Note:
This is a translation of the ESK Statement entitled
"Überprüfung bestehender KTA-Regeln für den Endlagerbereich sowie Überführung in ein eigenes Regelwerk"
In case of discrepancies between the English translation and the German original, the original shall prevail.

STATEMENT of the Nuclear Waste Management Commission

Screening of existing KTA Safety Standards with regard to radioactive waste disposal and transfer to a separate set of regulations

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1 Advisory request to the Nuclear Waste Management Commission

In its advisory request of 3 February 2023 [1], the BMUV asks in a first question for a review of which contents of the existing KTA Safety Standards are also relevant for the area of radioactive waste disposal[1] in the future. In particular, those KTA Safety Standards referred to in the plan approval decision for the Konrad repository (PFB Konrad) should be considered. Against this background, BASE prepared a compilation of all KTA Safety Standards that were used in the licensing procedures for the existing repositories in Germany and the Asse II mine [2]. It was explicitly analysed whether other KTA Safety Standards than those mentioned in the BASE report should be taken into account. In this context, a comparison was also made with a list of KTA Safety Standards compiled by the BGE, which could possibly be relevant for the areas of future repositories, retrieval of waste from the Asse II mine, and for a conditioning plant for high-level radioactive waste to be constructed in the future [3].

In a second question, the BMUV asks for an assessment of how the existing KTA Safety Standards can be replaced and how a future-oriented separate set of regulations can be introduced for the area of radioactive waste disposal. The BMUV asks whether a new regulatory structure could be logical and expedient and, if so, which technical requirements need to be taken into account for the structure. In addition, it is to be examined whether approaches can be derived from international processes.

2 Screening of existing KTA Safety Standards

In 2020 already, the ESK had formed an ad-hoc working group KTA to examine which KTA Safety Standards would still be relevant from the ESK's perspective for issues relating to interim storage and disposal in the future in terms of their technical content and whose content would therefore still need to be updated even after the last nuclear power plants had been shut down. The ad-hoc working group KTA drew up a list of KTA Safety Standards which, in its opinion, are no longer required in the area of radioactive waste disposal (24 KTA Safety Standards) [4]. The ESK considered a further 64 Safety Standards to be potentially still relevant for certain areas (research reactors, conditioning, interim storage and disposal). At this point, it should be noted that the present text, as described above, is essentially limited to the area of radioactive waste disposal. As part of other BMUV projects, enquiries are currently being made about KTA Safety Standards that could also be required in the future for other areas such as research reactors.

A comparison of the KTA Safety Standards categorised by the ESK with the list compiled by BASE leads to the result shown in Tables 1 and 2. A commentary on the individual KTA Safety Standards is provided in the appendix.

[1] The area of radioactive waste disposal refers to equipment, systems and components of a disposal facility.

Table 1:
The table was created by BASE and taken from [**Error! Bookmark not defined.**]. A detailed description of the table entries is available there. The colour coding was supplemented on the basis of the ESK's categorisation from 2020 [4]: [2]

red: In the view of the ESK, these KTA Safety Standards will no longer be required after 2027 for any of the areas under consideration (research reactors, power reactors, conditioning, interim storage, disposal).

yellow: In the view of the ESK, these KTA Safety Standards will only be needed after 2027 for certain areas (in particular research reactors in operation).

blue: In the view of the ESK, these KTA Safety Standards will be required after 2027 for the majority of the areas considered (research reactors, power reactors, conditioning, interim storage, disposal).

green: In the view of the ESK, these KTA Safety Standards will be required for all areas under consideration after 2027.

[2] This colour coding is not part of the consultation result [4]. It was only used for the evaluation as part of the the preparation of the consultation result.

KTA		davon	Häufigkeit	Thema	Anmerkung	KON	ASE	ERA
	1201		18	Betriebshandbuch		7	9	0
	1202		12	Prüfhandbuch		4	8	0
	1301	1301.1	1	Strahlenschutz Mitarbeiter - Auslegung		0	1	0
		1301.2	11	Strahlenschutz Mitarbeiter - Betrieb		4	7	0
	1401		11	Allg. Anforderungen QS		6	5	0
	1404		8	Dokumentation Bau/Betrieb		2	6	0
	1501		2	Stationäre ODL-Überwachung		2	0	0
	1503		22	Ableitungsüberwachung Fortluft		6	16	0
		1503.1	21	Ableitungsüberwachung Fortluft		6	15	0
	1504		2	Ableitungsüberwachung Wasser		2	0	0
	1505		1	Eigungsnachweis fest-installierte StrlSch-Messeinrichtungen		0	1	0
	1508		19	Wettermesseinreichtungen		3	16	0
	2101		28	Brandschutz		13	15	0
		2101.1	11	Brandschutz- Grundsätze		4	8	0
		2101.2	6	Brandschutz- bauliche Anlagen		4	2	0
		2101.3	8	Brandschutz- technische Anlagen		5	3	0
	2201		112	Auslegung Seismik		112	0	0
		2201.1	20	Auslegung Seismik- Grundsätze		20	0	0
		2201.2	2	Auslegung Seismik- Baugrund		2	0	0
		2201.3	44	Auslegung Seismik- Bauliche Anlagen		44	0	0
		2201.4	44	Auslegung Seismik- Anlagenteile		44	0	0
	2501		3	Bauwerksabdichtung		3	0	0
	3201	3201.3	2	Überwachung Komponentenherstellung		2	0	0
	3601		2	Lüftungstechnische Anlagen		0	2	0
	3603		1	Behandlung kont. Abwässer		1	0	0
	3604		13	Innerbetrieblicher Transport radioaktiver Stoffe		1	11	1
	3605		2	Behandlung kont. Gase		2	0	0
	3901		7	Kommunikationseinrichtungen		7	0	0
	3902		7	Hebezeuge - Auslegung		5	0	2
	3903		2	Hebezeuge - Prüfung und Betrieb		2	0	0
GS-12			1		keine Regel	0	1	0
-ohne-			22		Ref. ohne Nr.	20	2	0
					SUMME	204	100	3

Table 2:
KTA Safety Standards not mentioned in the BASE list, some of which were classified as B in the ESK list for the area of disposal [4] (B: The Safety Standard is required in extracts); colour coding as in Table 1.

1203 Anforderungen an das Notfallhandbuch
1402 Integriertes Managementsystem zum sicheren Betrieb von Kernkraftwerken
1403 Alterungsmanagement in Kernkraftwerken
1502 Überwachung der Aktivitätskonzentrationen radioaktiver Stoffe in der Raumluft von Kernkraftwerken
1503.3 Überwachung der Ableitung gasförimger und an Schwebstoffen gebundener radioaktiver Stoffe; Teil 3: Überwachung der nicht mit der Kaminfortluft abgeleiteten radioaktiven Stoffe
2103 Explosionsschutz in Kernkraftwerken mit Leichtwasserreaktoren (allgemeine und fallbezogene Anforderungen)
2201.6 Auslegung von Kernkraftwerken gegen seismische Einwirkungen; Teil 6: Maßnahmen nach Erdbeben
2207 Schutz von Kernkraftwerken gegen Hochwasser
3502 Störfallinstrumentierung
3605 Behandlung radioaktiv kontaminierter Gase in Kernkraftwerken mit Leichtwasserreaktoren
3904 Warte, Notsteuerstelle und örtliche Leitstände in Kernkraftwerken
3905 Lastanschlagpunkte an Lasten in Kernkraftwerken

The KTA Safety Standards highlighted in yellow in Tables 1 and 2 are primarily relevant for the operation of research reactors after the shutdown of the power plants in Germany. From the ESK's point of view, they require a clear editorial adaptation to the terminology and processes for application in the area of nuclear waste disposal. Although KTA Safety Standard 3605 mentioned in Table 1 is listed in the plan approval decision for the Konrad repository, it can be identified as a typographical error when considering the associated expert opinion and should correctly be KTA 3604. A more detailed justification for its non-consideration is given in the table in the appendix. KTA Safety Standard 3201, marked in red in Table 1, deals with the monitoring of the manufacture of components of the primary system in a nuclear power plant which, in the view of the ESK, are not relevant for a disposal facility.

All other KTA Safety Standards listed in the tables were analysed with regard to their relevance for disposal and recommendations for adaptation were formulated. The results can be found in the appendix. For all KTA Safety Standards, the scope of application is explicitly limited to the requirements in stationary nuclear power plants. Application to the area of nuclear waste disposal is therefore only possible by analogy for the safety standards discussed in this report and adaptations are necessary in each case, albeit to varying degrees. In contrast to a nuclear power plant, essential equipment parts of a deep geological repository are located several hundred metres underground. Structural requirements, operational procedures, possible accident and emergency scenarios and corresponding precautionary measures therefore differ considerably. For the development of a repository-relevant set of regulations, it is generally necessary to check whether the contents of existing KTA Safety Standards are not already covered by ordinances, existing standards, regulations and guidelines (e.g. Radiation Protection Ordinance, DIN or regulations of mining law or also ESK guidelines). In some cases, specific reference is made to other relevant regulations in the table in the appendix. For KTA 1503.3: ‘Monitoring the Discharge of Radioactive Gases and Airborne Radioactive Particulates; Part 3: Monitoring the Non-stack Discharge of Radioactive Matter’, the ESK came to the conclusion, in deviation from the ESK compilation from 2020, that this is not required for disposal facilities, as discharge via other discharge routes than the stack exhaust air in the disposal facility is negligible.

In a further step, KTA Safety Standards that were screened by the KTA Secretariat in December 2021 were reviewed [5]. This list contains KTA Safety Standards that were identified by the BGE as relevant for disposal. Further safety standards were named by the BGE on request [3]. In total, the BGE list contains a further 32 KTA Safety Standards that were neither included in the BASE compilation nor in the ESK list. They are marked in grey in the list in the appendix.

The ad-hoc working group of the ESK heard the BGE on 18 January 2024 in order to discuss the different assessments regarding the relevance of these safety standards. As a result of this discussion, it emerged that the BGE had considered KTA Safety Standards not only against the background of the planning, construction and operation of future disposal facilities, but also in particular for three other areas of responsibility due to an extended remit:

- the development of a HAW disposal container,
- the design of a conditioning facility for HAW (keyword: ‘hot cell’) and
- the retrieval of the waste from the Asse II mine.

The discrepancy between the list of the BGE and the results of the ESK is therefore essentially due to the different scopes of application considered. In accordance with the BMUV's advisory request, the ESK focused on the area of radioactive waste disposal. In the discussion with the BGE, it became clear that at the present time it is not clear whether the KTA Safety Standards or parts thereof identified by the BGE will really be needed in the future or whether existing regulations from the conventional sector are sufficient. For example, KTA Safety Standards identified by the BGE as applicable to the quality of filler metals and welding consumables in connection with the development of HAW disposal containers and the conditioning of high-level radioactive waste proved to be very specifically geared towards components for nuclear power plants with significantly different requirements. The ESK believes that the relevant DIN EN ISO regulations are sufficient for this purpose. Other regulations, e.g. describing requirements for personnel and material airlocks or penetrations, also refer to very specific conditions of a nuclear power plant (e.g. the pressure boundary of a containment), which in the ESK's assessment will probably not occur in the Asse II retrieval mine or in a conditioning plant. The BGE and the ESK unanimously came to the recommendation that the KTA Safety Standards in question should be reviewed for their relevance to the corresponding areas before their updating by the KTA is discontinued.

3 Categorisation of KTA Safety Standards into topic areas

As already described above, contents of KTA Safety Standards that in the past were generally applicable to the licensing and operation of nuclear power plants can already be taken into account today in the preparation of regulations for the area of radioactive waste disposal and related areas (container development, retrieval, conditioning plants). In many cases, however, adaptations are required that go far beyond a change in the scope of application. From the ESK's point of view, the following division into eight topic areas can be useful for grouping the KTA Safety Standards thematically, adapting their content accordingly and developing them further.

Topic area 1: General regulations for organisational and documentary matters

KTA Safety Standard	Title
1201	Requirements for the Operating Manual
1202	Requirements for the Testing Manual
1203	Requirements for the Emergency Manual
1401	General Requirements Regarding Quality Assurance
1402	Integrated Management Systems for the Safe Operation of Nuclear Power Plants
1403	Ageing Management in Nuclear Power Plants
1404	Documentation During the Construction and Operation of Nuclear Power Plants

Topic area 2: Radiation protection, radiation protection monitoring and ventilation systems

KTA Safety Standard	Title
1301.1-2	Radiation Protection Considerations for Plant Personnel in the Design and Operation of Nuclear Power Plants
1501	Stationary System for Monitoring the Local Dose Rate within Nuclear Power Plants
1502	Monitoring Volumetric Activity of Radioactive Substances in the Inner Atmosphere of Nuclear Power Plants
1503.1-2	Monitoring the Discharge of Radioactive Gases and Airborne Radioactive Particulates
1504	Monitoring and Assessing the Discharge of Radioactive Substances with Water
1505	Suitability Verification of the Stationary Measurement Equipment for Radiation Monitoring
1507	Monitoring the Discharge of Radioactive Substances from Research Reactors
1508	Instrumentation for Determining the Dispersion of Radioactive Substances in the Atmosphere
3601	Ventilation Systems in Nuclear Power Plants

Topic area 3: Fire and explosion protection

KTA Safety Standard	Title
2101.1-3	Fire Protection in Nuclear Power Plants
2103	Explosion Protection in Nuclear Power Plants with Light Water Reactors (General and Case-Specific Requirements)

Topic area 4: Design and protection against seismic events and flooding

KTA Safety Standard	Title
2201.1-6	Design of Nuclear Power Plants against Seismic Events
2207	Flood Protection for Nuclear Power Plants
2501	Structural Waterproofing of Nuclear Power Plants

Topic area 5: Facilities for handling radioactive materials

KTA Safety Standard	Title
3603	Facilities for Treating Radioactively Contaminated Water in Nuclear Power Plants
3604	Storage, Handling and Plant-internal Transport of Radioactive Substances in Nuclear Power Plants (with the Exception of Fuel Assemblies)
3602	Storage and Handling of Fuel Assemblies and Associated Items in Nuclear Power Plants with Light Water Reactors

Topic area 6: Communication means, control room, control stations, engineered safety features

KTA Safety Standard	Title
3901	Communication Means for Nuclear Power Plants
3904	Control Room, Remote Shutdown Station and Local Control Stations in Nuclear Power Plants
3501	Reactor Protection System and Monitoring Equipment of the Safety System
3502	Accident Measuring Systems
3503	Type Testing of Electrical Modules for the Instrumentation and Control System Important to Safety[3]
3504	Electrical Drive Mechanisms of the Safety System in Nuclear Power Plants
3505	Type Testing of Measuring Sensors and Transducers of the Instrumentation and Control System Important to Safety
3506	System Testing of the Instrumentation and Control Equipment Important to Safety of Nuclear Power Plants
3507	Factory Tests, Post-Repair Tests and the Certification of Proven Performance of Modules and Devices of the Instrumentation and Control System Important to Safety

Topic area 7: Lifting equipment

KTA Safety Standard	Title
3902	Design of Lifting Equipment in Nuclear Power Plants
3903	Inspection, Testing and Operation of Lifting Equipment in Nuclear Power Plants
3905	Load Attachment Points on Loads in Nuclear Power Plants

Topic area 8: Welding technology, technical components

KTA Safety Standard	Title
1408.1-3	Quality Assurance for Weld Filler Materials and Welding Consumables
3205.2-3	Component Support Structures with Non-integral Connections

[3] Translator's note: The German text gives the title of KTA 3503 as „*Reaktorschutzsystem und Überwachungseinrichtungen des Sicherheitssystems*" (Reactor Protection System and Monitoring Equipment of the Safety System), which is the title of KTA 3501.

3206	Verification Analysis for Rupture Preclusion for Pressure Retaining Components in Nuclear Power Plants
3211.1-4	Pressure and Activity Retaining Components of Systems Outside the Primary Circuit
3402	Airlocks on the Reactor Containment of Nuclear Power Plants
3403	Cable Penetrations through the Reactor Containment Vessel
3404	Isolation of Operating System Pipes Penetrating the Containment Vessel
3405	Leakage Test of the Containment Vessel
3407	Pipe Penetrations through the Reactor Containment Vessel
3409	Airlocks on the Reactor Containment of Nuclear Power Plants
3701	General Requirements for the Electrical Power Supply in Nuclear Power Plants
3702	Emergency Power Generating Facilities with Diesel-Generator Units in Nuclear Power Plants
3703	Emergency Power Facilities with Batteries and AC/DC Converters in Nuclear Power Plants
3704	Emergency Power Facilities with Static and Rotary Converters in Nuclear Power Plants
3705	Switchgear, Transformers and Distribution Networks for the Electrical Power Supply of the Safety System in Nuclear Power Plants

4 Requirements for a future regulatory framework for the area of radioactive waste disposal

In addition to the KTA Safety Standards, existing ESK guidelines (e.g. Guideline on the safe operation of a repository for high-level radioactive waste, 2023; Guideline on safety management in waste management organisations; Safety concept requirements for the barrier system of a disposal facility for high-level radioactive waste and their implementability; Guideline on the protection of repositories against flooding, etc.) must be taken into account when developing a set of regulations for the area of radioactive waste disposal. The future regulations for radioactive waste disposal must be developed into a consistent overall concept that is consistent with existing regulations, e.g. DIN/EN (e.g. DIN EN 1992-1-1 (EC2)), Mining Law (e.g. mining regulations), the technical regulations for workplaces (e.g. ASR 3.6) and other conventional standards and regulations (e.g. Land Construction Codes). The regulations under mining law in particular are highly relevant for the underground facilities of a repository and are not dealt with in the KTA's Safety Standards. In addition, other regulations, e.g. from the area of physical protection, must be reviewed for their applicability in the area of radioactive waste disposal and, if necessary, adapted or supplemented. The position of the respective regulations in the regulatory hierarchy must be clarified. Overall, the regulatory framework for the area of radioactive waste disposal should be designed in such a way that it allows the necessary damage prevention in accordance with the state of the art in science and technology. There are no known models from the international regulatory process that could be used for orientation. Rules that may be required for conditioning plants should also be considered. However, it should be examined at an early stage whether and in what way a newly developed set of regulations should or can be applicable to the existing Morsleben repository for radioactive waste (ERAM), the Asse II mine and the Konrad repository, which is subject to plan approval. Separate regulations may have to be drawn up for these facilities in order to remain compliant with the respective existing licences.

An analogous procedure for the development of a set of regulations for the area of radioactive waste disposal, as described in the KTA's concept for the nuclear safety standards for residual operation and dismantling of nuclear power plants and research reactors as well as the operation of research reactors [6], is considered appropriate. This includes the following aspects in particular:

- A coordinating body (*koordinierende Stelle - KS*) should be set up to organise the development of the new regulations.

- Topic areas with suitable content (e.g. based on the topic areas described in Chapter 4) should be dealt with in specialised working groups with as much interdisciplinary expertise as possible. If necessary, additional external experts from the specialised working groups should also be involved.

- The members of the specialised working groups should have knowledge of interfaces with other topic areas, such as repository safety, operational safety, etc.

- Members of the specialist working groups and any external experts consulted can make suggestions for the scope and depth of the regulations and should be involved in the finalisation of the regulations.

- Technical involvement of affected or suitable organisations (e.g. BGE, ESK) should be provided for, as well as the participation of the Länder and the public. Continuous development and updating of the regulations should be ensured in organisational terms.

It is foreseeable that it will take several years to finalise all regulations for the area of radioactive waste disposal. There is therefore an urgent need to provide the necessary specialist skills, not only for the preparation of the regulations, but also for their implementation. Appropriate programmes for teaching, training and further qualification for the necessary specialist competences (e.g. radiation protection, instrumentation, fire protection, instrumentation and control technology, mining technology, repository safety) must therefore be organized as a matter of priority (see also [7]).

The following are examples of relevant specialist competences. These are assigned to the topic areas listed in the tables in Chapter 3.

Topic area 1: General regulations for organisational and documentary matters
Overarching knowledge in all areas, but in particular competences regarding administrative management structures and management systems

Topic area 2: Radiation protection, radiation protection monitoring and ventilation systems
- Radiation protection regulations
- Radiation protection technology
- Measuring technology
- Ventilation technology (mining engineering competence, nuclear engineering competence)
- Instrumentation and control technology

Topic area 3: Fire and explosion protection

- Fire protection regulations, explosion protection regulations
- Fire protection technology, explosion protection technology (mining engineering competence, nuclear engineering competence)

Topic area 4: Design and protection against seismic events and flooding
- Geophysics, geotechnics
- Civil engineering, mining engineering
- Hydrogeology

Topic area 5: Facilities for handling radioactive materials
- Radiation protection
- Radiochemistry

Topic area 6: Communication means, control room, control stations, engineered safety features
- Instrumentation and control technology

Topic area 7: Lifting equipment
- Nuclear engineering
- Mining engineering

Topic area 8: Welding technology, technical components
- Nuclear engineering
- Materials engineering

5 References

[1] BMUV: Beratungsauftrag an die Entsorgungskommission. Überprüfung bestehender KTA-Regelungen für den Endlagerbereich sowie Überführung in ein eigenes Regelwerk, 03.02.2023

[2] BASE: Zusammenstellung von Inhalten der KTA-Regelungen mit Relevanz für den Bereich der Endlagerung, 6. Januar 2022; Anlage 1: Tabellarische Auflistung aller Fundstellen von KTA-Regeln in den wesentlichen Genehmigungsunterlagen der Projekte Konrad, ERAM und Asse II (53 S.).; Anlage 2: Tabellarische Auflistung aller betrachteten, wesentlichen Genehmigungsunterlagen (11 S.)

[3] Screening des KTA Regelwerks durch BGE (E-Mail vom 29.03.2018); Laut BGE benötigte KTA-Regeln zur Endlagerauslegung bzw. Behälterentwicklung (E-Mail vom 11.09.2023).

[4] KTA-Regelwerk – Relevanz ab 2028 aus Sicht der ESK, Brief der ESK-Vorsitzenden an die KTA-Geschäftsstelle, 24.11.2020

[5] KTA 21 Sachstandsbericht, KTA-Screening: Ermittlung des längerfristigen Bedarfs für KTA-Regeln, KTA-GS-83, Dezember 2021

[6] Konzept kerntechnischer Regeln für Restbetrieb und den Abbau der Kernkraftwerke und Forschungsreaktoren sowie den Betrieb von Forschungsreaktoren, https://www.kta-gs.de/d/Sachstand KTA BMUV Regelwerk-2023 08 15.pdf

[7] Bedarfsanalyse für die Sicherheit der nuklearen Entsorgung, Projektteam: „Perspektivischer Erhalt von Fachwissen und -Kapazitäten im Bereich der nuklearen Sicherheit des Strahlenschutzes“ (BMU, BASE, BfS, BGE, BGZ), Februar 2020