting proportionate enforcement measures.
- How the practices are implemented.
- Relevant findings during the implementation of enforcement measures are reported in the LAA committee responsible for the respective facility.

For the waste management part of the AHB, another process is being worked on by the Technical Committee for Nuclear Supply (FAVE), “Enforcement of measures for storage facilities pursuant to § 6 AtG”, which covers the topic of spent fuel storage pursuant to § 6 AtG (see S3). This process is expected to be finalised soon and to be adopted by circulation in the FA VE. In the meantime, according to the decision in the LAA-HA from June 2023, the process “Enforcement of measures” in the AHB applies analogously and with due regard to the respective specifics also for storage facilities pursuant to § 6 AtG.

2. Assessment

Suggestion S16 has been implemented and fulfilled by the AHB process “Enforcement of measures”, which includes principles and strategies for the graded approach to the application of enforcement measures available to the authorities.

3. Documents

Process 26 in the AHB, and as a supplement, regulations of individual supervisory authorities, which are more detailed

4. Reference to the measure(s) of the National Action Plan

Suggestion S16 has been implemented under Action 8.1 in the National Action Plan.

“Ensuring consistency in the enforcement policies and practices of the supervisory authorities”

7.10 Module 9 – Regulation and Guides

Suggestion S17

(1) ***BASIS:*** *SSG-25, para. 2.12. states that "A PSR should provide a comprehensive assessment of the safety of the nuclear power plant. Since the complex process of conducting a PSR can be aided by appropriate subdivision of tasks, this Safety Guide sets out these tasks in accordance with 14 safety factors."*

S17 ***Suggestion:*** *BMU should consider updating its PSR guidance to address all safety factors with a graded approach in view of its future application for all nuclear facilities.*

Statement:

1. Implementation

The review team had found that the current PSR guidelines were not complete, as not all of the 14 safety factors recommended in the IAEA safety standards were sufficiently taken into account. In response to it, a separate guideline was developed for the research reactors based on the existing guidelines for nuclear power plants, which takes into account all safety factors, such as safety culture, and represents the graded approach.

In the field of waste management, with ESK recommendation "ESK guidelines for the performance of periodic safety reviews and on technical ageing management for storage facilities for spent fuel and heat-generating radioactive waste" of 3rd March 2022, the recommendation of 13th March 2014 previously applicable to these facilities has been updated.

These guidelines also regulate the responsibilities for carrying out the PSR (Chapter 4.1). Accordingly, the nuclear supervisory authority presents the results of its review in a summary report, which is made available to the nuclear licensing authority.

The forwarding of information by the nuclear supervisory authorities to BASE as the licensing authority is regulated in the AHB for the field of waste management in the processes related to storage facilities pursuant to § 6 AtG.

2. Assessment

The development of the PSR guideline for research reactors and consultations within the "Working Group on Research Reactors" of the Federation/Länder body have been completed. Suggestion S17 will also be formally implemented in full with the adoption of the guideline at the next LAA-HA meeting.

With the update of the “ESK guidelines for the performance of periodic safety reviews and on technical ageing management for storage facilities for spent fuel and heat-generating radioactive waste” and their adoption in the Working Group Transport Cask Storage Facilities Supervision Suggestion S17 has been implemented for the field of waste management. The guidelines will be submitted to the LAA-HA for formal adoption at its next meeting.

3. Documents

Guideline for the periodic safety review of research reactors (draft)

ESK guidelines for the performance of periodic safety reviews and on technical ageing management for storage facilities for spent fuel and heat-generating radioactive waste

4. Reference to the measure(s) of the National Action Plan

Suggestion S17 is being implemented under Action 9.1 in the National Action Plan.

“Against the background of the new Radiation Protection Act and the phase-out of the use of nuclear energy, the BMU, together with the licensing and supervisory authorities of the Federation and the Länder, determine the necessary demand for a redevelopment and advancement of the substatutory regulations. This should be/is guided by the needs after 2022 in particular for research reactors, decommissioning and dismantling, and storage and disposal.”

Suggestion S18

(1) ***BASIS:*** *GSR Part 1 Requirement 32, para. 4.61 states that "The regulations and guides shall be kept consistent and comprehensive, and shall provide adequate coverage commensurate with the radiation risks associated with the facilities and activities, in accordance with a graded approach. "*

(2) ***BASIS:*** *SSR-3 Requirement 12 states that "The use of the graded approach in application of the safety requirements for a research reactor shall be commensurate with the potential hazard of the facility and shall be based on safety analysis and regulatory requirements."*

(3) ***BASIS:*** *SSG-22 para. 2.7 states that "The individual characteristics, or attributes, to be considered in deriving the category of the facility in accordance with its hazard are typically as follows:*
(a)The reactor power (for pulsed reactors, energy deposition is typically used, while for accelerator driven subcritical systems, thermal power is typically used);
(b)The radiological source term;
(c)The amount and enrichment of fissile material and fissionable material;…"

S18 ***Suggestion:*** *The regulatory authority should consider specifying the aspects in the regulations and/or guides on how to apply a graded approach to design, operation, authorization, review and assessments for research reactors.*

Statement:

1. Implementation

The review team had suggested that the BMUV should determine how the nuclear rules and regulations for nuclear power plants should be applied to research reactors, taking into account the graded approach.

A guideline was developed in which the relevant legal framework conditions for the operation of research reactors and the procedure for determining the hazard potential are presented. It documents the graded approach of the nuclear rules and regulations for nuclear power plants to research reactors in operation and post-operation. Three categories of application of the rules and regulations to research reactors are distinguished: unmodified application, protection goal-oriented application taking into account the existing hazard potential, and the non-applicability of the rule to research reactors. In the case of a protection-goal-oriented application, guidance is given on the application of the rules.

The guideline was adopted in the LAA-HA in June 2023.

2. Assessment

With the adoption of the Guideline for the application of the nuclear rules and regulations for nuclear power plants to research reactors by means of a graded approach, Suggestion S18 has been implemented.

3. Documents

Guideline for the application of the nuclear rules and regulations for nuclear power plants to research reactors by means of a graded approach

4. Reference to the measure(s) of the National Action Plan

Suggestion S18 has been implemented under Action 9.1 in the National Action Plan.

“Against the background of the new Radiation Protection Act and the phase-out of the use of nuclear energy, the BMU, together with the licensing and supervisory authorities of the Federation and the Länder, determine the necessary demand for a redevelopment and advancement of the substatutory regulations. This should be/is guided by the needs after 2022 in particular for research reactors, decommissioning and dismantling, and storage and disposal.”

Suggestion S19

(1) ***BASIS:*** *SSR 5 Part 5 Requirement 2 states that "The regulatory body shall establish regulatory requirements for the development of different types of disposal facility for radioactive waste and shall set out the procedures for meeting the requirements for the various stages of the licensing process. It shall also set conditions for the development, operation and closure of each individual disposal facility and shall carry out such activities as are necessary to ensure that the conditions are met."*

S19 ***Suggestion:*** *The regulatory body should consider the revision of safety requirements/guidance documents for the development, operation and closure of disposal facilities for radioactive waste with negligible heat generation, taking account of the state of the art in science and technology.*

Statement:

1. Implementation

The review team had found that, apart from the safety criteria for the disposal of radioactive waste in a mine published in 1983, there are no specific current documents on safety requirements for disposal of waste with negligible heat generation. The general legal requirement for licensing of construction, operation and decommissioning according to § 9b AtG is that precautions to prevent damage must be taken as are necessary in the light of the state of the art in science and technology (S&T). The nuclear supervisory authority applies the rules applicable to this facility when supervising compliance with issued plan approval notices. In particular, it relies in individual cases on the analogous application of KTA safety standards on which the plan approval is based. In the current versions, the KTA safety standards take into account the state of the art S&T.

The review team nevertheless suggested that consideration should be given to revising the safety requirements/guidance documents for the development, operation and closure of disposal facilities for radioactive waste with negligible heat generation, taking account of the state of the art in S&T.

Since the implementation of the IRRS mission 2019, the BMUV and BASE have initiated a process that in principle enables BASE, as the regulatory authority in the waste management sector, to draw up substatutory regulations in consultation with the BMUV to specify the safety requirements in the field of disposal. After entry into force, application of these regulations by the BGE can be made mandatory.

The BMUV and BASE have agreed on the basic approach to the development of regulations. This is currently being further tested in pilot projects. Among other things, the expertise of the ESK is being called upon, particularly for the survey of the state of the art in S&T state of the

art. In addition, the topics requiring regulation – both for disposal facilities for high-level radioactive waste and for disposal facilities for non-heat-generating waste – will be identified step by step. At the end of the process, BASE will submit a proposal to the BMUV for the development of further necessary specific safety standards in the field of disposal. The BMUV will then consider issuing additional safety requirements.

On the one hand, the topic of periodic safety reviews for disposal facilities for non-heat-generating waste and, on the other hand, the review and transfer of the KTA safety standards into an independent program of standards specific to disposal were identified as currently in need of regulation. The ESK is mandated to advise on these topics. Other pilot projects initiated are the “Calculation basis for dose assessment in the disposal of high-level radioactive waste” and the “Framework requirements for the management system of the Federal Company for Radioactive Waste Disposal” (BGE) (see S1).

The review team's Suggestion S19 was also taken up with the result that this suggestion can already be implemented in a target-oriented manner for the operation of a disposal facility for highly radioactive waste at the present time.

As envisaged by the Site Selection Act, consistent safety requirements for a disposal facility for high-level radioactive waste were developed and anchored at the level of an ordinance with the provisions of the Disposal Facility Safety Requirements Ordinance (EndlSiAnfV) and the Disposal Facility Safety Analyses Ordinance (EndlSiUntV). Among other things, in developing the dose assessments required by the ordinances for a disposal facility for high-level radioactive waste, the basic procedure described above is now being worked out for the creation of possible necessary new safety standards in the sense of a regulatory process.

2. Assessment

On the basis of the suggestion, the previous procedure for the application of the latest state of the art in S&T was reviewed. In Germany, the necessary precautions against damage are secured for each permit – depending on the risk potential. A graded approach is also included here.

The suggestion has been and will continue to be dealt with insofar as a concrete need for substatutory regulations or safety requirements is identified in a dynamic approach taking the state of the art in S&T into account.

3. Documents

BASE mandate to the ESK on the subject of periodic safety reviews dated 16th September 2022

Advisory request to the ESK – Review of existing KTA safety standards for the disposal sector and transfer into a separate set of rules and regulations of 3rd February 2023.

4. Reference to the measure(s) of the National Action Plan

Suggestion S19 is being implemented under Action 9.1 in the National Action Plan.

"Against the background of the new Radiation Protection Act and the phase-out of the use of nuclear energy, the BMU, together with the licensing and supervisory authorities of the Federation and the Länder, determine the necessary demand for a redevelopment and advancement of the substatutory regulations. This should be/is guided by the needs after 2022 in particular for research reactors, decommissioning and dismantling, and storage and disposal."

Suggestion S20

(1) ***BASIS:*** *GSR Part 5 Requirement 6 states that "Interdependences among all steps in the predisposal management of radioactive waste, as well as the impact of the anticipated disposal option, shall be appropriately taken into account."*

(2) ***BASIS:*** *GSR Part 5 Requirement 11 states that "Waste shall be stored in such a manner that it can be inspected, monitored, retrieved and preserved in a condition suitable for its subsequent management. Due account should be taken if the expected period of storage, and, to the extent possible, passive safety features shall be applied. For long term storage in particular, measures shall be taken to prevent degradation of the waste containment."*

(3) ***BASIS:*** *GSR Part 6 Requirement 14 states that "Radioactive waste shall be managed for all waste streams in decommissioning."*

S20 ***Suggestion:*** *The regulatory body should consider updating the guidance on the predisposal of radioactive waste to ensure they reflect the interdependences between the steps of predisposal management and the possibility of extended storage periods.*

Statement:

1. Implementation

On 10th December 2020, the ESK adopted the "Guidelines for the conditioning of radioactive waste with negligible heat generation" (Conditioning guidelines), the purpose of which is to summarise both requirements for the conditioning facilities (design and operation) and requirements for the waste forms or packages to be produced. The requirements for the waste forms or waste packages to be produced result from the boundary conditions for transport, storage and disposal (and thus also for extended storage).

Furthermore, the ESK revised the Guidelines for the storage of radioactive waste with negligible heat generation (Storage facilities guidelines) of 10th June 2013 and adopted them on 9th December 2021. These guidelines formulate requirements for safe storage, especially for extended storage over several decades. For this reason, great importance was attached in these guidelines to the long-term inherent stability of the radioactive waste and waste forms in combination with the containers under the operational boundary conditions of the storage facility.

At the meeting of the FA VE on 20th/21st January 2021, the special meeting of the FA VE on 16th February 2021 and the joint meeting of the FA RS and the FA VE on 15th April 2021, the Länder and the Federation agreed to apply the Conditioning guidelines of 10th December 2020 and the ESK explanatory note on the application of the ESK guidelines for the conditioning of radioactive waste with negligible heat generation of 25th March 2021 as a basis in their licensing and supervisory procedures.

The LAA-HA took note of the FA VE decision on 2nd July 2021. The decision was published together with the Conditioning guidelines and the ESK explanatory note in the Federal Gazette on 29th September (BAnz AT 29.09.2021 B4).

Furthermore, on 30th June 2022, the LAA-HA adopted the proposed decision of the FA VE and the FA RS to also apply the storage facility guidelines in the version of 9th December 2021 as a basis in their licensing and supervisory procedures. This decision was published together with the Storage facilities guidelines in the Federal Gazette on 19th August 2022 (BAnz AT 19.08.2022 B4).

In addition, the Federation and the Länder have agreed to draw up a guideline to consolidate the contents of these two guidelines, the Guideline for radioactive waste. Furthermore, the Guideline on the control of radioactive waste with negligible heat generation not delivered to a Land collecting facility (of 16th January 1989; BAnz 1989, No. 63a) (last amendment of 14th January 1994; BAnz 1994, No. 19) and the Guideline on the control of residual radioactive material and radioactive waste (of 19th November 2008; BAnz 2008, No. 197) are to be incorporated in this Guideline for radioactive waste. With the Guideline for radioactive waste, it is intended to create a set of rules that covers all aspects of the handling of radioactive waste – starting with waste flow control, through conditioning to storage with the aim of disposal. A Federation-Länder working group was set up to draft the guideline. It consists of representatives of the Länder Baden-Württemberg, Bavaria, Hesse, Mecklenburg-Western Pomerania, Lower Saxony, North Rhine-Westphalia, Rhineland-Palatinate, Saxony, and Schleswig-Holstein as well as BASE.

2. Assessment

Already with the preparation of the Conditioning guidelines as well as the revision of the Storage facilities guidelines by the ESK together with the decision of the LAA-HA to apply these guidelines as a basis within the framework of the licensing and supervisory procedures, a legal basis was created that comprehensively takes into account the steps of predisposal and the possibility of extended storage periods. The Guideline for radioactive waste, which is currently being drafted, will incorporate these contents and also take into account other aspects such as waste flow control.

3. Documents

Guidelines for the conditioning of radioactive waste with negligible heat generation of 10th December 2020 and the ESK explanatory note on the application of the ESK guidelines for the conditioning of radioactive waste with negligible heat generation of 25th March 2021; publication

together with decision on application in licensing and supervisory procedures in the Federal Gazette: BAnz AT 29.09.2021 B4

ESK Guidelines for the storage of radioactive waste with negligible heat generation (Storage facilities guidelines) of 9th December 2021; publication together with decision for application in licensing and supervisory procedures in the Federal Gazette: BAnz AT 19.08.2022 B4

4. Reference to the measure(s) of the National Action Plan

Suggestion S20 has been implemented under Action 9.1 in the National Action Plan.

"Against the background of the new Radiation Protection Act and the phase-out of the use of nuclear energy, the BMU, together with the licensing and supervisory authorities of the Federation and the Länder, determine the necessary demand for a redevelopment and advancement of the substatutory regulations. This should be/is guided by the needs after 2022 in particular for research reactors, decommissioning and dismantling, and storage and disposal."

Suggestion S21

(1) ***BASIS:*** *GSR Part 6 Requirement 8 para. 5.1 states that "The preferred decommissioning strategy shall be immediate dismantling. However, there may be situations in which immediate dismantling is not a practicable strategy when all relevant factors are considered."*

(2) ***BASIS:*** *GSR Part 6 Requirement 8 states that "The licensee shall select a decommissioning strategy that will form the basis for the planning for decommissioning. The strategy shall be consistent with the national policy on the management of radioactive waste."*

(3) ***BASIS:*** *GSR Part 6 Requirement 8, para. 5.5 states that "For sites with more than one facility, a site strategy for decommissioning shall be developed to ensure that interdependences between the facilities are taken into account in the planning for individual facilities that will lead to final decommissioning plans for each facility (e.g. by means of release of parts of the site from regulatory control, if justified)."*

S21 ***Suggestion:*** *The regulatory body should consider revising decommissioning guidance to address interdependences among multiple facilities and authorised parties at the same site when implementing dismantling projects.*

Statement:

1. Implementation

The review team had noted that the Decommissioning Guide does not address interdependences among multiple nuclear facilities and different licensees at the same site, which may influence the implementation of a decommissioning project and the sequence and planning of decommissioning phases. The lack of statements in this regard was addressed in Suggestion S21.

Suggestion S21 has been implemented and fulfilled by supplementing the Decommissioning Guide.

The BMUV has drawn up a proposal to supplement the Decommissioning Guide, which was subsequently agreed on in the LAA technical committees and adopted in the LAA-HA in July 2021.

The corresponding addition in Section 3.5 of the Decommissioning Guide reads:

"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."

2. Assessment

Suggestion S21 has been implemented and fulfilled through an addition in the Decommissioning Guide that addresses interdependences among multiple nuclear facilities and different licensees at the same site, which may influence the implementation of a decommissioning project and the sequence and planning of decommissioning phases.

3. Documents

Guide to the decommissioning, safe enclosure and dismantling of facilities or parts thereof as defined in § 7 AtG of 16th September 2021 (Decommissioning Guide)

4. Reference to the measure(s) of the National Action Plan

Suggestion S21 has been implemented under Action 9.1 in the National Action Plan.

"Against the background of the new Radiation Protection Act and the phase-out of the use of nuclear energy, the BMU, together with the licensing and supervisory authorities of the Federation and the Länder, determine the necessary demand for a redevelopment and advancement of the substatutory regulations. This should be/is guided by the needs after 2022 in particular for research reactors, decommissioning and dismantling, and storage and disposal."

Suggestion S22

(1) ***BASIS:*** *GSR Part 6 Requirement 5 states that "The regulatory body shall regulate all aspects of decommissioning throughout all stages of the facility's lifetime, from initial planning for decommissioning during the siting and design of the facility, to the completion of decommissioning actions and the termination of authorization for decommissioning."*

S22 ***Suggestion:*** *The regulatory body should consider developing guidance on decommissioning for facilities which are regulated under the Radiation Protection Act.*

Statement:

1. Implementation

As perceived and in accordance with the scope of the IRRS mission, regarding this issue, the reviewers were primarily concerned with the storage facilities for radioactive waste with negligible heat generation that were or are being constructed at the sites of the nuclear power plants to be decommissioned and that are operated with a handling licence pursuant to § 12 of the Radiation Protection Act (StrlSchG).

In this respect, however, Suggestion S22 is based on a misunderstanding of the somewhat more differentiated factual and legal situation for these facilities in Germany.

First of all, for a large part of the on-site storage facilities, a handling licence pursuant to § 12 StrlSchG is not required anyway according to § 10a(2) AtG since a licence pursuant to § 7 AtG extends legally and factually to handling pursuant to § 12 StrlSchG.

For legally independent on-site storage facilities for radioactive waste with negligible heat generation, there is no need for an independent decommissioning licence or a guideline accompanying the decommissioning process for legal-structural reasons. This is because § 12 StrlSchG is not a facility-related licence, such as licences under § 7 AtG for a nuclear power plant, but a so-called activity-related licence. Here, the activity of handling radioactive material in the form of storage of radioactive waste is licensed, i.e. first of all its storage at a particular location, but also activities necessary for this (e.g. taking over and preparations of casks, transportation to the cask position, maintenance work and other common operations). This storage does not require a comprehensive licence for construction, operation and decommissioning under nuclear law. For the construction of such a storage facility, the building laws of the respective Länder apply. The construction licence is limited regarding the use of the building insofar as it does not contain a final decision on the protection against radiation-specific risks.

This issue is subject to examination under radiation protection law by the competent authority within the framework of the licensing procedure. This authority examines the respective conditions under radiation protection law with regard to safe handling of the respective radioactive material and its protection against malevolent disruptive acts or other third-party intervention. Such facilities are designed for the handling and storage of radioactive material in waste packages. The waste containers thus assume the function of safe activity confinement for the entire storage period.

At the end of the operating phase, no additional decommissioning licence is issued under radiation protection law. Instead, the waste is to be transferred to a disposal facility. Any material subjected to clearance is released from regulatory control. The facility (hall) itself will be demolished after licensing under conventional building law.

2. Assessment

For the above-mentioned reasons, it is not planned to follow up on Suggestion S22. For the facilities in question here, there is no safety gap in terms of radiation protection law that needs to be filled or flanked by guidelines.

3. Documents

None

4. References to the measure(s) of the National Action Plan

None

Suggestion S23

(1) ***BASIS:*** *GSR Part 3 Requirement 25, para. 3.106 states that "Employers, registrants and licensees: (a) Shall provide workers with access to records of their own occupational exposure;"*

S23 ***Suggestion:*** *The regulatory body should consider establishing regulatory requirements to mandate provision of relevant exposure records to workers employed by a licensee, not only upon request.*

Statement:

1. Implementation

§ 64(3) StrlSchV generally stipulates that an occupational exposure received shall upon request be reported in writing to the person concerned. This obligation does not apply if a radiation passbook is already kept for the person.

The personal dose shall be measured with a dosimeter of a measuring office appointed pursuant to § 169 StrlSchG or with a dosimeter under the responsibility of the radiation protection executive, the use of which has been approved by a measuring office appointed pursuant to § 169 StrlSchG (§ 66(1) StrlSchV). § 167(1) StrlSchG stipulates that the results of the measurements shall be recorded without delay by the radiation protection executive. Furthermore, § 170(1) StrlSchG stipulates that data on occupational exposure shall be recorded in the National Dose Register at the Federal Office for Radiation Protection.

If there is a suspicion that dose limits have been exceeded, the person shall be informed of the body dose determined without delay (§ 65(3) StrlSchV). This ensures that the person concerned is not only informed when the limit is actually exceeded, but already when it appears possible that the limit may be exceeded. This serves the precautionary protection of the person concerned, who – in addition to the protective measures provided for by law – can also take further steps of his or her own if necessary.

In addition, a person may request to be provided with a dosimeter that can be read at any time ,as defined in § 66(5) StrlSchV. It is not necessary for the person concerned to give reasons; the request for a dosimeter that can be read at any time must be granted. Furthermore, according to § 69(2) sentence 1 No. 2 StrlSchV, pregnant persons shall also be informed without delay of any exposure determined. This already partly corresponds to Suggestion S23.

A general obligation to always automatically provide exposure data to all monitored employees would mean a disproportionate administrative burden, in particular for the licensees, especially since a large part of the monitored persons were not exposed to any exposure above a detection

limit. Against this background, it would also be to be expected that such automated information would also be regarded as dispensable by a larger proportion of the persons monitored. There could even be a “saturation effect” in that the monthly notifications to the persons concerned would then no longer be actively registered by them (but would be perceived as a kind of “spam”), with the disadvantage that important notifications with suspected limit value exceedances or actual dose limit exceedances would then no longer be adequately perceived by the person concerned. In contrast, no significant benefit can be ascertained; and corresponding requirements have not yet been specified in the amendment of the Radiation Protection Act either.

The BMUV will monitor whether new technologies (databases, automation, company-internal e-mail incl. possibilities of encryption, e-files, etc.) offer simple possibilities in the medium term to implement this suggestion in an appropriate manner without greater administrative effort and in compliance with data protection.

The release of exposure data is possible at any time upon request. An obligation on the part of the licensee to notify employees of every measurement result, especially those with the result “0 mSv”, leads to an unnecessarily increased administrative burden in view of the large number of licences and monitored persons in occupational radiation protection.

2. Assessment

For the above reasons, a follow-up on this issue is not required.

3. Documents

Radiation Protection Act (StrlSchG)

- Excerpt §§167, 169, 179 StrlSchG

Radiation Protection Ordinance (StrlSchV)

- Excerpt §§64, 65, 66, 69 StrlSchV

4. Reference to the measure(s) of the National Action Plan

None

7.11 Module 10 – Emergency Preparedness and Response (EP&R)

Suggestion S24

(1) ***BASIS:*** *GSR Part 7 para. 6.17 states that "Each response organization shall prepare an emergency plan or plans for coordinating and performing their assigned functions as specified in Section 5 and in accordance with the hazard assessment and the protection strategy. An emergency plan shall be developed at the national level that integrates all relevant plans for emergency response in a coordinated manner and consistently with an all-hazards approach. Emergency plans shall specify how responsibilities for managing operations in an emergency response are to be discharged on the site, off the site and across national borders, as appropriate. The emergency plans shall be coordinated with other plans and procedures that may be implemented in a nuclear or radiological emergency, to ensure that the simultaneous implementation of the plans would not reduce their effectiveness or cause conflicts.*

S24 ***Suggestion:*** *The regulatory body should consider developing general and special emergency plans based on the reference scenarios defined according to the Radiation Protection Act (to replace the existing provisional plans).*

Statement:

1. Implementation

According to §§ 97 to 99 StrlSchG, a Federal Emergency Plan of the Federation (ANoPl-Bund) and Special Emergency Response Plans of the Federation (BNoPl-Bund) shall be developed. The emergency plans of the Federation are to be adopted by the Federal Government as general administrative provisions with the consent of the Bundesrat.

ANoPl-Bund: The ANoPl-Bund is prepared under the leadership of the BMUV. The interdepartmental coordination of the Ministry draft of the ANoPl-Bund was initiated in March 2022. At the same time, a hearing of scientific experts, the Länder, associations, and other stakeholders was conducted. The revision of the Ministry draft on the basis of the large amount of feedback was completed in summer 2023. The decision on the ANoPl-Bund is sought by autumn 2023 after completion of the interdepartmental coordination.

The ANoPl-Bund will be supplemented by an anticipated seven BNoPl-Bund, which will specify the emergency response in the respective subject areas. The BNoPl-Bund are currently being developed under the leadership of the ministries responsible for these subject areas. The aim of the special emergency planning is to embed emergency preparedness and response for radiological emergencies in the infrastructure and procedures for the protection of the population established in the respective subject areas following an all-hazards approach. The development of these plans is at different stages of progress and is usually carried out in working groups with the participation of various federal authorities and the Länder.

Until the ANoPl-Bund and the BNoPl-Bund gradually step into force, the provisional emergency plans of the Federation pursuant to § 97(5) in conjunction with Annex 4 StrlSchG shall apply. Based on these provisional emergency plans and the other applicable regulations, the German emergency management system is operational at all times and complies with the requirements of Directive 2013/59/Euratom.

2. Assessment

Significant progress has been made since the IRRS mission 2019 in the development of the general and special emergency plans of the Federation pursuant to the StrlSchG. The ANoPl-Bund is expected to be adopted in the near future. Work on the BNoPl-Bund is ongoing, but completion of these plans is not expected in 2023. The Länder are developing their general emergency plans to supplement and concretise the ANoPl-Bund. Until adoption, the Länder are guided by the present Ministry draft of the ANoPl-Bund. In addition, the Länder are involved in the drafting of the BNoPl-Bund and, as far as possible, prepare their respective special emergency plans in parallel.

3. Documents

Ministry draft of the ANoPl-Bund

4. Reference to the measure(s) of the National Action Plan

Suggestion S24 is currently being implemented under actions 10.1 to 10.5 in the National Action Plan.

Action 10.1 "A*ccording to § 98 StrlSchG, the BMU prepares the federal general emergency response plan, which is agreed by the Federal Government with consent of the Bundesrat as a binding administrative regulation for all authorities of the Federation and the Länder. As a core element, the federal general emergency response plan contains a catalogue of different postulated events and related scenarios, which serves as a basis for the Federation and the Länder in the planning for possible emergencies in Germany or abroad. Furthermore, the federal general emergency response plan contains an optimised protection strategy for each of these emergency scenarios. Until the issuing of the federal general emergency and special emergency plans, the documents specified in Appendix 4 StrlSchG apply as the provisional federal emergency plans."*

Action 10.2 "A*ccording to § 99 StrlSchG, the federal ministries responsible for the respective areas compile a range of special federal emergency response plans which supplement and specify the federal general emergency plan. They represent the emergency planning and*

response (EP&R) for the specific and legal areas affected in an emergency (such as waste disposal, drinking water supply, traffic etc.). The special federal emergency response plans are likewise adopted as a binding administrative regulation by the Federal Government with the consent of the Bundesrat."

Action 10.3 *"According to §100 StrlSchG, the Länder prepare general and special emergency response plans, which supplement the corresponding federal plans. These specify the emergency precautions for the area and the authorities of each Land. Until the issuing of the emergency response plans of the Länder, the relevant documents existing at Land level apply as provisional emergency response plans for the Länder."*

Action 10.4 *"According to §101 StrlSchG, the disaster control authorities of the Länder prepare or update external emergency response plans for the surroundings of installations with special hazard potential (such as nuclear installations). These site-specific external emergency response plans specify the emergency protection precautions and the emergency response plans of the Federation and the Länder with consideration of the local conditions and on-site emergency preparedness."*

Suggestion S25

(1) ***BASIS:*** *GSR Part 7 para. 4.8 states that "The government shall ensure that response organizations, operating organizations and the regulatory body have the necessary human, financial and other resources, in view of their expected roles and responsibilities and the assessed hazards, to prepare for and to deal with both radiological and nonradiological consequences of a nuclear or radiological emergency, whether the emergency occurs within or beyond national borders."*

S25 ***Suggestion:*** *BMU should consider evaluating the extent of resources needed to prepare for and respond to emergencies at foreign nuclear power plants affecting Germany or emergencies at other nuclear facilities in Germany and, if necessary, secure funding of those resources after the phase out.*

Statement:

1. Implementation

The emergency management system of the Federation and the Länder is based on Part 3 StrlSchG and the other legal provisions of the Federation and the Länder for averting dangers for human health, the environment or public safety, which are mentioned in § 92 StrlSchG. Within the framework of the general emergency planning of the Federation, the BMUV has assessed possible emergency exposure situations that may arise from various scenarios in Germany and abroad. These hazard analyses form the basis for the emergency planning of the Federation and the Länder. They also include scenarios that may occur after or independently of the nuclear phase-out. The authorities that have tasks in the emergency management system of the Federation and the Länder shall make the necessary arrangements for an efficient emergency response.

The First Act Amending the Radiation Protection Act of 20th May 2021 (Federal Law Gazette BGBl. I p. 1194) supplemented § 193a StrlSchG, which states that the authorities must have the necessary financial and human resources to fulfil their statutory tasks. This statutory provision does not only apply to authorities of the Federation and the Länder that perform emergency preparedness or response tasks in implementation of the StrlSchG, but also to all other authorities involved in the emergency management system under Part 3 StrlSchG on the basis of the sector interlinking concept (see explanatory memorandum in Bundestag printed paper 19/26943, p. 56 f.).

2. Assessment

By supplementing § 193a StrlSchG, sufficient financial and human resources of the authorities that perform tasks in the emergency management system of the Federation and the Länder is ensured at the statutory level. The sector-specific special emergency plans of the Federation and the Länder will specify the resource requirements for emergency preparedness and response.

3. Documents

First Act Amending the Radiation Protection Act of 20th May 2021 (Federal Law Gazette BGBl. I p. 1194)

4. Reference to the measure(s) of the National Action Plan

Suggestion S25 relates to actions 10.1 to 10.5 in the National Action Plan.

Action 10.1 "A*ccording to § 98 StrlSchG, the BMU prepares the federal general emergency response plan, which is agreed by the Federal Government with consent of the Bundesrat as a binding administrative regulation for all authorities of the Federation and the Länder. As a core element, the federal general emergency response plan contains a catalogue of different postulated events and related scenarios, which serves as a basis for the Federation and the Länder in the planning for possible emergencies in Germany or abroad. Furthermore, the federal general emergency response plan contains an optimised protection strategy for each of these emergency scenarios. Until the issuing of the federal general emergency and special emergency plans, the documents specified in Appendix 4 StrlSchG apply as the provisional federal emergency plans."*

Action 10.2 "A*ccording to § 99 StrlSchG, the federal ministries responsible for the respective areas compile a range of special federal emergency response plans which supplement and specify the federal general emergency plan. They represent the emergency planning and response (EP&R) for the specific and legal areas affected in an emergency (such as waste disposal, drinking water supply, traffic etc.). The special federal emergency response plans are likewise adopted as a binding administrative regulation by the Federal Government with the consent of the Bundesrat."*

Action 10.3 *"According to § 100 StrlSchG, the Länder prepare general and special emergency response plans, which supplement the corresponding federal plans. These specify the emergency precautions for the area and the authorities of each Land. Until the issuing of the*

emergency response plans of the Länder, the relevant documents existing at Land level apply as provisional emergency response plans for the Länder."

Action 10.4 *"According to §101 StrlSchG, the disaster control authorities of the Länder prepare or update external emergency response plans for the surroundings of installations with special hazard potential (such as nuclear installations). These site-specific external emergency response plans specify the emergency protection precautions and the emergency response plans of the Federation and the Länder with consideration of the local conditions and on-site emergency preparedness."*

Action 10.5 *"The BMU prepares the ordinances prescribed in the emergency protection part of the StrlSchG, if these are necessary and have not already been considered in the first article ordinance of the StrlSchG."*

8 Policy Issue Discussion

Policy issue: Changing the way of working – on the way to the 'new normal'

Requirements
Safety Standards Series No. GSR Part 1; Page 19 Requirement 16
Requirement 16: Organizational structure of the regulatory body and allocation of resources
The regulatory body shall structure its organization and manage its resources so as to discharge its responsibilities and perform its functions effectively; this shall be accomplished in a manner commensurate with the radiation risks associated with facilities and activities
Safety Standards Series No. GSR Part 1; Page 21 Requirement 19
Requirement 19: The management system of the regulatory body
The regulatory body shall establish, implement and assess and improve a management system that is aligned with its safety goals and contributes to their achievement.
4.15. The management system of the regulatory body has three purposes: (1) To ensure that the responsibilities assigned to the regulatory body are properly discharged; (2) To maintain and improve the performance of the regulatory body by means of the planning, control and supervision of its safety related activities; (3) To foster and support a safety culture in the regulatory body through the development and reinforcement of leadership as well as good attitudes and behaviour in relation to safety on the part of individuals and teams.
Safety Standards Series No. GSR Part 2; Page 15-16 Requirement 12
Requirement 12: Fostering a culture for safety
Individuals in the organization, from senior managers downwards, shall foster a strong safety culture. The management system and leadership for safety shall be such as to foster and sustain a strong safety culture.
5.2 Senior managers and all other managers shall advocate and support the following: […] c) An organizational culture that supports and encourages trust, collaboration, consultation and communication;

Starting point and objective

The Covid-19 pandemic has posed unprecedented challenges to the work environment worldwide. In Germany, this has certainly advanced the introduction of new ways of working ('new work') and accelerated the general digitalisation of the work environment. In part, ways of working that at the beginning were only thought of as temporary solutions have now become established and thus part of the 'new normal' constituting of a mix of physical/classical and virtual/new ways of working – also beyond the pandemic. The individual flexibility of work location and working hours as well as events and meetings conducted in virtual space – both nationally and internationally – are now no longer exceptions but the rule in many places. This is because many of the associated opportunities, for

example the increased flexibility and thereby greater motivation of individuals as well as the possibility for groups to hold meetings at short notice and irrespective of locations and distances, have proven advantageous also regardless of any pandemic-related restrictions. However, in addition to the further acceleration and consolidation of digital work processes, this is also accompanied by challenges such as increased personal responsibility, ensuring social cohesion, good communication and cooperation among groups, the integration and onboarding of new employees, and leadership at a distance – all of them are aspects of particular importance for the regulatory safety culture.

In 2021, the BMUV prepared a new service agreement on flexible working in space and time as part of the overarching management system, in particular to exploit the potential of flexibility and digitalisation without disregarding service-related interests and ensuring smooth service operations. Similar models have also been introduced at many Land authorities.

Targeted training for supervisors as well as for staff members was offered to both raise awareness and support professional handling of the challenges of work flexibility. Besides, virtual networking opportunities were prepared for the informal exchange among staff. However, specific challenges arise for regulatory authorities – especially with regard to safety-oriented action and safety-oriented leadership – that have to be mastered in the best-possible way. In particular, the question arises of what is the optimal balance for the “new normal” in practice.

This especially concerns the question of the extent to which interdisciplinary and cross-group exchange still takes place under the new boundary conditions. Especially the understanding and perspective of other disciplines or work units has so far benefited from the informal exchange among staff members. The same applies to impressions beyond the respective responsibilities that are gathered during plant visits or technical discussions. The informal exchange among colleagues about such impressions also serves for drawing attention to certain points.

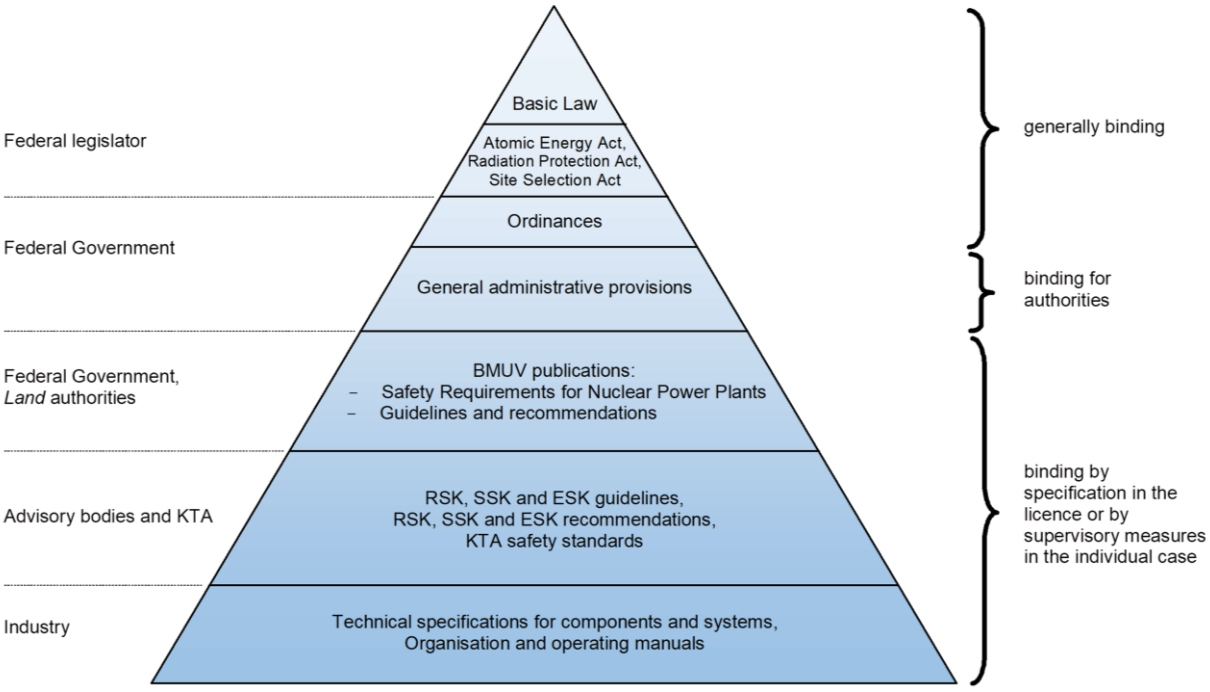
Questions for the experts

- How has the way of working in your authority changed in the course of the pandemic? Did you adapt existing regulations or develop new working concepts? What experiences, if any, have been made with new ways of working ('new work'; e.g. agile methods)?
- What instruments / methods are used at your authority to ensure the regulatory safety culture in the face of increasing flexibility of working time and place of work?
- What instruments / methods are used at your authority to share impressions from supervision that go beyond case-specific issues, and what experience has been gained with them?

9 Further Documentation

In the following, a list of further documentation is given. In case of statutory and substatutory regulations, only those are given which are relevant for the implementation of the German action plan. In the electronic format of the ARM links to these documents have been included. All documents are provided together with the ARM in electronic format.

The following documents are listed in accordance with the German regulatory pyramid.



Law and conventions

Act on the peaceful utilisation of nuclear energy and the protection against its hazards (Atomic Energy Act – AtG) of 23rd December 1959, as amended and promulgated on 15th July 1985, last amendment of 4th December 2022

Act on the Protection against the Harmful Effects of Ionizing Radiation (Radiation Protection Act – StrlSchG), of 27th June 2017, last amendment of 3rd January 2022, (in German)

- Excerpt §§167, 169, 179 StrlSchG
- Excerpt §193a StrlSchG

Act on the Search for and Selection of a Site for a Disposal Facility for High-Level Radioactive Waste (Site Selection Act – StandAG) of 5th May 2017, last amendment of 20 July 2017 (in English),

- last amendment of 7th December 2020 (in German)

Convention on Nuclear Safety, Report by the Government of the Federal Republic of Germany for the Combined 8th/9th Review Meeting in March 2023

Convention on Nuclear Safety, Country Review Report (CRR) for the Federal Republic of Germany, Combined 8th/9th Review Meeting in March 2023

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Report of the Federal Republic of Germany for the Seventh Review Meeting in May 2021

Ordinances

Ordinance on Safety Requirements for the Disposal of High-Level Radioactive Waste (Disposal Facility Safety Requirements Ordinance – EndlSiAnfV), 6th October 2020 (in German)

Ordinance on Requirements for the Performance of Preliminary Safety Analyses in the Site Selection Procedure for the Disposal of High-Level Radioactive Waste (Disposal Facility Safety Analyses Ordinance – EndlSiUntV), 6th October 2020 (in German)

Ordinance on the Protection against Damage and Injuries Caused by Ionizing Radiation (Radiation Protection Ordinance – StrlSchV), 29th November 2018, amended by Article 1 of the ordinance of 8th October 2021 (in German)

- Excerpt §§64, 65, 66, 69 StrlSchV

Ordinance on the Procedure for Licensing of Installations under § 7 of the Atomic Energy Act (Nuclear Licensing Ordinance – AtVfV), of 18th February 1977, as amended and promulgated on 3rd February 1995, amended by Article 3 of the ordinance of 11th November 2020

Ordinance on the Nuclear Safety Officer and the Reporting of Incidents and other Events (Nuclear Safety Officer and Reporting Ordinance – AtSMV), of 14th October 1992, last Amendment of 8th June 2010

Modification of the Nuclear Safety Officer and Reporting Ordinance, 29th November 2018

BMUV publications

Safety Requirements for Nuclear Power Plants, promulgated on 3 March 2015 (in English), promulgated on 25th January 2022 (in German)

Guideline for the Periodic Safety Review of Research Reactors, draft as at 21th June 2023

Guide to the decommissioning, the safe enclosure and the dismantling of facilities or parts thereof as defined in § 7 of the Atomic Energy Act as at 16th September 2021

Guideline for the application of the nuclear rules and regulations for nuclear power plants to research reactors by means of a graded approach, adopted 29 June 2023

Ministry draft of the Federal Emergency Plan of the Federation (ANoPl-Bund) (in German)

Guides and recommendations

ESK Guidelines for the conditioning of radioactive waste with negligible heat generation of 10th December 2020;

Application of the ESK guidelines for the conditioning of radioactive waste with negligible heat generation of 25th March 2021

ESK Guidelines for the storage of radioactive waste with negligible heat generation of 9th December 2021; publication together with decision for application in licensing and supervisory procedures in the Federal Gazette: BAnz AT 19.08.2022 B4 (in German)

RSK Statement (532nd meeting of the Reactor Safety Commission (RSK) on 11th November 2022), Continued operation of German nuclear power plants until 15th April 2023 (in German)

ESK guidelines for the performance of periodic safety reviews and on technical ageing management for storage facilities for spent fuel and heat-generating radioactive waste of 3rd March 2022

BMUV references

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, National Policy Paper “Nuclear Safety”, 17.05.2021

Federal Government Strategy for Competence Building and the Development of Future Talent for Nuclear Safety (August 2020)

Handbook on Cooperation between the Federation and the Länder in Nuclear Law (as at June 2023) (in German)

- Excerpt chapter 0. Introduction
- Excerpt process 23 Review and assessment in the licensing and supervisory procedure
- Excerpt process 24 Supervisory process integrated safety assessment
- Excerpt process 25 On-site inspection
- Excerpt process 26 Enforcement of measures

Handbook on Cooperation between the Federation and the Länder in Nuclear Law (as at June 2018)

Handbook on Cooperation between the Federation and the Länder in Nuclear Law – Waste Management Part (June 2023)

- Excerpt process 1. Procedure for new licences pursuant to § 6 AtG for the storage of nuclear fuel (storage facilities)

- Excerpt process 2. Procedure for modification licences pursuant to § 6 AtG for the storage of nuclear fuel (storage facilities)
- Excerpt process 3. Communication between licensing authority and nuclear supervisory authorities on the storage of nuclear fuel pursuant to § 6 AtG (storage facilities)
- Excerpt process 4. Reportable events pursuant to the Nuclear Safety Officer and Reporting Ordinance (AtSMV) during storage pursuant to § 6 AtG and their classification according to INES (International Nuclear and Radiological Event Scale) (storage facilities)
- Excerpt process 5. Technical Committee for Nuclear Fuel Cycle (FA VE)

Needs analysis for the safety of nuclear facilities (in German)

Needs analysis for the maintenance and expansion of radiation protection competence in Germany (in German)

Needs analysis for the safety of nuclear waste management (in German)

Policy paper Safety culture in nuclear licensing and supervisory authorities, 14.03.2019

Framework paper on the set of instruments for the self-audit of the regulatory safety culture

- Lists of 40 practices for the self-assessment of the regulatory safety culture
- Questionnaire on regulatory safety culture

Framework paper on the independent assessment of the management system of licensing and supervisory authorities under nuclear and radiation protection law at federal and supreme Land level (contents and sections A – C)

Rules of procedure for the auditing pool for licensing and supervisory authorities under nuclear and radiation protection law at federal and supreme Land level

Common understanding between the Federation and the Länder on inspection programmes for research and teaching reactors in Germany

Advisory request to the ESK – Review of existing KTA safety standards for the disposal sector and transfer into a separate set of rules and regulations of 3rd February 2023 (in German)

BASE references

BASE draft on framework requirements for the management system of the Bundesgesellschaft für Endlager mbH (BGE) (in German)

Excerpt from the BASE Management System Manual (BASE-MMH) (in German)

BASE mandate to the ESK on the subject of periodic safety reviews dated 16th September 2022 (in German)

Länder references

Bavarian State Ministry of the Environment and Consumer Protection, Handbook for state supervision on the high flux neutron source Munich in Garching (FRM II) – Supervision Manual, 15.06.2023 (in German)

- Excerpt table of content, chapter XI. enforcement strategy, chapter XII. Supervisory activities at FRM II

Excerpt (contents and introduction) from the supervision concept of the Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg

UM BW, Inspection report, Inspection preventive maintenance during operation (PMO) and 72 h test run NSD XJ10

Other references

Report of the Integrated Regulatory Review Service (IRRS) mission to Germany 2019, IAEA-NS-IRRS-2019/02

Report of the Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) mission to Germany 2019, IAEA-2019

Report of the Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) Follow-up mission to Germany 2022, IAEA-NS-ARTEMIS, 2022

10 Abbreviations

AHB	Aufsichtshandbuch Handbuch über die Zusammenarbeit zwischen Bund und Ländern im Atomrecht Handbook on Cooperation between the Federation and the Länder in Nuclear Law (Supervision Manual)
ANoPl-Bund	Allgemeiner Notfallplan des Bundes Federal Emergency Plan of the Federation
ARM	Advance Reference Material
ARTEMIS	Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation
AtG	Atomgesetz Atomic Energy Act
AtSMV	Atomrechtliche Sicherheitsbeauftragten- und Meldeverordnung Nuclear Safety Officer and Reporting Ordinance
AtVfV	Atomrechtliche Verfahrensverordnung Nuclear Licensing Procedure Ordinance
AVR	Arbeitsgemeinschaft Versuchsreaktor
AVV	Allgemeine Verwaltungsvorschrift General administrative provision
BNoPl-Bund	Besondere Notfallpläne des Bundes Special Emergency Response Plans of the Federation
CNS	Convention on Nuclear Safety
DIN	Deutsches Institut für Normung German Institute for Standardization
EndlSiAnfV	Verordnung über Sicherheitsanforderungen an die Endlagerung hochradioaktiver Abfälle Disposal Facility Safety Requirements Ordinance
EndlSiUntV	Verordnung über Anforderungen an die Durchführung der vorläufigen Sicherheitsuntersuchungen im Standortauswahlverfahren für die Endlagerung hochradioaktiver Abfälle Disposal Facility Safety Analyses Ordinance
EMAS	Eco Management and Audit Scheme
EP&R	Emergency Preparedness and Response
ERAM	Endlager für radioaktive Abfälle Morsleben Morsleben Disposal Facility for Radioactive Waste
ESK	Entsorgungskommission Nuclear Waste Management Commission
EURATOM	Europäische Atomgemeinschaft European Atomic Energy Community
EWN	Entsorgungswerk für Nuklearanlagen GmbH, formerly Energiewerke Nord GmbH
FA R	Fachausschuss Recht Technical Committee for Legal Affairs
FA RS	Fachausschuss Reaktorsicherheit Technical Committee for Reactor Safety

FA S	Fachausschuss Strahlenschutz Technical Committee for Radiation Protection
FA VE	Fachausschuss Nukleare Ver- und Entsorgung Technical Committee for Nuclear Fuel Cycle
FRM II	Forschungs-Neutronenquelle Heinz Maier-Leibnitz, Technische Universität München
GG	Grundgesetz Basic Law
GNS	Gesellschaft für Nuklear-Service mbH
IAEA	International Atomic Energy Agency
IMS	Integrated Management System
INES	International Nuclear and Radiological Event Scale
IRS	International Reporting System on Operating Experience
IRRS	Integrated Regulatory Review Service
IRSRR	Incident Reporting System for Research Reactors
ISO	International Organization for Standardization
JC	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
KOBAF	Koordinierungsstelle für Informationen zur Behälterabfertigung Coordination office for information on cask handling
KTA	Kerntechnischer Ausschuss Nuclear Safety Standards Commission
LAA	Länderausschuss für Atomkernenergie Länder Committee for Nuclear Energy
LAA-HA	LAA-Hauptausschuss LAA Main Committee
MMH	Managementsystem-Handbuch Management system manual
NAcP	National Action Plan
NPP(s)	Nuclear power plant(s)
OECD/NEA	Organisation for Economic Co-operation and Development/Nuclear Energy Agency
PNS	Portal for Nuclear Safety
PSR	Periodic Safety Review
RACI	Responsibility Assignment Matrix
RLZ	Radiologisches Lagezentrum des Bundes Federal Radiological Situation Centre
RSK	Reaktor-Sicherheitskommission Reactor Safety Commission
S	Directorate General S (Nuclear Safety, Radiation Protection) of the BMUV
SiAnf	Sicherheitsanforderungen an Kernkraftwerke Safety Requirements for Nuclear Power Plants
SSK	Strahlenschutzkommission Commission on Radiological Protection
StandAG	Standortauswahlgesetz Site Selection Act

StrlSchG	Strahlenschutzgesetz Radiation Protection Act
StrlSchV	Strahlenschutzverordnung Radiation Protection Ordinance
SZL	Standortnahes Zwischenlager On-site storage facility
TBL	Transportbehälterlager Tansport cask storage facility
TECDOC	IAEA Technical Documents
ToR	Terms of Reference
TSO	Technical support organisation
TÜV	Technischer Überwachungsverein Technical Inspection Association
VwVfG	Verwaltungsverfahrensgesetz des Bundes Federal Administrative Procedure Act
WENRA	Western European Nuclear Regulators Association

11 List of German Organisations and Institutions

BAM Bundesanstalt für Materialforschung und -prüfung

BASE Federal Office for the Safety of Nuclear Waste Management / Bundesamt für die Sicherheit der nuklearen Entsorgung

BfE Federal Office for the Safety of Nuclear Waste Management / Bundesamt für kerntechnische Entsorgungssicherheit – now BASE

BfS Federal Office for Radiation Protection / Bundesamt für Strahlenschutz

BGE Federal company for radioactive waste disposal / Bundesgesellschaft für Endlagerung mbH

BGZ Federal company for radioactive waste storage / Gesellschaft für Zwischenlagerung mbH

BMBF Federal Ministry of Education and Research / Bundesministerium für Bildung und Forschung

BMUV Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection / Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz

BMWK Federal Ministry for Economic Affairs and Climate Action / Bundesministerium für Wirtschaft und Klimaschutz – now BMWK

BMWi Federal Ministry for Economic Affairs and Energy / Bundesministerium für Wirtschaft und Energie

ESK Nuclear Waste Management Commission / Entsorgungskommission

GRS Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH – Non-profit limited liability company

HMUKLV Ministry for the Environment, Climate Protection, Agriculture and Consumer Protection of the State of Hesse / Ministerium für Umwelt, Klimaschutz, Landwirtschaft und Verbraucherschutz, Hessen

LM MV Ministry for Climate Protection, Agriculture, Rural Areas and the Environment of the State of Mecklenburg-Western Pomerania / Ministerium für Klimaschutz, Landwirtschaft, ländliche Räume und Umwelt Mecklenburg-Vorpommern

KTA Nuclear Safety Standards Commission / Kerntechnischer Ausschuss

MEKUN Ministry for Energy Transition, Climate Protection, Environment and Nature of the State of Schleswig-Holstein of the State of Schleswig-Holstein / Ministerium für Energiewende, Klimaschutz, Umwelt und Natur, Schleswig-Holstein [only in German]

MWIKE Ministry of Economic Affairs, Industry, Climate Action and Energy of the State of North Rhine-Westphalia / Ministerium für Wirtschaft, Industrie, Klimaschutz und Energie, Nordrhein-Westfalen

MU Ministry of the Environment, Energy and Climate Protection of the State of Lower Saxony / Niedersächsisches Ministerium für Umwelt, Energie, und Klimaschutz [only in German]

UM BW Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg / Ministerium für Umwelt, Klima und Energiewirtschaft Baden-Württemberg

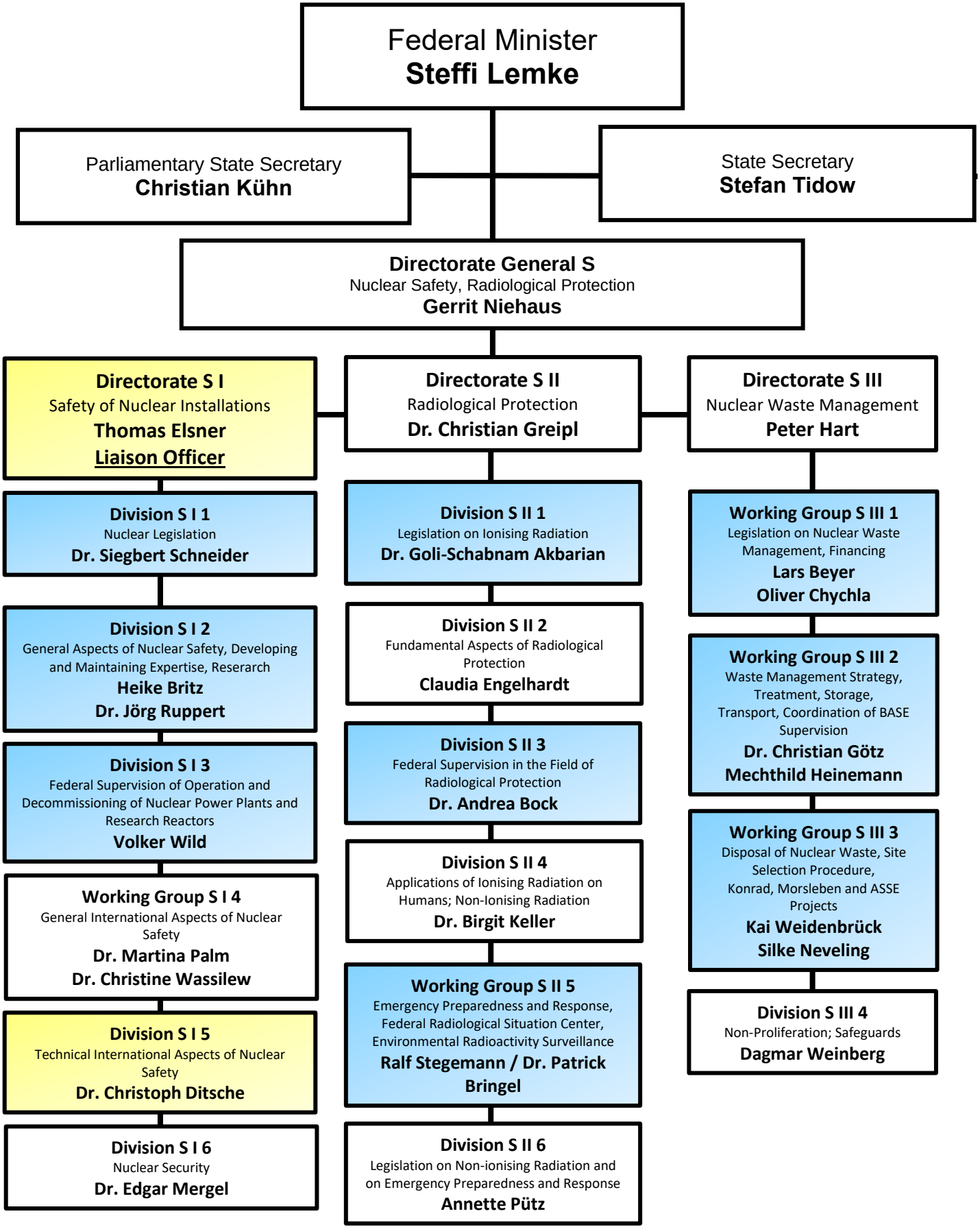
RSK Reactor Safety Commission / Reaktor-Sicherheitskommission

SSK Commission on Radiological Protection / Strahlenschutz Kommission

StMUV Bavarian State Ministry of the Environment and Consumer Protection / Bayerisches Staatsministerium für Umwelt und Verbraucherschutz

TÜV Technical Inspection Association

12 Organizational Charts of the Involved Authorities

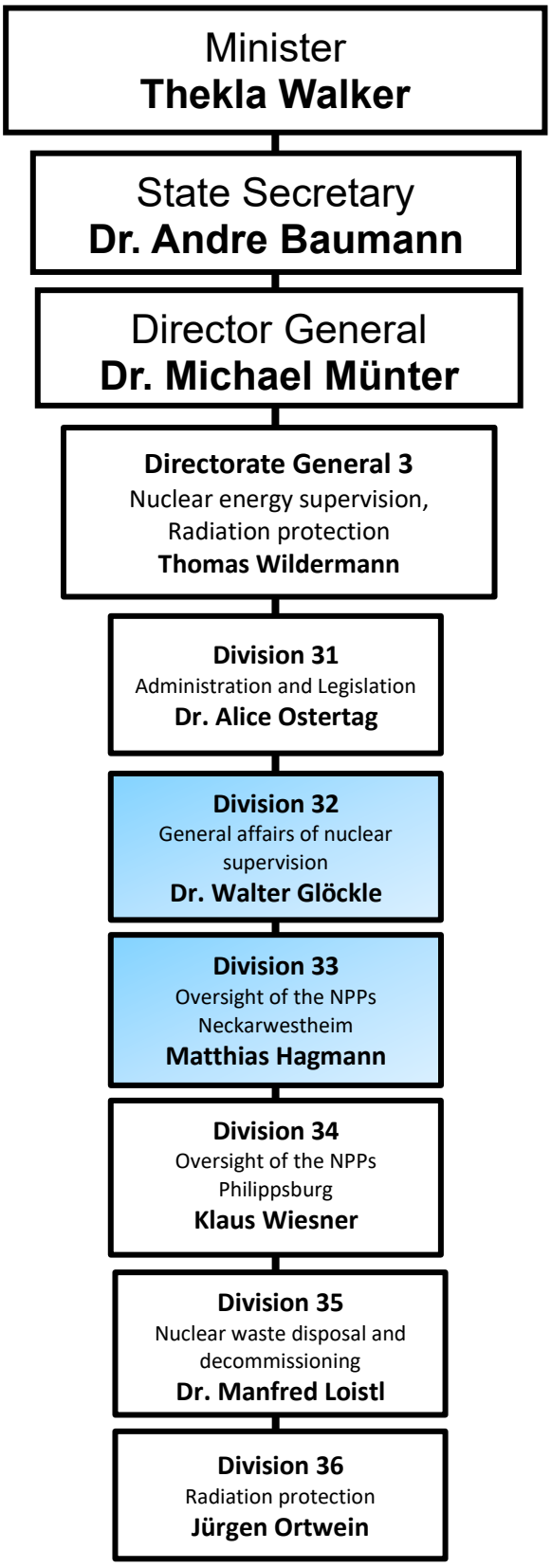


The complete organisational chart is available under:

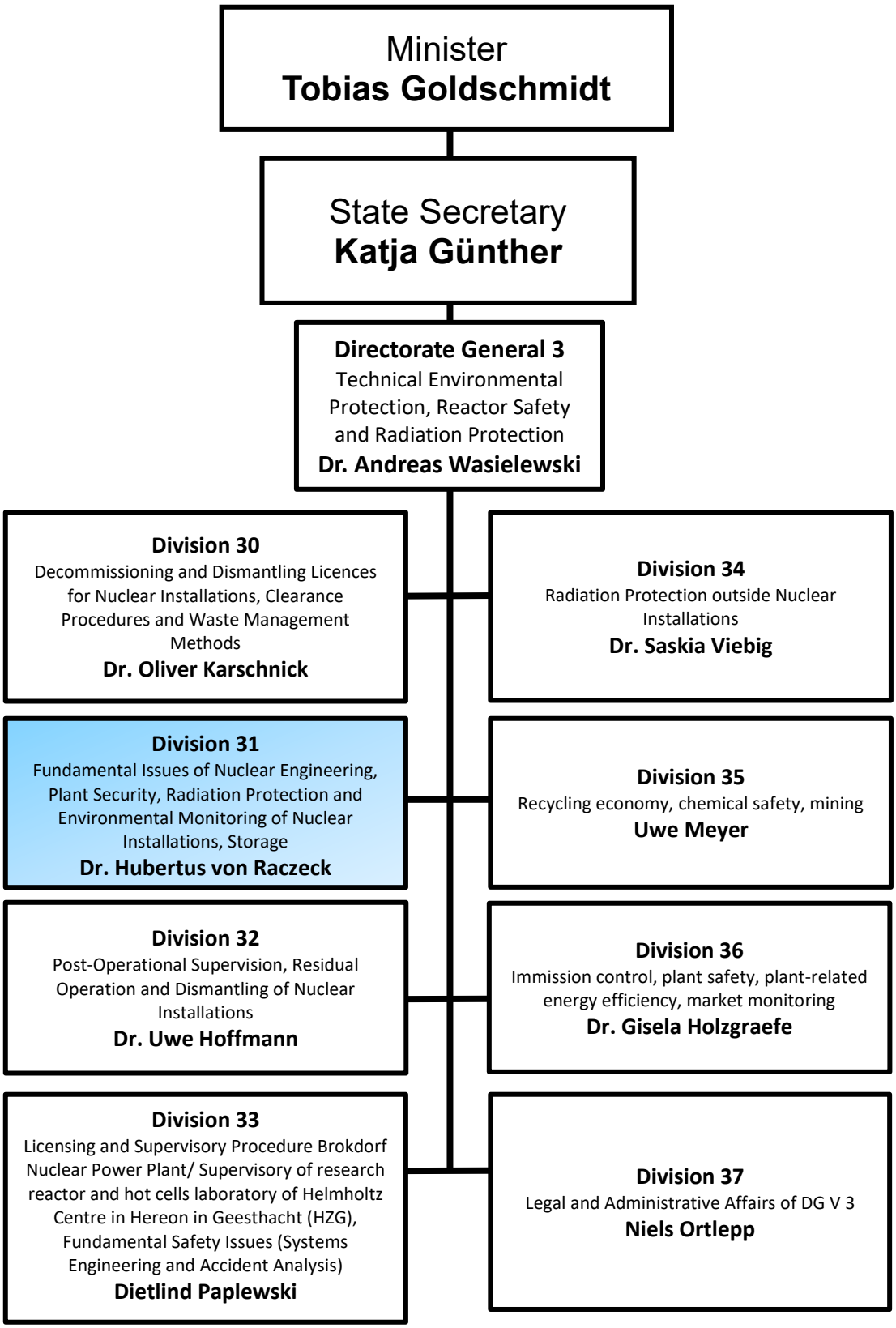
https://www.bmuv.de/fileadmin/Daten_BMU/Organigramme/organigramm_en_bf.pdf

Baden-Württemberg
MINISTRY OF THE ENVIRONMENT, CLIMATE PROTECTION AND THE ENERGY SECTOR

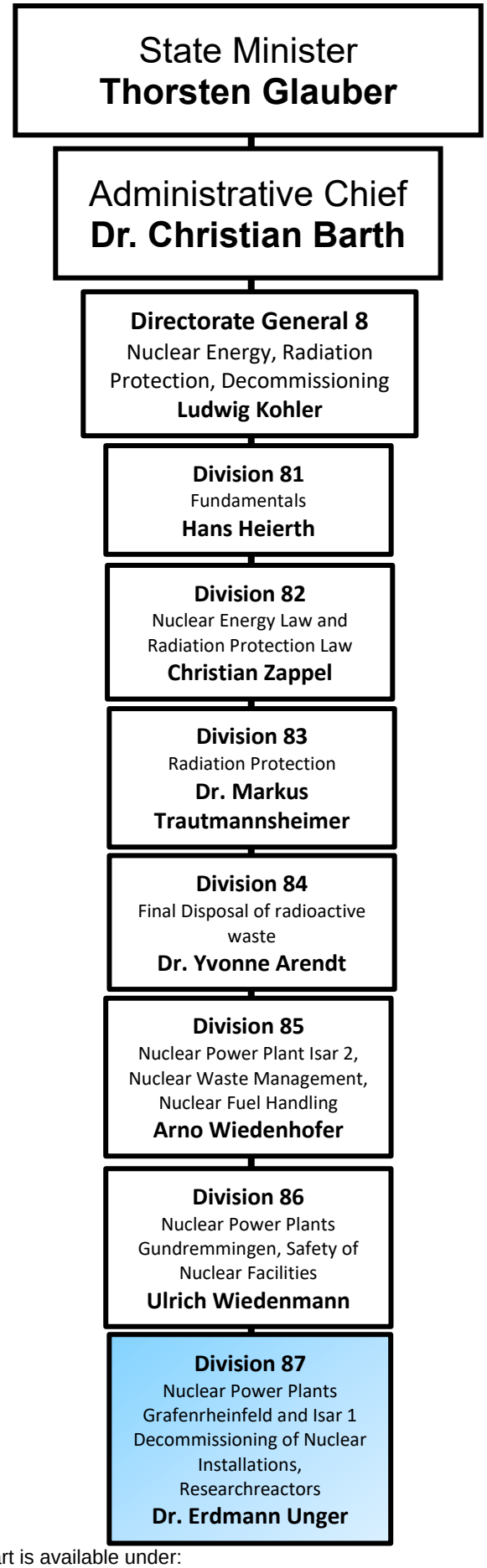
Organisational chart (excerpt)



The complete organisational chart is available under:
https://um.baden-wuerttemberg.de/de/ministerium/aufgaben-organisation



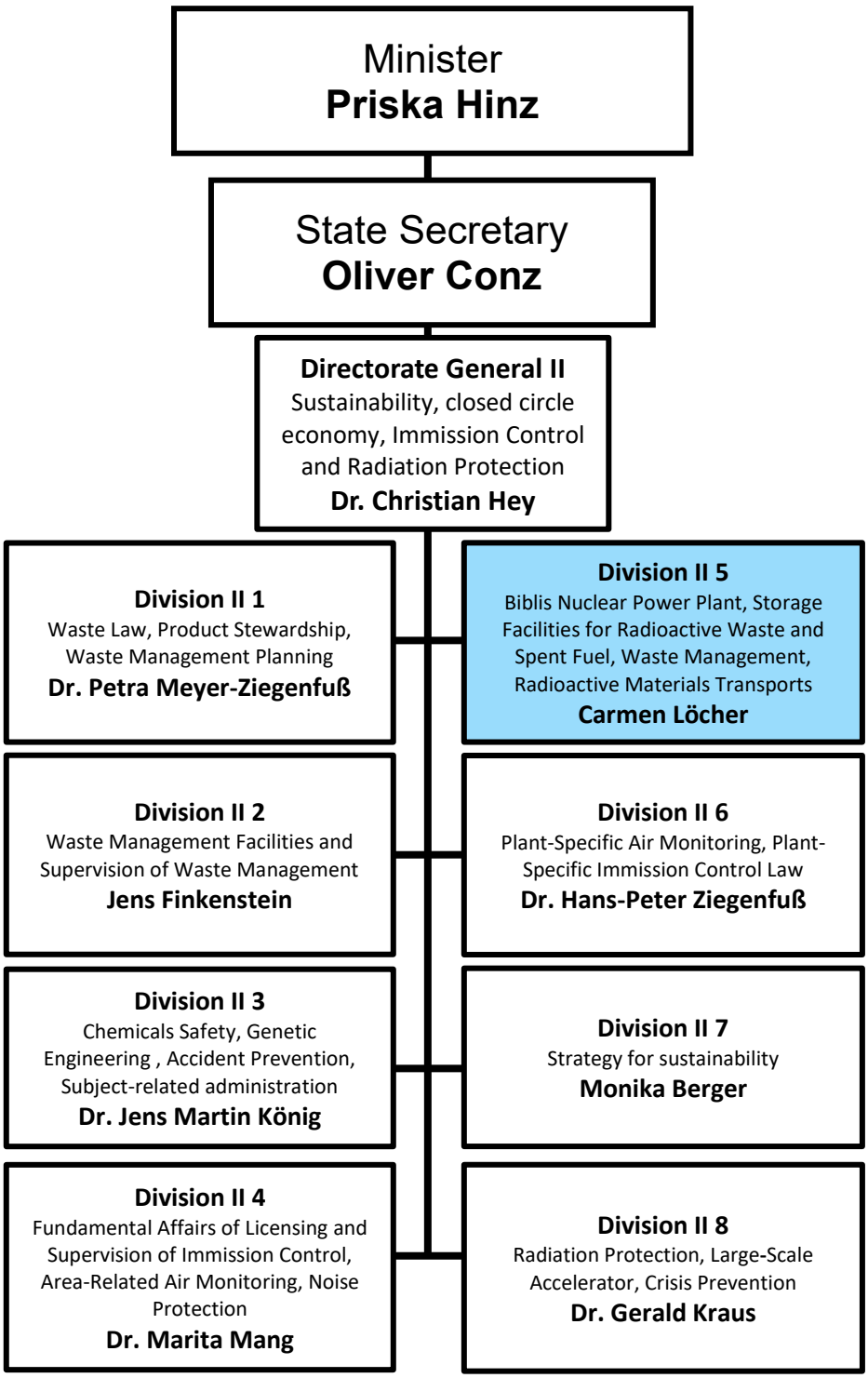
The complete organisational chart is available under:
https://www.schleswig-holstein.de/DE/landesregierung/ministerien-behoerden/V/Ministerium/OrganisationAnsprechpartner/_documents/Organigramm.pdf?__blob=publicationFile&v=4



The complete organisational chart is available under:

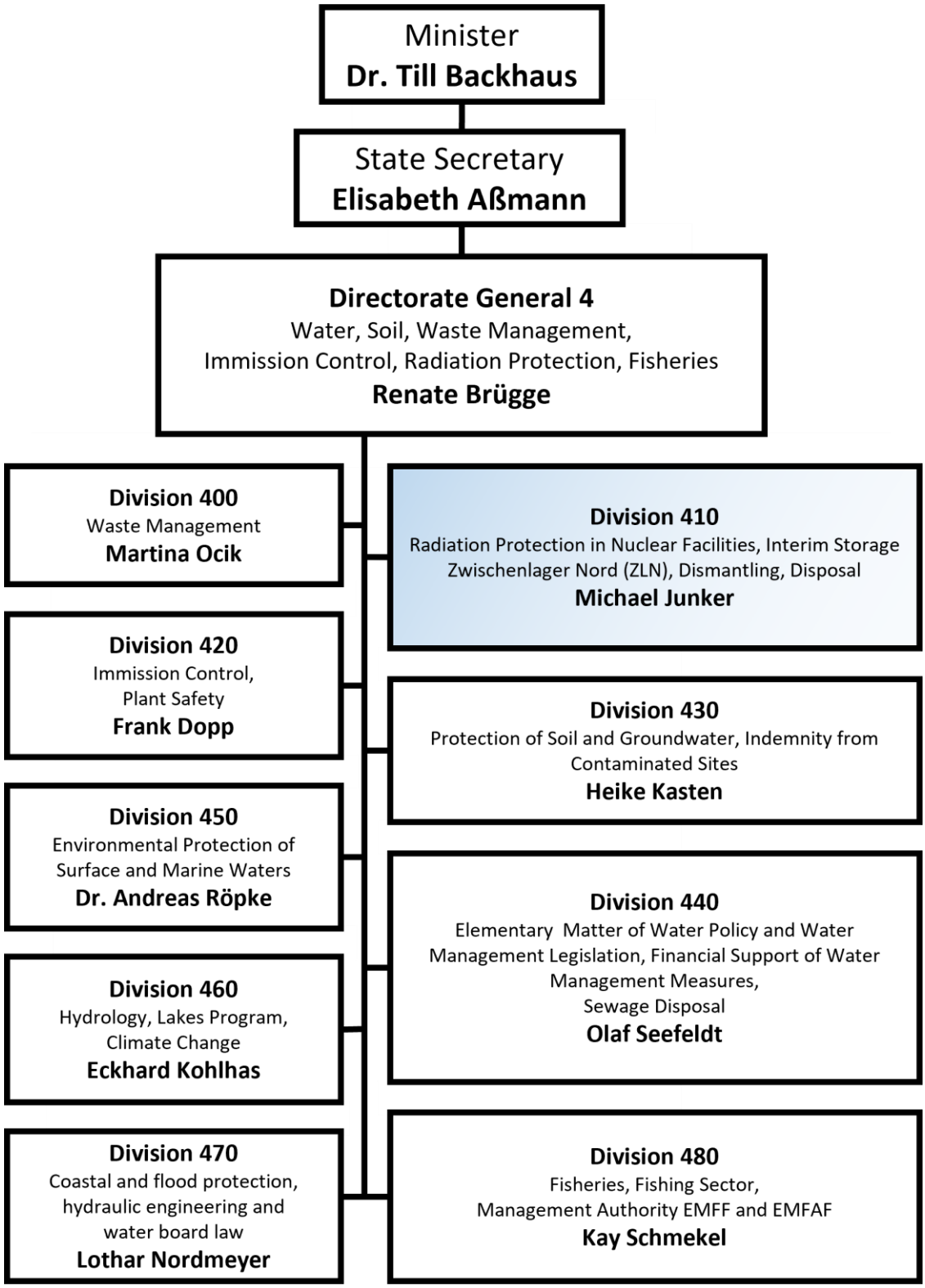
https://www.stmuv.bayern.de/ministerium/doc/org.pdf

Organisational chart (excerpt)



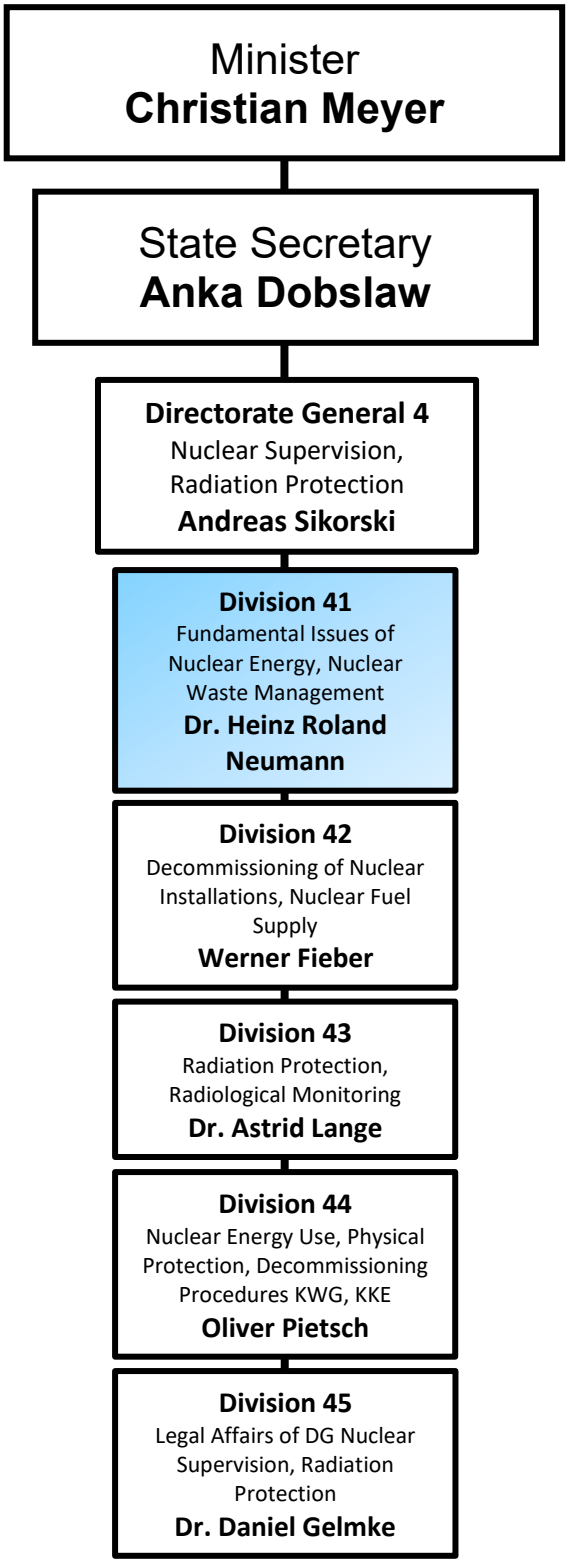
The complete organisational chart is available under:

https://umwelt.hessen.de/ueber-uns



The complete organisational chart is available under:

https://www.regierung-mv.de/Landesregierung/lm/Ministerium/Organigramm/

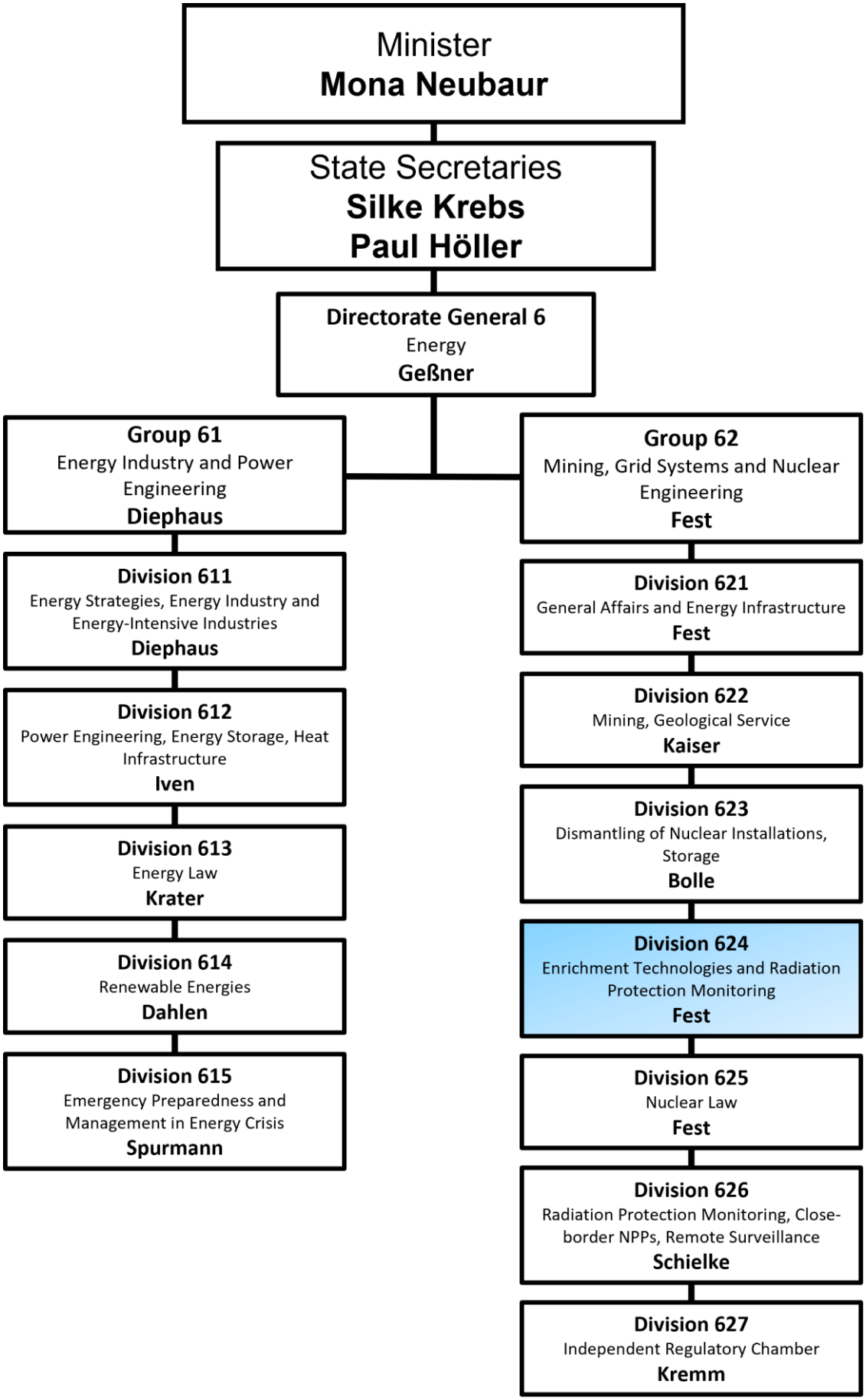


The complete organisational chart is available under:

https://www.umwelt.niedersachsen.de/download/7400/Organisationsplan_Stand_06.07.2023_.pdf

Ministry of Economic Affairs,
Industry, Climate Action and Energy
of the State of North Rhine-Westphalia

Organisational chart (excerpt)

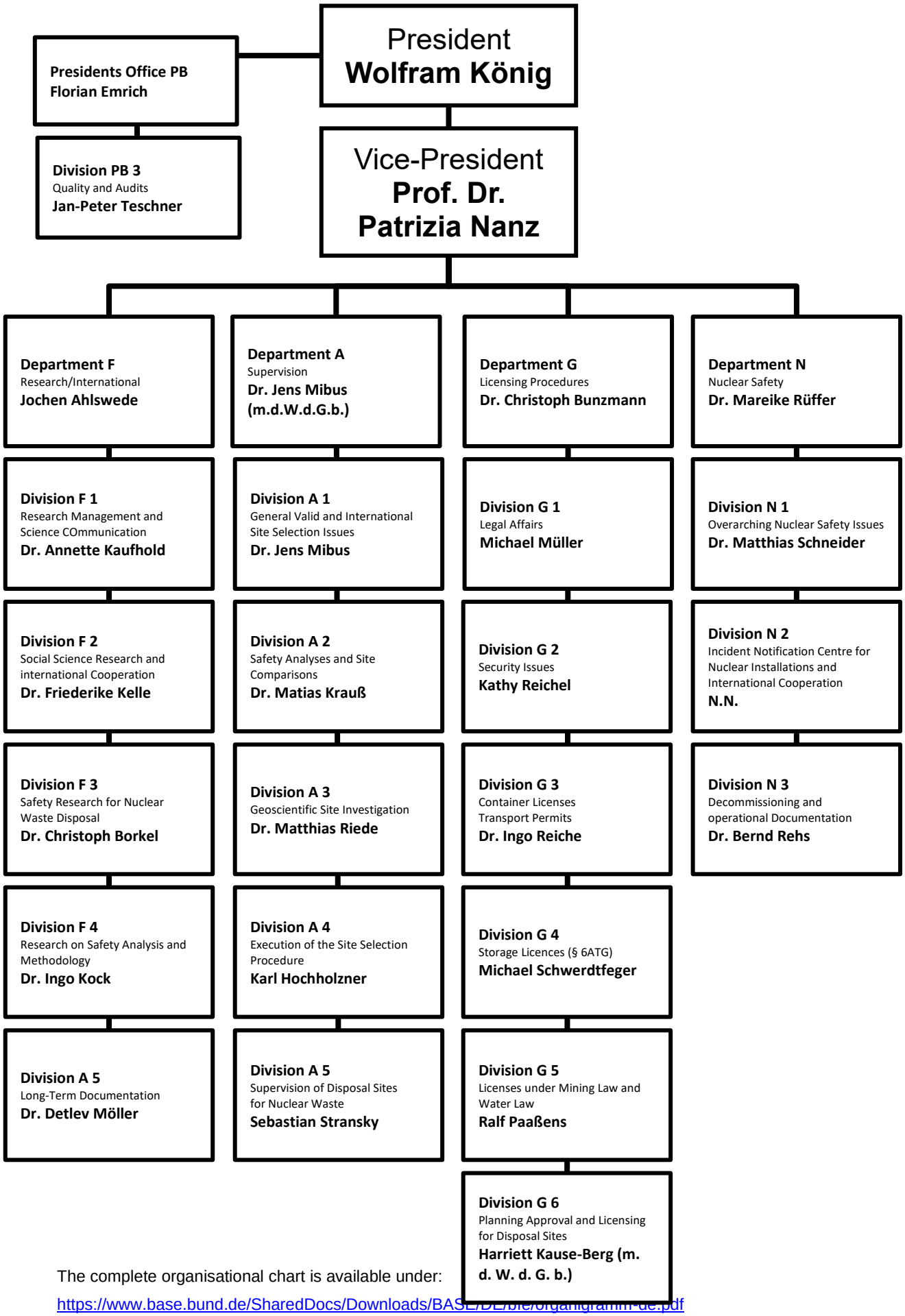


The complete organisational chart is available under:

https://www.wirtschaft.nrw/system/files/media/document/file/2023-06-01_orgaplan-mwike-extern.pdf

Federal Office
for the Safety of
Nuclear Waste Management

Organisational chart (excerpt)



The complete organisational chart is available under:

https://www.base.bund.de/SharedDocs/Downloads/BASE/DE/ble/organigramm-de.pdf

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