

# Report

# Decommissioning

# Safety

# Reference Levels

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Report of Working Group of Waste and Decommissioning (WGWD)  
Version 2.3, January 2024

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# Preface to version 2.3

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The purpose of this version 2.3 of the decommissioning report is to provide the reader with the most recent update on the implementation of the decommissioning safety reference levels in the regulatory systems of WENRA member countries.

WGWD, the waste and decommissioning working group of WENRA, has rearranged their V.1 decommissioning safety reference levels of 2007 into an improved V.2 in 2011. Early self-assessments and benchmarking results based on V.1 SRLs had to be translated. The historical development of SRLs and benchmarking exercises is still reflected in the introduction and in part III of this report. In the country specific fact sheets of part III, however, the action plan tables only represent the recent implementation situation of SRLs in the national regulatory systems. If all SRLs are implemented, the corresponding table is empty. The history of developments is summarized in the national text contributions or has to be deduced from consultation of earlier versions of this report.

The WENRA working groups are currently collaborating in establishing a common framework for “generic” SRLs. If successful, this might result in a significant rearrangement and major update of this and other SRL reports of WGWD.

# Executive Summary

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The Western European Nuclear Regulators' Association (WENRA) is an international body made up of the Heads and senior staff members of Nuclear Regulatory Authorities of European countries with nuclear power plants in operation or decommissioning. The main objectives of WENRA are to develop a common approach to nuclear safety, to provide an independent capability to examine nuclear safety in applicant countries and to be a network for chief nuclear safety regulators in Europe to exchange experience and discuss significant safety issues.

To accomplish these tasks three working groups within the WENRA have been established - Reactor Harmonisation Working Group (RHWG), Working Group on Waste and Decommissioning (WGWD) and the Working Group on Research Reactors (WGRR).

This document contains the results of the work of WGWD in the area of the decommissioning of nuclear installations. The objective of this report is to provide safety reference levels for decommissioning activities, which are based on corresponding documents (requirements, guidance, etc.) of the International Atomic Energy Agency (IAEA). Although the IAEA safety standards establish an essential basis for the safety of all nuclear installations covering also decommissioning activities, the WENRA Safety Reference Levels incorporate more facility specific requirements.

This document was prepared by the WENRA WGWD, based on the previous version 2.2 of April 2015, taking into account results from the national benchmarking processes for version 1.0, in particular the implementation of the safety reference levels in the national legal and regulatory framework. It is also taking into account results from the stakeholder involvement performed in early 2012.

Part III of this report describes the process by which the SRLs have been updated since version 1.0. It also describes benchmarking process and the status of the country-specific national action plans which have been developed to incorporate the SRLs in each country's national regulatory framework.

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**Terms of Reference**  
**of the WESTERN EUROPEAN NUCLEAR REGULATORS’**  
**ASSOCIATION**  
**(WENRA)**




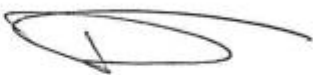


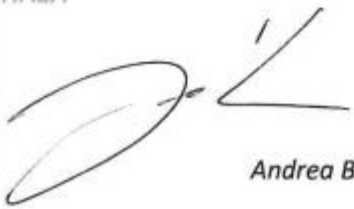

**14 November 2023**

1. We, the Heads of Nuclear Regulatory Authorities (signatories<sup>1</sup>) of European countries with nuclear power plants, gathered within WENRA, the independent association of European national nuclear regulators, commit to work together to continuously improve and harmonise nuclear safety to as high as reasonably practicable levels.
2. We commit, in particular, to maintain and further develop a common set of up to date safety reference levels (SRLs) aiming at a high safety level, strive for their implementation in our national regulatory frameworks and benchmark their implementation.
3. WENRA’s vision is to have consistent high levels of nuclear safety in Europe, protecting people and the environment now and in the future.
4. Besides WENRA full members, other heads of national regulatory authorities may participate in WENRA under the status of associated member or observer member. The application process is defined in a separate document, approved by WENRA, defines the application process, the main criteria considered by WENRA, as well as the rights and duties of associated members and observer members. In any case admission of a new member remains a sovereign decision by WENRA full members.
5. WENRA, as an independent association, does not receive any instructions from national governments nor from EU or other international institutions.
6. Decisions in the name of WENRA are taken by consensus among full members and are expected to be applied by each of members.
7. Taking into account the European and international environment in the nuclear field, WENRA defines and updates regularly strategic objectives that streamline its actions.
8. Final documents reflecting WENRA’s activities or positions on safety related matters are made public.
9. Working groups are established and shutdown through WENRA decisions during plenary meetings dependent on agreed priorities.
10. WENRA members provide adequate resources to ensure effective working of WENRA and its working groups.

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<sup>1</sup> WENRA full members are the signatories of the Terms of Reference  
WENRA Report on Decommissioning Safety Reference Levels

11. WENRA keeps regular relationships with the European Union institutions, in particular ENSREG, to discuss any significant safety-related topic of interest, identify emerging safety issues that can challenge its members, address interface and avoid duplication in respective activities and provide advice on nuclear safety and regulatory matters.
12. WENRA develops and maintains suitable relations with regulatory authorities from other countries as well as with international organisations.
13. WENRA ensures appropriate opportunities for stakeholders to be informed of or, when applicable, to contribute to its work

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# Glossary

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## **Ageing**

General process in which characteristics of a structure, system or component gradually change with time or use.

## **Ageing management**

Engineering, operations and maintenance actions to control within acceptable limits the ageing degradation of structures, systems or components.

## **Decommissioning**

Administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a facility (except for a repository or for certain nuclear facilities used for the disposal of residues from the mining and processing of radioactive material, which are 'closed' and not 'decommissioned'). For a repository, the corresponding term is closure.

## **Decommissioning plan**

An initial or final document – depending on the operational phase of the facility - with detailed information about the concept and schedule for the decommissioning and dismantling of the nuclear facility.

**Initial decommissioning plan** based on the decommissioning strategy includes the feasibility of decommissioning, main steps of the decommissioning/dismantling and the end state of the facility and is the basis for the estimation of decommissioning costs. This document is of general nature during the design and operational phase and will be updated during the operational phase to the level as appropriate.

**Final decommissioning plan** as the basis to start major decommissioning activities shall be prepared before the beginning of the decommissioning phase together with the safety case. This detailed document will be updated as required during the decommissioning stages.

## **Decommissioning strategies**

**Immediate dismantling** is the strategy in which the equipment, structures and parts of a nuclear facility containing radioactive contaminants are removed or decontaminated to a level that permits the facility to be released for unrestricted use, or with restrictions imposed by the regulatory body. In this case decommissioning implementation activities begin shortly after permanent cessation of operations. It implies prompt and complete decommissioning and involves the removal and processing of all radioactive material from the facility to another new or existing licensed nuclear facility for either long-term storage or disposal.

**Deferred dismantling (sometimes called safe storage, safe store or safe enclosure)** is the strategy in which parts of a nuclear facility containing radioactive contaminants are either processed or placed in such a condition that they can be safely stored and maintained until they can subsequently be decontaminated and/or dismantled to levels that permit the facility to be released for other uses. The period in which those parts are safely stored and maintained is the “period of deferment”.

**Entombment** is the strategy in which radioactive contaminants are encased in a structurally long-lived material until radioactivity decays to a level permitting unrestricted release of the nuclear facility, or release with restrictions imposed by the regulatory body. Because radioactive material will remain on the site, this essentially means that the facility will eventually become designated as a near surface waste disposal facility as long as it can meet the requirements for a near surface disposal facility.

## **Decontamination**

The complete or partial removal of contamination by a deliberate physical, chemical or biological process.

## **Discharge, authorized**

Planned and controlled release of (usually gaseous or liquid) radioactive material into the environment in accordance with an authorization.

## **Emergency**

A non-routine situation that necessitates prompt action, primarily to mitigate a hazard or adverse consequences for human health and safety, quality of life, property or the environment. This includes nuclear and radiological emergencies and conventional

emergencies such as fires, release of hazardous chemicals, storms or earthquakes. It includes situations for which prompt action is warranted to mitigate the effects of a perceived hazard.

*Nuclear or radiological emergency.* An emergency in which there is, or is perceived to be, a hazard due to:

- (a) The energy resulting from a nuclear chain reaction or from the decay of the products of a chain reaction; or
- (b) Radiation exposure.

Points (a) and (b) approximately represent nuclear and radiological emergencies, respectively. However, this is not an exact distinction.

## **Emergency Preparedness**

The capability to take actions that will effectively mitigate the consequences of an emergency for human health and safety, quality of life, property and the environment.

## **End state**

A predetermined criterion defining the point at which the specific task or process is to be considered completed. The licensee can apply for termination of the license when the proposed end-state of decommissioning activities has been reached.

## **Licensee**

The licensee is the person or organization having overall responsibility for a facility or activity (the responsible organization)

**Remark:** WGWD recognizes that this organisation may change as the facility passes to the decommissioning phase according to national strategies



## **Management system**

A set of interrelated or interacting elements (system) for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner.

The management system integrates all elements of an organization into one coherent system to enable all of the organization's objectives to be achieved. These elements include the organizational structure, resources and processes. Personnel, equipment and organizational culture as well as the documented policies and processes are parts of the management system. The organization's processes have to address the totality of the requirements on the organization as established in, for example, IAEA safety standards and other international codes and standards.

## **Monitoring**

1. The measurement of dose or contamination for reasons related to the assessment or control of exposure.
2. Continuous or periodic measurement of radiological or other parameters or determination of the status of a system, structure or component. Sampling may be involved as a preliminary step to measurement.

## **Nuclear facility**

A facility and its associated land, buildings and equipment in which nuclear materials are produced, processed, used, handled, stored or disposed of on such a scale that consideration of safety is required.

## **Nuclear safety**

See 'Protection and Safety'

## **Operation**

All activities performed to achieve the purpose for which an authorized facility was constructed.

## **Protection and safety**

The protection of people against exposure to ionizing radiation or radioactive materials and the safety of radiation sources, including the means for achieving this, and the means for preventing accidents and for mitigating the consequences of accidents should they occur.

Safety is primarily concerned with maintaining control over sources, whereas radiation protection is primarily concerned with controlling exposure to radiation and its effects. Clearly the two are closely connected: radiation protection is very much simpler if the source in question is under control, so safety necessarily contributes towards protection. Sources come in many different types, and hence safety may be termed nuclear safety, radiation safety, radioactive waste safety or transport safety, but protection (in this sense) is primarily concerned with protecting humans against exposure, whatever the source, and so is always radiation protection.

**Radiation protection:** The protection of people from the effects of exposure to ionizing radiation, and the means for achieving this.

**Nuclear safety:** The achievement of proper operating conditions, prevention of accidents or mitigation of accident consequences, resulting in protection of workers, the public and the environment from undue radiation hazards.

## **Radiation protection**

See 'protection and safety'

## **Regulatory body**

An authority or a system of authorities designated by the government of a State as having legal authority for conducting the regulatory process, including issuing authorizations, and thereby regulating nuclear, radiation, radioactive waste and transport safety.

## **Safety assessment**

Assessment of all aspects of the site, design, operation and decommissioning of an authorized facility that are relevant to protection and safety.

Note: assessment should be distinguished from analysis. Assessment is aimed at providing information that forms the basis of a decision on whether or not something is satisfactory.

Various kinds of analysis may be used as tools in doing this. Hence an assessment may include a number of analyses.

### **Safety case**

A collection of arguments and evidence in support of the safety of a facility or activity. This will normally include the findings of a safety assessment and a statement of confidence in these findings.

### **Structures, systems and components (SSCs)**

A general term encompassing all of the elements (items) of a facility or activity which contribute to protection and safety, except human factors.

- **Structures** are the passive elements: buildings, vessels, shielding, etc.
- A **system** comprises several **components**, assembled in such a way as to perform a specific (active) function.
- A **component** is a discrete element of a system.

### **Use**

**Authorized use:** Use of radioactive materials or radioactive objects from an authorized practice in accordance with an authorization.

**Restricted use:** The use of an area or of materials, subject to restrictions imposed for reasons of radiation protection and safety. Restrictions would typically be expressed in the form of prohibition of particular activities (e.g. materials may only be recycled or reused within a facility).

**Unrestricted use:** The use of an area or of materials without any radiologically based restrictions.

# List of Abbreviations

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EU	European Union
IAEA	International Atomic Energy Agency
NAP	National Action Plan
NPP	nuclear power plant
OLC	operational limits and conditions
PIE	postulated initiating events
RHWG	Reactor Harmonisation Working Group
SSCs	structures, systems and components
SRL	safety reference level
V.1	Version 1 of the SRLs
V.2	Version 2 of the SRLs
WENRA	Western European Nuclear Regulators' Association
WGRR	Working Group on Research Reactors
WGWD	Working Group on Waste and Decommissioning

## Part 1

# Introduction and Methodology

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## 1.1

# Introduction

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The Decommissioning Safety Reference Level Report in version 2.0, November 2011, was the result of an effort done by the Working Group on Waste and Decommissioning of WENRA, from 2009 to 2011 to improve the version 1.0 of March 2007. The improvement was based on lessons learned from the benchmarking processes for version 1.0, especially on the implementation of the reference levels in the national legal and regulatory framework. Version 2.0 presented the safety reference levels (SRLs) for decommissioned facilities that are thought to be a good basis for harmonisation on a European level.

This report is the result of an effort done by the Working Group on Waste and Decommissioning (WGWD) of WENRA, in particular focussing on the period since the publication of the previous version of this report, v 2.2, in 2015. This new update of the Decommissioning Report serves to highlight the regulatory changes and improvements effected in the member states since then.

The SRLs cannot be considered as independent European safety requirements because current legislation in WENRA Member States would not allow that due to fundamental differences reflecting the historical development in European countries. The SRLs are a set of requirements against which the situation of each country is assessed, and it is each country's responsibility to implement actions to ensure that these levels are reached.

### 1.1.1 Background

WENRA, which has been established in February 1999, is the association of the Heads of nuclear regulatory authorities of European countries with at least one nuclear power plant in construction, operation or decommissioning phase. WENRA has been formally extended in 2003 to include future new European Union (EU) Member States. Currently, regulatory authorities from the following countries are members of WENRA: Belgium, Bulgaria, the Czech Republic, Finland, France, Germany, Hungary, Italy, Lithuania, the Netherlands, Romania, Slovenia, Slovakia, Spain, Sweden, Switzerland, Ukraine and the United Kingdom. Recently, authorities from Canada and the Russian Federation have gained the status of “associated members” of WENRA, and authorities from various other states have been admitted to WENRA meetings as “observers”, including Japan and the USA. However, while some observers have been present and active at WGWD meetings, the preparation of this report as well as the

development of the SRLs and efforts to harmonise their national regulations have been undertaken only by the members.

The original objectives of the Association were:

- to develop a common approach to nuclear safety and regulation, in particular within the EU,
- to provide the EU with an independent capability to examine nuclear safety and regulation in candidate countries,
- to evaluate and achieve a common approach to nuclear safety and regulatory issues which arise.

The second objective of WENRA has been fulfilled by the preparation of a report on nuclear safety in candidate countries having at least one nuclear power plant. After 1st May 2004, when most of these candidate countries became regular EU Member States, the new WENRA tasks, based on first and third original Association's objectives, became:

- to develop an independent nuclear safety assessment capability, based on in-depth knowledge of nuclear installations, and
- to develop common approaches to nuclear safety and regulations and to encourage the harmonisation of practices.

Each WENRA member commits to implementing SRLs in its regulatory framework and to tracking this implementation. WENRA associated members commit to considering implementing the SRLs.

The SRLs are administered by WGWD which gives a rating for each member state's performance against each SRL. Each country undertakes a national self-assessment against each SRL, which is then benchmarked or moderated by the members of WGWD, with a rating of A (fully conforming with SRL), B (not applicable, or SRL addressed satisfactorily in another way) or C (improvements needed). WENRA Members which identified areas for improvement then develop a National Action Plan to respond to the findings, usually within a period of 2 to 3 years, and undergo re-benchmarking.

To perform these tasks two working groups within the WENRA have been established – initially the Reactor Harmonisation Working Group (RHWG) and the Working Group on Waste and Decommissioning (WGWD), then in 2021 the Working Group on Research Reactors (WGRR). The work of WGWD has started in 2002.

### 1.1.2 Objective

The term “decommissioning” refers to administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a nuclear facility other than a repository. These actions involve decontamination, dismantling and removal of radioactive materials, waste, components and structures. They are carried out to achieve a progressive and systematic reduction in radiological hazards.

This report provides harmonised safety reference levels applicable during design, construction, operation and decommissioning of a nuclear facility to ensure a safe decommissioning process.

These SRLs constitute the basis for a common approach to nuclear safety during decommissioning in the WENRA Member States and, based on national action plans, shall be implemented in the legal and regulatory framework system of each WENRA Member State. Detailed country-specific progress on these activities is presented in part III of the report.

### 1.1.3 Scope

The decommissioning SRLs apply to nuclear reactors (of any power), fuel reprocessing facilities, fuel manufacturing facilities, uranium concentration and conversion facilities, uranium enrichment facilities, research facilities involving nuclear material. They may also be applied to waste storage facilities and other waste management facilities. These reference levels are not intended to be applicable to uranium mining and milling, and to isotope production facilities other than reactors.

The point at which decommissioning starts will vary from country to country depending on national arrangements, ranging from the decision to shut down the facility up to the beginning of dismantling activities.

For the purposes of this document, it is assumed that the normal operational phase includes the removal of the bulk of fuel and radioactive materials from the facility in accordance with the safety case for normal operations. In certain cases part of the nuclear inventory of a facility is only removed after the start of decommissioning activities. In such case appropriate SRLs (e.g. for criticality control) for the operational phase of the facility remain applicable. The decommissioning phase is assumed to start technically once further operations cannot be carried out using normal operational methods or within the bounds of the safety case for normal operation. The decommissioning phase is usually governed by a specific decommissioning licence.



The decommissioning SRLs address mainly the radiological hazards resulting from the activities associated with the decommissioning of facilities, primarily with decommissioning after a planned shutdown. Non-radiological hazards can also arise during decommissioning activities. These hazards should be given due consideration during the planning process and in the risk analyses as far as they may influence the radiological hazards or risks.

Regulatory requirements for Environmental Impact Assessment (required by EU directives), waste disposal, conventional occupational health and safety, physical protection and decommissioning funding, are important for decommissioning. Aspects on waste disposal are addressed in a new Safety Reference Levels Report of the WGWD. The other matters are not always regulated by the WENRA members, but are addressed by other national regulatory organisations. As a result, WGWD did not take into account in detail these matters and has therefore concentrated on the nuclear safety requirements.

As this document is intended to cover a wide range of sites and facilities (from small isolated nuclear facility to large complex reprocessing or reactor sites), the SRLs will need to be implemented in different ways to be appropriate for the particular facility, taking into account the magnitude of the hazard in a graded approach. In accordance with that graded approach, the decommissioning strategies and plans necessary to ensure safety need to be commensurate with the type and status of the facility and the hazards associated with the decommissioning of the facility. Some SRLs apply to design and construction of a nuclear facility. In case of already existing nuclear facilities these SRLs need to be implemented by the licensee during and after the operational phase to achieve the safety objectives intended.

It should be noted, that some SRLs from other WENRA reports need to be considered during decommissioning, if spent fuel is still in the nuclear facility during decommissioning or storages for spent fuel or radioactive waste are part of the decommissioning project. Vice versa, some of the decommissioning related SRLs shall be considered during construction and operation of nuclear power plants and storage facilities and as such complement the related reports on safety reference levels.

#### **1.1.4 Structure**

The report consists of three main parts.

Following this Introduction in Part I of the report, Section I.-2 presents the general methodology that was followed to develop the version 2.1 of the SRLs and to analyse their application in participating countries.

Part II of the report presents the actual decommissioning safety reference levels. Even if the WENRA working groups are currently collaborating in establishing a common framework for “generic” SRLs and that might result in a significant rearrangement and major update of this and other SRLs reports of WGWD, this Reports includes an update of the IAEA references in all SRLs.

Part III of the report describes the results of the benchmarking process and the undertaken or foreseen efforts of the WENRA Member States to implement these SRLs in the national legal and regulatory framework on the basis of national action plans (NAP).

## 1.2 Methodology

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The objective of this report is to provide safety reference levels for decommissioning activities. This document contains the results of the work of WGWD in the area of the decommissioning of nuclear installations performed since the publication of the last Report, version 2.2 in 2015, to 2023. This version is identical to V 2.2 but including country-specific information on NAP-status. The SRL have not been changed since they were updated in 2011 (version 2.0). In this report we have updated the related IAEA documents, as far as these have been revised or superseded. The references presented in Part 2 have been updated to reflect the developments in internationally accepted safety standards and their continuing relation to the decommissioning SRLs.

The work of WGWD from 2009 to 2011 resulted in version 2.0 of November 2011 to improve the Decommissioning Safety Reference Levels Report, version 1.0 of March 2007, and the results from a stakeholder involvement, performed early 2012 on version 2.0.

For version 1.0 of the Decommissioning Safety Reference Levels report while considering their own experiences the WENRA WGWD members selected a set of requirements and recommendations from decommissioning related IAEA Safety Standards. From WENRA WGWD members' point of view the selected requirements and recommendations are those which they regarded as of prime importance for harmonisation on the European level and which address the licensee and are enforceable by the regulatory body. The SRLs of version 2.1 cover most of these specific requirements and recommendations stated in version 1.0 taking into account lessons learned from the national benchmarking processes on version 1.0, especially on the implementation of the safety reference levels in the national legal and regulatory framework and feedback from stakeholders, and the results from the stakeholder involvement on version 2.0.

In a benchmarking exercise the justification and evidence for implementation of each SRL was discussed country by country and agreed within WGWD in subgroups and/or panel discussions taking into account national action plans developed by the WENRA Member States in order to address identified discrepancies and to update their national regulations till the end of 2014. The progress of the national action plans was described in part III of report, version 2.2.

Since 2015 WENRA members have continued to update their national regulatory frameworks and to implement the WENRA requirements defined by the set of Safety Reference Levels on decommissioning in their regulations. This report highlights the progress that was achieved in

the member states since 2015.

Document / activity	Date	SRL-Version
Decommissioning report V 1.0; (only working document, never approved by WENRA-directors)	2007	1: 81 SRLs(D-nn)
Benchmarking with reference to V 1.0	2007-2009	1: 81 SRLs(D-nn)
Decommissioning report V 1.1 (restricted for use within WENRA only): identical to V 1.0 but including documentation of benchmarking results	2012	1: 81 SRLs(D-nn)
Decommissioning report V 1.2 (Public version): identical to V 1.1 but including anonymised benchmarking results	2012	1: 81 SRLs(D-nn)
Decommissioning report V 2.0: updated set of SRLs, approved by WENRA-directors	2011	2: 62 SRLs(D-nn)
Decommissioning report V 2.1: based on V 2.0 and taking into account results of a stakeholder involvement process performed in early 2012	2012	2: 62 SRLs(D-nn)
Re-benchmarking with reference to results of national action plans and consideration of modified SRL-set of version 2	2013-2015	2: 62 SRLs(D-nn)
Decommissioning report V 2.2: identical to V 2.1 but including country-specific information on NAP-status	2015	2: 62 SRLs(DE-nn)*
*modified SRL-labelling: D-nn changed to DE-nn (not to confuse with disposal SRLs)		

## Part 2

# Decommissioning Safety Reference Levels

## 2.1

# Safety area: Safety management

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### 2.1.1 Safety issue: Responsibility

#### DE-01:

A licensee<sup>2</sup> shall be responsible for all aspects of nuclear safety on the facility. The continuity of responsibility shall be ensured throughout operation and decommissioning.

*Related IAEA safety standards:*

*The licensee shall be responsible for all aspects of safety, radiation protection and protection of the environment during decommissioning. (GSR Part 6, Requirement 6)*

#### DE-02:

To fulfil its prime responsibility for safety during decommissioning of the facility, the licensee shall establish and implement safety policies and ensure that safety issues are given the highest priority.

*Related IAEA safety standards:*

*The operating organization shall have the prime responsibility for the safety of a nuclear fuel cycle facility over its lifetime. This responsibility includes ensuring that the design meets all applicable safety requirements. (SSR-4, Requirement 2)*

*The operating organization shall establish and implement safety, health and environmental policies that give protection and safety the overriding priority warranted by their significance. (SSR-4 Part 6, Requirement 3)*

#### DE-03:

The ultimate responsibility for safety shall remain with the licensee, although it is permissible to delegate the performance of specific tasks to subcontractors. The licensee shall ensure that the work of contractors is appropriately controlled so that it is conducted safely.

*Related IAEA safety standards:*

*The prime responsibility for safety shall remain with the licensee. The licensee can delegate the performance of specified tasks to contractors and the integrated management system shall make*

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<sup>2</sup> Covers the possible change of licensee  
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*provisions to ensure that the work of contractors is appropriately specified and controlled and is conducted safely. (GSR Part 6, para. 4.3)*

#### **DE-04:**

In accordance with the national system the licensee or the owner shall provide financial assurances and resources to cover the costs associated with safe decommissioning, including management of resulting radioactive waste.

*Related IAEA safety standards:*

*The responsibilities of the licensee shall include:*

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- *Estimating the cost of decommissioning actions and providing financial assurances and resources to cover the costs associated with safe decommissioning, including the management of the resulting radioactive waste. (GSR Part 6, para. 3.4)*

### **2.1.2 Safety issue: Organisational structure**

#### **DE-05:**

The licensee shall establish an organizational structure for the management and implementation of decommissioning, with the responsibility to ensure that decommissioning will be conducted safely.

*Related IAEA safety standards:*

*An integrated management system shall provide a single framework for the arrangements and processes necessary to address all the goals of the operating organization, including goals relevant to decommissioning. These goals shall include safety, health, security, environmental, quality and economic elements. (GSR Part 6, para. 4.1)*

#### **DE-06:**

The licensee shall assess the adequacy of the organisational structure, for safe and reliable decommissioning of the facility, and for ensuring an appropriate response in emergencies, on a regular basis and in particular, if there is a major change in the plant state or hazard.

*Related IAEA safety standards:*

*The type of information and the level of detail in the decommissioning plans and supporting documents, including the safety assessments, shall be commensurate with the type, scale, complexity, status and stage in the lifetime of the facility and with the hazards associated with the decommissioning of the facility... The conduct and regulatory oversight of decommissioning actions shall be applied in a manner that is commensurate with the hazards and risks associated with the decommissioning of the facility.*

*(GSR Part 6, para. 2.4 and 2.5)*

*The licensee should implement an appropriate integrated management system before the commencement of decommissioning actions. The management system should extend to all phases of the decommissioning project, including planning for decommissioning and preparatory actions performed during normal operation. (SSG-47, para. 4.1)*

*Administrative procedures used in the operational stage of the facility might be relevant for decommissioning. However, these procedures should be reviewed and modified as necessary to ensure that they are appropriate for the decommissioning actions that will be undertaken.... (SSG-47, para. 4.24)*

#### **DE-07:**

The licensee shall ensure that there is a clear allocation of authorities and responsibilities, together with the interfaces and communication routes that will be used especially when contractors or outside organizations are used.

*Related IAEA safety standards:*

*Responsibilities and interfaces between the different organizations should be specified by the licensee, as the overall responsibility for safety remains with the licensee. As part of the integrated management system, arrangements for the control of contractors and subcontractors should be established, agreed by all organizations involved and recorded. (SSG-47, para. 4.12)*

#### **DE-08:**

The licensee shall evaluate the skills needed for safe decommissioning and shall determine the minimum number and qualification requirements of staff responsible for safety at the various stages of decommissioning.

*Related IAEA safety standards:*

*Individuals performing decommissioning actions shall have the necessary skills, expertise and training to perform decommissioning safely.*

*(GSR Part 6, para. 4.4)*

*The licensee is responsible for ensuring that a sufficient number of trained and qualified workers are available for safely conducting decommissioning actions, for the overall safety performance, for demonstrating that the end state of the facility ensures compliance with the end state criteria defined in the final decommissioning plan and for retaining decommissioning records, as required. (SSG-47, para. 3.23)*



### 2.1.3 Safety issue: Record and knowledge keeping

#### DE-09:

The licensee shall ensure that sufficient knowledge of the facility and technical expertise is maintained during life time of the facility.

The licensee shall ensure that appropriate records and reports that are relevant to decommissioning (e.g. records on the use of the facility, events and incidents, radionuclide inventories, dose rates and contamination levels) shall be retained during life time of the facility. In this way, the design and modifications of the facility and its operating history will be identified and factored into the decommissioning plan.

*Related IAEA safety standards:*

*Individuals performing decommissioning actions shall have the necessary skills, expertise and training to perform decommissioning safely. Provisions shall be made to ensure that institutional knowledge about the facility is obtained and made accessible and, as far as possible, that key staff from the facility are retained. (GSR Part 6, para. 4.4)*

*Appropriate records and reports that are relevant to decommissioning (e.g. records and reports of events) shall be retained by the licensee throughout the lifetime of the facility. The design of the facility, modifications to the facility and the facility's operating history shall be identified and shall be considered in preparing the decommissioning plans.*

*(GSR Part 6, para. 7.7)*

#### DE-10:

The licensee shall maintain an appropriate record system to ensure, before decommissioning, that the radioactive material contained in the facility at the end of the operational phase is accounted for. During decommissioning, this record system shall include an up-to-date inventory of the radioactive material contained in the facility.

*Related IAEA safety standards:*

*Appropriate records and reports that are relevant to decommissioning (e.g. records and reports of events) shall be retained by the licensee throughout the lifetime of the facility. The design of the facility, modifications to the facility and the facility's operating history shall be identified and shall be considered in preparing the decommissioning plans.*

*(GSR Part 6, para. 7.7)*

*During the preparation and updating of the final decommissioning plan, the extent and type of radioactive material at the facility (e.g. activated and contaminated structures and components) shall be determined by means of a detailed characterization survey and on the basis of records collected during the operational period. .... (GSR Part 6, para. 7.13)*

## 2.1.4 Safety issue: Implementation of a management system

### DE-11:

The licensee shall establish, implement, assess and continually improve a management system. It shall be aligned with the goals of the organization and shall contribute to their achievement. The main aim of the management system shall be to achieve and enhance safety by:

- Bringing together in a coherent manner all the requirements for managing the organization;
- Describing the planned and systematic actions necessary to provide adequate confidence that all these requirements are satisfied;
- Ensuring that health, environmental, security, quality and economic requirements are not considered separately from safety requirements, to help preclude their possible negative impact on safety.

*Related IAEA safety standards:*

*The management system shall be applied to achieve goals safely, to enhance safety and to foster a strong safety culture by:*

- *Bringing together in a coherent manner all the necessary elements for safely managing the organization and its activities;*
- *Describing the arrangements made for management of the organization and its activities;*
- *Describing the planned and systematic actions necessary to provide confidence that all requirements are met;*
- *Ensuring that safety is taken into account in decision making and is not compromised by any decisions taken. (GSR Part 2, para. 4.9)*

*Leadership in safety matters has to be demonstrated at the highest levels in an organization. Safety has to be achieved and maintained by means of an effective management system. This system has to integrate all elements of management so that requirements for safety are established and applied coherently with other requirements, including those for human performance, quality and security, and so that safety is not compromised by other requirements or demands. The management system also has to ensure the promotion of a safety culture, the regular assessment of safety performance and the application of lessons learned from experience. (SF-1, principle 3, para 3.12)*

**DE-12:**

The licensee shall ensure that the management system is applied to all phases of decommissioning taking into account the continuous change during decommissioning.

*Related IAEA safety standards:*

*The licensee shall ensure that its integrated management system covers all aspects of decommissioning.*

*(GSR Part 6, Requirement 7)*

*The licensee should implement an appropriate integrated management system before the commencement of decommissioning actions. The management system should extend to all phases of the decommissioning project, including planning for decommissioning and preparatory actions performed during normal operation (SSG-47, para. 4.1)*

**DE-13:**

The licensee shall ensure, that processes of the management system that are needed to achieve the goals, provide the means to meet all requirements and deliver the products of the organization are identified, and their development are planned, implemented, assessed and continually improved. The work performed in each process shall be carried out under controlled conditions, by using approved current procedures, instructions, drawings or other appropriate means that are periodically reviewed to ensure their adequacy and effectiveness.

*Related IAEA safety standards:*

*Processes and activities shall be developed and shall be effectively managed to achieve the organization's goals without compromising safety.*

*(GSR Part 2, Requirement 10)*

*Each process or activity that could have implications for safety shall be carried out under controlled conditions, by means of following readily understood, approved and current procedures, instructions and drawings. These procedures, instructions and drawings shall be validated before their first use and shall be periodically reviewed to ensure their adequacy and effectiveness.*

*(GSR Part 2, para 4.32)*

**DE-14:**

The licensee shall ensure that the documentation of the management system includes the following:

- The policy statements of the licensee;
- A description of the management system;
- A description of the organisational structure of the licensee;
- A description of the functional responsibilities, accountabilities, levels of authority and interactions of those managing, performing and assessing work;

- A description of the interactions with relevant external organisations;
- A description of the processes and supporting information that explain how work is to be prepared, reviewed, carried out, recorded, assessed and improved.

*Related IAEA safety standards:*

*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. (GSR Part 2, para 4.16)*

## 2.2

# Safety area: Decommissioning strategy and planning

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### 2.2.1 Safety issue: Facilitating decommissioning during design, construction and operational phase

#### DE-15:

The licensee shall take account of the need to decommission a facility at the time it is being planned, designed, constructed and operated. Measures, including design features, contamination and activation control, shall be described and justified.

*Related IAEA safety standards:*

*The responsibilities of the licensee shall include:*

- *Selecting a decommissioning strategy as the basis for preparing and maintaining the decommissioning plans (i.e. the initial decommissioning plan and the final decommissioning plan) throughout the lifetime of the facility. (GSR Part 6, para 3.4)*

#### DE-16:

The licensee shall undertake a baseline survey, including radiological conditions of the site before construction, for comparison with the proposed end-state after decommissioning. For those practices for which such a baseline survey has not been done in the past, data from analogous, undisturbed areas with similar characteristics can be used instead of pre-operational baseline data.

*Related IAEA safety standards:*

*At the siting stage, a background survey of the site, including the obtaining of information on radiological conditions, shall be performed prior to the construction of a new facility, and the baseline data shall be updated prior to its commissioning. This information shall be used to determine background radiological conditions. For those facilities for which no such background survey has been made in the past, data from analogous and undisturbed areas with similar characteristics shall be used instead of pre-operational baseline data. (GSR Part 6, para 7.2)*

## 2.2.2 Safety issue: Decommissioning strategy

### DE-17:

The licensee shall establish a decommissioning strategy for its facility. This decommissioning strategy shall be consistent with existing related national strategies and regulatory requirements, e. g. on decommissioning or radioactive waste management.

*Related IAEA safety standards:*

*The responsibilities of the licensee shall include:*

- *Selecting a decommissioning strategy as the basis for preparing and maintaining the decommissioning plans (i.e. the initial decommissioning plan and the final decommissioning plan) throughout the lifetime of the facility. (GSR Part 6, para 3.4)*

*... The strategy shall be consistent with the national policy on the management of radioactive waste. (GSR Part 6, Requirement 8)*

### DE-18:

The decommissioning strategy shall be documented including a description of the options, overall timescales for the decommissioning of the facility and the end-state after completion of all decommissioning activities. The reasons for the preferred option shall be explained, and options not involving immediate dismantling shall be rigorously justified.

*Related IAEA safety standards:*

*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. (GSR Part 6, para 5.1)*

*If deferred dismantling has been selected as a decommissioning strategy, the licensee shall demonstrate in the final decommissioning plan and supporting documents that such an option will be implemented safely. The availability of adequate financial resources to ensure that the facility is maintained in a safe condition during the deferral period and for subsequent decontamination and/or dismantling shall be demonstrated. (GSR Part 6, para 7.14)*

## 2.2.3 Safety issue: Facility decommissioning plan during design, construction and operational phases

### DE-19:

Based on the established decommissioning strategy the licensee shall establish an initial decommissioning plan for the facility. The details of the plan shall be commensurate with the type and status of the facility (graded approach).

*Related IAEA safety standards:*

*The responsibilities of the licensee shall include:*

- *Selecting a decommissioning strategy as the basis for preparing and maintaining the decommissioning plans (i.e. the initial decommissioning plan and the final decommissioning plan) throughout the lifetime of the facility. (GSR Part 6, para 3.4)*

**DE-20:**

The licensee shall submit the initial decommissioning plan to the regulatory body in support of the licence application for construction for a new facility.

*Related IAEA safety standards:*

*The initial decommissioning plan will be limited in detail, because it will be based on experience from previous projects and assumptions, which need to be validated at a later time (see paras 7.11–7.19). The initial decommissioning plan is required to be submitted by the licensee to the regulatory body in support of the licence application or authorization for operating the facility (SSG-47, para 7.10).*

*The licensee shall prepare and submit to the regulatory body an initial decommissioning plan together with the application for authorization to operate the facility. This initial decommissioning plan shall be required in order to identify decommissioning options, to demonstrate the feasibility of decommissioning, to ensure that sufficient financial resources will be available for decommissioning, and to identify categories and estimate quantities of waste that will be generated during decommissioning. (GSR Part 6, para 7.4)*

**DE-21:**

The initial decommissioning plan shall:

- (a) take into account major safety issues;
- (b) support the fact that decommissioning can be safely conducted using proven techniques or ones being developed;
- (c) include a generic study showing the feasibility of decommissioning;
- (d) include consideration of environmental aspects of decommissioning, such as management of waste and radioactive effluents;
- (e) provide a basis to assess the costs of the decommissioning work and the means of financing it.

*Related IAEA safety standards:*

*The initial decommissioning plan:*

- (a) *Should preferably be based on the immediate dismantling strategy; however, a deferred dismantling strategy for individual facilities might be considered, such as in the case of a multifacility site;*

- (b) *Should include a generic feasibility study of decommissioning, based on the selected decommissioning strategy, which should consider design provisions and operating experience for facilitating decommissioning, including the proposed end state (preferably release without restrictions), related key decommissioning actions and basic safety issues;*
- (c) *Should include a schedule for major decommissioning actions;*
- (d) *Should provide a basis for a preliminary cost estimate of the decommissioning project and should specify the means to ensure financial provisions for the decommissioning;*
- (e) *Should provide a basis for a preliminary cost estimate of the decommissioning project and should specify the means to ensure financial provisions for the decommissioning;*

*Should demonstrate that the decommissioning can be performed in a safe manner. (SSG-47, para 7.10)*

#### **DE-22:**

If several facilities are located at the same site it shall be ensured that in each facility decommissioning plan any interactions and interdependencies between the facilities are taken into account.

*Related IAEA safety standards:*

*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). (GSR Part 6, para 5.5)*

#### **DE-23:**

During operation the decommissioning plan shall be reviewed by the licensee regularly, at least as frequently as the periodic safety review, and shall be updated as required. These reviews of the decommissioning plan shall consider, in particular, changes in the facility operation experiences or regulatory requirements, and advances in technology to further evolve the decommissioning plan.

*Related IAEA safety standards:*

*The decommissioning plan shall be updated by the licensee and shall be reviewed by the regulatory body periodically (typically every five years or as prescribed by the regulatory body), or when specific circumstances warrant, such as if changes in an operational process necessitate significant changes to the plan. The decommissioning plan shall be updated as necessary in the light of relevant operational experience gained, available lessons learned from the decommissioning of similar facilities, new or revised safety requirements, or*

*technological developments relevant to the selected decommissioning strategy. If an accident occurs or a situation arises with consequences relevant for decommissioning, the decommissioning plan shall be updated by the licensee as soon as possible and shall be reviewed by the regulatory body. (GSR Part 6, para 7.5)*



#### DE-24:

The decommissioning plan shall be supported by an appropriate safety assessment for the decommissioning activities the details of which are commensurate with the type and status of the facility (graded approach).

*Related IAEA safety standards:*

*The type of information and the level of detail in the decommissioning plans and supporting documents, including the safety assessments, shall be commensurate with the type, scale, complexity, status and stage in the lifetime of the facility and with the hazards associated with the decommissioning of the facility. (GSR Part 6, para 2.4)*

*The safety assessment should determine whether the decommissioning strategy, plans and activities will minimize exposures of workers and the public to levels as low as reasonably achievable and reduce the risks due to normal and/or accident conditions during decommissioning. (WS-G-5.2, para. 3.17).*

#### DE-25:

The decommissioning plan shall identify major existing systems and equipment that may be used during decommissioning to ensure that they are available when needed. The decommissioning plan shall also identify necessary changes or replacements of these existing systems. The decommissioning plan shall also identify the need for existing and new facilities to carry out decommissioning and waste management.

*Related IAEA safety standards:*

*As stated in para. 7.9 of GSR Part 6, the licensee is required to inform the regulatory body (or the government, if so required) prior to shutting down a facility permanently. The licensee should also inform the regulatory body about its intention to decommission the facility. Additionally, at this time or at the latest during the transition from operation to decommissioning, the licensee should initiate studies to support development of the final decommissioning plan. These studies should identify the systems, equipment and infrastructure from the operational stage that will need to be maintained for use during decommissioning, and should specify, and if necessary research, any new systems, equipment and infrastructure that will need to be installed to support decommissioning (SSG-47, para. 7.20)*

### 2.2.4 Safety issue: Final decommissioning plan<sup>3</sup>

#### DE-26:

As soon as it has been decided to permanently shut down a nuclear facility, the licensee shall inform the regulatory body.

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<sup>3</sup> For explanations on the relation between the final decommissioning plan and the safety case for decommissioning please refer to appendix C.

*Related IAEA safety standards:*

*The licensee shall inform the regulatory body (or the government, if so required) prior to shutting down a facility permanently... (GSR Part 6, para 7.9).*

#### **DE-27:**

If a facility is shut down and no longer used for its intended purpose, a final decommissioning plan shall be submitted to the regulatory body not later than two years after the shut down of the facility, unless an alternative schedule for the submission of the final decommissioning plan is specifically authorized by the regulatory body.

*Related IAEA safety standards:*

*... If a facility is permanently shut down and/or is no longer used for its intended purpose, a final decommissioning plan shall be submitted to the regulatory body for approval within a period agreed with the regulatory body (typically within two to five years of permanent shutdown). (GSR Part 6, para 7.9).*

*Prior to the conduct of decommissioning actions, a final decommissioning plan<sup>3</sup> shall be prepared and shall be submitted to the regulatory body for approval. (GSR Part 6, Requirement 11)*

*<sup>3)</sup> The final decommissioning plan is that version of the decommissioning plan submitted for approval to the regulatory body prior to implementation of the plan. During implementation of this final plan, revisions or amendments may subsequently be needed as the activity progresses.*

#### **DE-28:**

A final decommissioning plan shall

- be consistent with the decommissioning strategy proposed for the facility,
- be consistent with the safety case for decommissioning (ref. DE-50),
- describe the decommissioning activities, including the timeframe and the end-state of the decommissioning project, and the content of the individual phases, if a phased approach is applied,
- describe the facilities, systems and equipment needed to perform the decommissioning project,
- describe the organisational structure, skills and qualifications required for safe decommissioning,
- describe the management of residual material and waste in accordance with the national waste strategy, and
- describe the program of the final radiation survey of the end-state of decommissioning.

*Related IAEA safety standards:*

*Prior to the conduct of decommissioning actions, a final decommissioning plan shall be prepared and shall be submitted to the regulatory body for approval. (GSR Part 6, Requirement 11)*

*The final decommissioning plan and supporting documents shall cover the following: the selected decommissioning strategy; the schedule, type and sequence of decommissioning actions; the waste management strategy applied, including clearance, the proposed end state and how the licensee will demonstrate that the end state has been achieved; the storage and disposal of the waste from decommissioning; the timeframe for decommissioning; and financing for the completion of decommissioning. (GSR Part 6, para 7.10)*

*The final decommissioning plan should be a living document, to be updated to reflect the current status of the facility and the ongoing progress of the project. The final decommissioning plan should be supported by a safety assessment, which covers all phases of the decommissioning project. (SSG-47, para 7.30)*

*Suggested structure and content of the final decommissioning plan and supporting documents. (SSG-47, ANNEX I).*

#### SUMMARY

1. INTRODUCTION
2. DESCRIPTION OF THE SITE AND FACILITY
3. DECOMMISSIONING STRATEGY
4. INTEGRATED MANAGEMENT SYSTEM FOR DECOMMISSIONING
5. CONDUCT OF DECOMMISSIONING ACTIONS
6. WASTE MANAGEMENT AND MATERIAL MANAGEMENT
7. FINANCIAL RESOURCES
8. RADIATION PROTECTION [I-2]
9. SAFETY ASSESSMENT [I-3]
10. ENVIRONMENTAL IMPACT ASSESSMENT
11. EMERGENCY ARRANGEMENTS [I-4]
12. PHYSICAL PROTECTION AND ARRANGEMENTS FOR ACCOUNTING FOR AND CONTROL OF NUCLEAR MATERIALS
13. FINAL RADIOLOGICAL SURVEY

### **2.2.5 Safety issue: Decommissioning plan update during decommissioning operations**

#### **DE-29:**

Depending on the timeframe of decommissioning, the decommissioning plan shall be reviewed regularly by the licensee during decommissioning operations and shall be updated as required. These updates of the decommissioning plan are to reflect, in particular, changes in the decommissioning strategy, deviations from the scheduled program, experiences from ongoing decommissioning or changes of regulatory requirements and advances in technology.

*Related IAEA safety standards:*

*The decommissioning plan shall be updated by the licensee and shall be reviewed by the regulatory body periodically (typically every five years or as prescribed by the regulatory body), or when specific circumstances warrant, such as if changes in an operational process necessitate significant changes to the plan... If an accident occurs or a situation arises with consequences relevant for decommissioning,*

*the decommissioning plan shall be updated by the licensee as soon as possible and shall be reviewed by the regulatory body. (GSR Part 6, para 7.5)*

*... The decommissioning plan shall be updated as necessary in the light of relevant operational experience gained, available lessons learned from the decommissioning of similar facilities, new or revised safety requirements, or technological developments relevant to the selected decommissioning strategy. (GSR Part 6, para 7.5)*

## 2.3

# Safety area: Conduct of decommissioning

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### 2.3.1 Safety issue: Safety classification

#### DE-30:

SSCs may be re-classified as they change in importance to safety in the course of decommissioning activities. The licensee shall reflect this re-classification in the safety case.

*Related IAEA safety standards:*

*As part of the safety assessment, safety functions and their associated SSCs should be identified, both for planned decommissioning activities and for accident conditions, and their suitability and sufficiency should be demonstrated. The safety functions required to be fulfilled during decommissioning comprise a combination of safety functions that were needed during operation of the facility and additional functions that will be needed as a result of the specific decommissioning activities proposed (e.g. fire detection and suppression during cutting and grinding activities). The effects of decommissioning on the safety functions at adjacent facilities should also be evaluated. In addition, dismantling of major facility structures during decommissioning may involve the deliberate destruction and removal of engineered SSCs that had fulfilled specified safety functions during operation of the facility (e.g. containment, shielding, ventilation, cooling). If these safety functions are still required, the associated SSCs should be maintained in an appropriate state during decommissioning. If this is not practicable, these functions should be provided by suitable alternative means (e.g. tents, temporary facilities, fire systems, electrical systems, administrative procedures) for as long as is required on the basis of the safety assessment. The appropriateness of alternative means of fulfilling these functions should be demonstrated. Any change of safety functions during decommissioning should be justified in advance before its implementation. (WS-G-5.2, para 3.14)*

*The safety assessment for decommissioning may identify a number of potentially significant non-radiological hazards, which might have radiological consequences during the decommissioning of the facility... The method for dealing with most of the non-radiological hazards should be managed in accordance with national regulations, and in addition a strong safety culture will help to ensure that such hazards are identified and adequately controlled. (SSG-47, para A.20)*

### 2.3.2 Safety issue: On-site emergency preparedness

If for the set of foreseeable accidents considered in the safety case, events requiring protective measures cannot be excluded, planned emergency arrangements will be required. These emergency plans should be proportionate taking account of the magnitude of the accident consequence. For some facilities (such as with low radioactive inventory) an off-site emergency plan may not be required, which must be justified and the off-site aspects of this safety issue will not apply. This site emergency plan can be based on the operational one but modified according to changed hazards during the decommissioning actions. The following SRLs therefore need to be applied in a proportionate manner.

#### DE-31:

The licensee shall provide arrangements for responding effectively to reasonably foreseeable events requiring measures at the scene for:

- regaining control of any emergency arising at the site, including events related to combinations of non-nuclear and nuclear hazards;
- preventing or mitigating the consequences at the scene of any such emergency and
- co-operating with external emergency response organizations in preventing adverse health effects in workers and the public.

*Related IAEA safety standards:*

*Arrangements must be made for emergency preparedness and response for nuclear or radiation incidents.*

*(SF-1, Principle 9)*

*The primary goals of preparedness and response for a nuclear or radiation emergency are:*

- *To ensure that arrangements are in place for an effective response at the scene and, as appropriate, at the local, regional, national and international levels, to a nuclear or radiation emergency;*
- *To ensure that, for reasonably foreseeable incidents, radiation risks would be minor;*
- *For any incidents that do occur, to take practical measures to mitigate any consequences for human life and health and the environment. (SF-1; para 3.34)*
- *Emergency preparedness and response arrangements commensurate with the threat category of the facility, [...], should be developed and implemented. (WS-G-6.1, para 5.14)*

*Emergency response arrangements for decommissioning, commensurate with the hazards, shall be established and maintained, and events significant to safety shall be reported to the regulatory body in a timely manner. (GSR Part 6, Requirement 13)*

*The requirements for preparedness and response for a nuclear or radiological emergency are established in Ref. [7]. (GSR Part 6, para 8.6)*

*Prior to the decommissioning of a facility, there is usually an emergency plan in place for the facility during its operation, or for the whole site where the facility is located, as required by IAEA Safety Standards Series No. GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency [29]. A review of this emergency plan should be made before commencement of decommissioning*

*actions, to ensure it is adequate for decommissioning (in some cases new organizations might be involved, and new possible emergency situations and/or security threats and vulnerabilities might become relevant). If an emergency plan does not exist, an emergency plan should be developed commensurate with the magnitude and likelihood of potential exposures and risks posed by the facility. (SSG-47, para 8.29)*

*... Personnel should be qualified, trained in emergency procedures and fit for duty, and consideration should be given to the need for the periodic review and updating of these procedures by means of regular exercises. (SSG-47, para 8.31)*

### **DE-32:**

The licensee shall

- prepare an on-site emergency plan as the basis for preparation and conduct of emergency measures,
- establish the necessary organizational structure for clear allocation of responsibilities, authorities and arrangements for coordinating on-site activities and cooperating with external response agencies throughout all phases of an emergency and
- ensure that, based on the on-site emergency plan trained and qualified personnel, facilities and equipment needed to control an emergency are appropriate, reliable and available at the time.

*Related IAEA safety standards:*

*The appropriate responsible authorities shall ensure that:*

- (a) *A 'concept of operations'<sup>3</sup> for emergency response is developed at the beginning of the preparedness stage.*
- (b) *Emergency plans and procedures are prepared and, as appropriate, approved for any facility or activity, area or location that could give rise to an emergency warranting protective actions and other response actions.*
- (c) *Response organizations and operating organizations, as appropriate, are involved in the preparation of emergency plans and procedures, as appropriate.*
- (d) *Account is taken in the content, features and extent of emergency plans of the results of any hazard assessment and any lessons from operating experience and from past emergencies, including conventional emergencies (see paras 4.18–4.26).*
- (e) *Emergency plans and procedures are periodically reviewed and updated (see paras 6.36 and 6.38). (GSR Part 7, para 6.18)*

<sup>3)</sup> *A concept of operations is a brief description of an ideal response to a postulated nuclear or radiological emergency, used to ensure that all those personnel and organizations involved in the development of a capability for emergency response share a common understanding.*

*Adequate tools, instruments, supplies, equipment, communication systems, facilities and documentation (such as documentation of procedures, checklists, manuals, telephone numbers and email addresses)*

*shall be provided for performing the functions specified in Section 5. These items and facilities shall be selected or designed to be operational under the conditions (such as radiological conditions, working conditions and environmental conditions) that could be encountered in the emergency response, and to be compatible with other procedures and equipment for the response (e.g. compatible with the communication frequencies used by other response organizations), as appropriate. These support items shall be located or provided in a manner that allows their effective use under the emergency conditions postulated. (GSR Part 7, para 6.22)*

*The operating organization and response organizations shall identify the knowledge, skills and abilities necessary to perform the functions specified [...]. The operating organization and response organizations shall make arrangements for the selection of personnel and for training to ensure that the personnel selected have the requisite knowledge, skills and abilities to perform their assigned response functions. The arrangements shall include arrangements for continuing refresher training on an appropriate schedule and arrangements for ensuring that personnel assigned to positions with responsibilities in an emergency response undergo the specified training. (GSR Part 7, para 8.29)*

#### **DE-33:**

During decommissioning, the licensee shall review and update as necessary the existing on-site emergency plan, so that it stays appropriate for current and future states of the facility. Experience from recent emergency exercises and reports on real emergency occurrences shall be taken into account.

*Related IAEA safety standards:*

*Emergency response arrangements for decommissioning, commensurate with the hazards, shall be established and maintained, and events significant to safety shall be reported to the regulatory body in a timely manner. (GSR Part 6, Requirement 13)*

*The operating organization shall develop an emergency plan and shall establish the necessary organizational structure, with assigned responsibilities for managing an emergency, and shall contribute to the development of off-site emergency procedures. (SSR-2/2, para 5.3)*

*The emergency plan shall cover all activities under the responsibility of the operating organization and it shall be adhered to in the event of an emergency ... Preparation of the emergency plan shall be coordinated with those bodies having responsibilities in an emergency, including public authorities and private enterprises, as relevant, and the plan shall be submitted to the regulatory body as required... (SSR-2/2, para 5.4)*

#### **DE-34:**

The licensee shall perform at regular intervals on-site emergency exercises, the results of which shall be reported to the regulatory body. Some of these exercises shall include the participation to the extent possible of external organizations concerned with on-site emergency.



*Related IAEA safety standards:*

*In developing the emergency response arrangements, consideration has to be given to all reasonably foreseeable events. Emergency plans have to be exercised periodically to ensure the preparedness of the organizations having responsibilities in emergency response. (SF-1; para 3.37)*

*Exercise programmes shall be developed and implemented to ensure that all specified functions required to be performed for emergency response, all organizational interfaces for facilities in category I, II or III, and the national level programmes for category IV or V are tested at suitable intervals. These programmes shall include the participation in some exercises of, as appropriate and feasible, all the organizations concerned, people who are potentially affected, and representatives of news media. The exercises shall be systematically evaluated (see para. 4.10(h)) and some exercises shall be evaluated by the regulatory body. Programmes shall be subject to review and revision in the light of experience gained (see paras 6.36 and 6.38) (GSR Part 7, para 6.30)*

### **2.3.3 Safety issue: Decommissioning experience feedback**

#### **DE-35:**

The licensee shall establish and implement experience feedback arrangements to collect, screen, analyse and document experience and events at the facility in a systematic way to improve and ensure safe decommissioning. Relevant experience and events reported by other facilities shall also be considered as appropriate.

*Related IAEA safety standards:*

*Leadership in safety matters has to be demonstrated at the highest levels in an organization. Safety has to be achieved and maintained by means of an effective management system. This system has to integrate all elements of management so that requirements for safety are established and applied coherently with other requirements, including those for human performance, quality and security, and so that safety is not compromised by other requirements or demands. The management system also has to ensure the promotion of a safety culture, the regular assessment of safety performance and the application of lessons learned from experience. (SF-1, para 3.12)*

*The process of safety assessment for facilities and activities is repeated in whole or in part as necessary later in the conduct of operations in order to take into account changed circumstances (such as the application of new standards or scientific and technological developments), the feedback of operating experience, modifications and the effects of ageing. ... (SF-1, para 3.16)*

*... The feedback of operating experience from facilities and activities — and, where relevant, from elsewhere — is a key means of enhancing safety. Processes must be put in place for the feedback and analysis of operating experience, including initiating events, accident precursors, near misses, accidents and unauthorized acts, so that lessons may be learned, shared and acted upon. (SF-1, para 3.17)*

#### DE-36:

To prevent recurrence and to counteract developments adverse to safety the licensee shall ensure that results are obtained, that conclusions are drawn, measures are taken, good practices and advances in technology are considered and that timely and appropriate corrective actions are implemented.

*Related IAEA safety standards:*

*Non-conformances and associated causes should be trended to identify repeat occurrences, generic (common) issues and weaknesses while the weaknesses are still at a level at which they do not pose a significant hazard. (GS-G-3.1, para 6.72)*

- *Non-conforming products should be properly identified, segregated, controlled, recorded and reported. The impact of the non-conformance should then be evaluated and reviewed and the non-conforming product should be (a) accepted; or (b) reworked or corrected within a specified time period; or (c) rejected and discarded or destroyed to prevent its inadvertent use. (GS-G-3.1, para 6.58)*

*The purpose of preventive actions is to prevent the potential causes of non-conformances from occurring and to maintain safety and performance. A process for preventive actions:*

- *Should take proactive steps to ensure that a potential non-conformance does not occur;*
- *Should use process analysis to determine how to build in process changes. (GS-G-3.1, para 6.76)*

*In many organizations there are several processes to control nonconforming products or processes, for example product inspections. The process or processes should include provisions to prevent the inadvertent use or installation of products or processes that do not conform and to ensure that effective corrective action is taken. (GS-G-3.1, para 6.50)*

#### DE-37:

Following any abnormal event during decommissioning which is significant for safety the licensee shall carry out an investigation and implement corrective measures to prevent a recurrence and to recover an appropriate level of safety as defined by the safety case for decommissioning.

*Related IAEA safety standards:*

*Prior to the restart or the resumption of full power of the affected plant, the operating organization shall carry out necessary remedial actions, including inspection, testing and repair of damaged structures, systems and components, and shall revalidate the safety functions that might be challenged by the event. Restart conditions and criteria shall be established and followed after the timely implementation of the necessary corrective actions (SSR-2/2 (Rev. 1), para. 4.31)*

### 2.3.4 Safety issue: Waste management

Waste from decommissioning shall be safely managed using appropriate routes with respect to their nature and characteristics that have to be determined as soon as possible. Procedures shall be implemented so that waste is segregated as soon as possible to avoid mixing of waste of different natures so as to optimize their management. Whenever categories of waste exit in the national waste management system, procedures shall be such that the waste is segregated in accordance with these categories.

#### DE-38:

The licensee shall develop, document and implement arrangements to characterise, segregate and manage the particularly large quantities and different types of radioactive waste and of other material that are produced during decommissioning, in accordance with the requirements set by the national regulatory authority and with the national waste management strategy.

*Related IAEA safety standards:*

*Decommissioning of nuclear power plants, research reactors and other nuclear fuel cycle facilities invariably involves the generation of large amounts of material and waste in forms that might be different from the material and the waste categories routinely handled during the operational stage of the facility. A waste management plan that covers all the anticipated decommissioning waste streams and waste categories should be developed. The waste management plan should define the manner by which material and radioactive waste will be removed from the facility and the means for segregating radioactive waste from non-radioactive and hazardous waste. The waste management plan for decommissioning should be part of the decommissioning plan (SSG-47, para 8.34)*

#### DE-39:

The licensee shall develop, document and implement optimized arrangements to segregate radioactive waste and reduce its volume in accordance with the requirements set by the national legal framework and with the national waste management strategy.

*Related IAEA safety standards:*

*... Specific plans for the reuse, recycling, storage or disposal of the waste should be developed. Such plans should aim to minimize the volume of waste to be disposed of as radioactive waste, facilitate future downstream processing of the waste and reduce overall costs. (SSG-47, para 8.37)*

*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. (GSR Part 6, Requirement n.8))*

**DE-40:**

The licensee shall keep accurate records of any radioactive decommissioning waste and material removed from regulatory control. The records shall be kept in accordance with national records retention requirements.

*Related IAEA safety standards:*

*The licensee shall ensure traceability for all waste generated during decommissioning. The licensee shall maintain up to date records of the waste generated, stored in the facility, or transferred to another authorized facility, specifying its quantities, characteristics, treatment methods and destination. (GSR Part 6, para 8.9)*

*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. (GSR Part 6, para 9.7)*

### **2.3.5 Safety issue: On-site and off-site monitoring**

**DE-41:**

Due to the changes of the facility, specific hazards and effluents associated with decommissioning, the licensee shall apply, review and modify as necessary its on- and off-site monitoring program.

*Related IAEA safety standards:*

*..... Finally, the environmental monitoring programme will need to be adapted when operations change or cease, during decommissioning of the source facility and in the post-closure period. (RS-G-1.8, para 5.10)*

*Arrangements for radiation protection during decommissioning are required to be addressed in the decommissioning plan and have to be based on the national requirements for radiation protection. Optimization of protection is required to be implemented, with account taken of the specifics of the decommissioning project (SSG-47, para 2.2)*

*Cases in which special attention should be paid to the protection of workers include those in which workers have to work in close proximity to contaminated components being dismantled, which could lead to significant exposure or spread of contamination. Special attention should be paid to preventing and reducing the exposure of workers by using specific and appropriate personal protective equipment. Personal protective equipment may need to be tailored to specific work conditions, for example enhancing the resistance of protective gloves to puncture in order to avoid injuries that might result in an intake of radionuclides. (SSG-47, para 2.5)*

*... The authorizations for discharges for the reactor and for the entire site should then be reviewed and revised as appropriate, taking into consideration the decommissioning actions to be undertaken. Guidance for the development and implementation of an environmental monitoring programme can be found in IAEA Safety Standards Series No. RS-G-1.8, Environmental and Source Monitoring for Purposes of Radiation Protection (SSG-47, para 8.20).*

### 2.3.6 Safety issue: Maintenance, Testing and Inspection

#### DE-42:

The licensee shall prepare, and implement documented programmes for maintenance, testing, surveillance and inspection of SSCs and other equipment significant to safety to ensure that their availability, reliability and functionality remain in accordance with the safety case for decommissioning. The programmes shall take into account operational limits and conditions (OLCs) and be re-evaluated in the light of experience and the continuous changes of the facility during decommissioning.

*Related IAEA safety standards:*

*Maintenance, testing, surveillance and inspection programmes shall be established that include predictive, preventive and corrective maintenance activities. These maintenance activities shall be conducted to maintain availability during the service life of structures, systems and components by controlling degradation and preventing failures. In the event that failures do occur, maintenance activities shall be conducted to restore the capability of failed structures, systems and components to function within acceptance criteria (SSR-2/2, para 8.1)*

*The frequency of maintenance, testing, surveillance and inspection of individual structures, systems and components shall be determined on the basis of:*

- (a) The importance to safety of the structures, systems and components, with insights from probabilistic safety assessment taken into account;*
- (b) Their reliability in, and availability for, operation;*
- (c) Their assessed potential for degradation in operation and their ageing characteristics;*
- (d) Operating experience;*

*Recommendations of vendors (SSR-2/2, para 8.5)*

*Data on maintenance, testing, surveillance and inspection shall be recorded, stored and analysed for the purpose of confirming that the operating performance is in accordance with the design intent and with requirements for the reliability and availability of equipment (SSR-2/2, para 8.4)*

*Corrective maintenance of structures, systems and components shall be performed as promptly as practicable and in compliance with operational limits and conditions. Priorities shall be established, with account taken first of the relative importance to safety of the defective structures, systems and components. (SSR-2/2 (Rev. 1), para 8.14)*

#### DE-43:

The licensee shall address the ageing of SSCs and other equipment significant to safety by establishing, if necessary, provisions for their maintenance, testing and inspection.

*Related IAEA safety standards:*

*The safety assessment in itself cannot achieve safety. Safety can only be achieved if the input assumptions are valid, the derived limits and conditions are implemented and maintained, and the assessment reflects the facility or activity as it actually is at any point in time. Facilities and activities change and evolve over their lifetimes (e.g. through construction, commissioning, operation, and decommissioning and dismantling or closure) and with modifications, improvements and effects of ageing. Knowledge and understanding also advance with time and experience. The safety assessment has to be updated to reflect such changes and to remain valid. Updating of the safety assessment is also important in order to provide a baseline for the future evaluation of monitoring data and performance indicators and, for facilities for the storage and disposal of radioactive waste, to provide an appropriate record for reference with regard to future use of the site. (GSR-Part 4, para 5.2)*

*Ageing management for nuclear power plants is implemented to ensure that the effects of ageing will not prevent structures, systems and components (SSCs) from being able to accomplish their required safety functions throughout the lifetime of the nuclear power plant (including its decommissioning) and it takes account of changes that occur with time and use (SSG-48, para 1.2)*

**DE-44:**

**The licensee shall record, store, analyse and review data on maintenance, testing, surveillance, inspection of SSCs and other equipment relevant for safety. Where necessary corrective measures such as repair, replacement or changes in the maintenance programme shall be implemented.**

*Related IAEA safety standards:*

*Data on maintenance, testing, surveillance and inspection shall be recorded, stored and analysed to confirm that performance is in accordance with design assumptions and with expectations on equipment reliability. (SSR-2/2, para 6.10)*

*Data on maintenance, testing, surveillance and inspection shall be recorded, stored and analysed for the purpose of confirming that the operating performance is in accordance with the design intent and with requirements for the reliability and availability of equipment (SSR-2/2, para 8.4)*

*An investigation shall be carried out to determine the cause of the event (by means of root cause analysis wherever necessary) and corrective actions shall be taken to make its recurrence less likely. Prior to the restart or the resumption of full power of the affected plant, the operating organization shall carry out necessary remedial actions, including inspection, testing and repair of damaged structures, systems and components, and shall revalidate the safety functions that might be challenged by the event. Restart conditions and criteria shall be established and followed after the timely implementation of the necessary corrective actions. (SSR-2/2 (Rev. 1) para 4.31)*

*... An investigation shall be carried out to determine the cause of the event (by means of root cause analysis wherever necessary) and corrective actions shall be taken to make its recurrence less likely... (SSR-2/2, para 4.31)*

- *The following approaches and methods focus on the ‘actions and practices’ and ‘understanding’ [...] supported by enabling processes in the ‘management for safety’ element. Assign sufficient resources*

*for information exchange and identifying lessons learned and good practices through all phases. Provide consistent methods for knowledge transfer and retention. Encourage open reporting and access to forums and information, so that individuals at every level of the organization can contribute experience and good practices. Utilize existing operating experience feedback databases maintained by the IAEA and other agencies, and participate in expert missions to gain exposure to international practices (IAEA Safety Standards Series No. 74, para 4.6.3)*

*Maintenance, testing, surveillance and inspection programmes shall be established that include predictive, preventive and corrective maintenance activities. These maintenance activities shall be conducted to maintain availability during the service life of structures, systems and components by controlling degradation and preventing failures. In the event that failures do occur, maintenance activities shall be conducted to restore the capability of failed structures, systems and components to function within acceptance criteria. (SSR-2/2, para 8.1)*

### **2.3.7 Safety issue: Control of decommissioning activities**

#### **DE-45:**

The licensee shall control decommissioning operations through the use of written and approved procedures. The licensee shall make and implement arrangements for issuing, modifying and terminating work procedures as part of the management system.

*Related IAEA safety standards:*

*Decommissioning shall be controlled through the use of written procedures. Such procedures shall be subject to review and approval by those parts of the licensee responsible for ensuring safety. A methodology for issuing, modifying and terminating work procedures shall be established (GSR Part 6, para 4.6)*

#### **DE-46:**

No decommissioning activity shall be undertaken without a prior assessment of its impact on safety taking into account the postulated initiating events with internal causes included in the safety case for decommissioning. Due consideration shall be given to different decommissioning activities executed in parallel which might adversely effect safety of each other.

#### **DE-47:**

The licensee shall control modifications of planned decommissioning activities according to their safety significance thereby ensuring that they do not compromise the safety of decommissioning activities.

*Related IAEA safety standards:*

*The licensee should implement an appropriate integrated management system before the commencement of decommissioning actions. The management system should extend to all phases of the*

*decommissioning project, including planning for decommissioning and preparatory actions performed during normal operation (SSG-47, para 4.1)*

*... The management system should provide assurance that:*

*...*

*(h) Appropriate updating and maintenance of safety assessments are performed with due consideration of: changes in the state of the facility as decommissioning progresses; the decommissioning plan; the acquisition of new knowledge; new regulatory concerns; updates of the inventory on the basis of data from sampling and environmental monitoring; measurements of occupational doses; and radioactive releases during decommissioning activities; (WS-G-5.2, para 3.34)*

### **2.3.8 Safety issue: Period of Deferment**

#### **DE-48:**

In case of deferred dismantling the licensee shall make the facility passively safe as far as it is reasonably practicable before entering the period of deferment, so as to minimize the need for active safety systems, monitoring, and human intervention in order to ensure safety.

*Related IAEA safety standards:*

*If deferred dismantling has been selected as a decommissioning strategy, the licensee shall demonstrate in the final decommissioning plan and supporting documents that such an option will be implemented safely ... (GSR Part 6, para 7.14)*

*In the case of deferred dismantling, the licensee shall ensure that the facility is maintained in a safe configuration so that subsequent decontamination and/or dismantling can be performed. An adequate programme for maintenance, monitoring and surveillance, which shall be subject to approval by the regulatory body, shall be developed to ensure safety throughout the period of deferral. (GSR Part 6, para 8.2)*

#### **DE-49:**

Before the start of the period of deferment, the licensee shall develop an adequate care-and-maintenance program, the implementation of which ensures safety and does not impair future decommissioning.

*Related IAEA safety standards:*

*A surveillance and maintenance plan for the safe enclosure period should be developed on the basis of the outcomes of the safety assessment. The safety assessment for the deferred dismantling strategy should be the basis of identification of the safety functions and the safety parameters (e.g. confinement, shielding, temperature, humidity, level of discharges to the environment) that should be provided and maintained by the means described in the surveillance and maintenance plan (SSG-47, para 7.41)*



## 2.4

# Safety area: Safety verification

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### 2.4.1 Safety issue: Contents, review and update of the safety case for decommissioning<sup>4</sup>

#### DE-50:

The licensee shall provide a safety case, which addresses all issues relevant for safety during decommissioning (for typical contents refer to appendix A). It shall be used as the basis for assessing the safety implications of changes to the facility or to decommissioning practices.

In particular the safety case shall address:

- dynamic changes in facility state,
- new or modified installations, systems and equipment,
- management of large quantities of radioactive material,
- conventional safety and radiation protection issues from demolition and dismantling and also the unusual working environment.

*Related IAEA safety standards:*

*The type of information and the level of detail in the decommissioning plans and supporting documents, including the safety assessments, shall be commensurate with the type, scale, complexity, status and stage in the lifetime of the facility and with the hazards associated with the decommissioning of the facility (GSR Part 6, para 2.4).*

*The final decommissioning plan shall be supported by a safety assessment addressing the planned decommissioning actions and incidents, including accidents that may occur or situations that may arise during decommissioning (GSR Part 6, para 2.6).*

*The final decommissioning plan should be a living document, to be updated to reflect the current status of the facility and the ongoing progress of the project. The final decommissioning plan should be supported by a safety assessment, which covers all phases of the decommissioning project. (SSG-47, para 7.30)*

*Suggested structure and content of the final decommissioning plan and supporting documents. (SSG-47, ANNEX I).*

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<sup>4</sup> For explanations on the relation between the final decommissioning plan and the safety case for decommissioning please refer to appendix C

## SUMMARY

1. INTRODUCTION
2. DESCRIPTION OF THE SITE AND FACILITY
3. DECOMMISSIONING STRATEGY
4. INTEGRATED MANAGEMENT SYSTEM FOR DECOMMISSIONING
5. CONDUCT OF DECOMMISSIONING ACTIONS
6. WASTE MANAGEMENT AND MATERIAL MANAGEMENT
7. FINANCIAL RESOURCES
8. RADIATION PROTECTION [I-2]
9. SAFETY ASSESSMENT [I-3]
10. ENVIRONMENTAL IMPACT ASSESSMENT
11. EMERGENCY ARRANGEMENTS [I-4]
12. PHYSICAL PROTECTION AND ARRANGEMENTS FOR ACCOUNTING FOR AND CONTROL OF NUCLEAR MATERIALS
13. FINAL RADIOLOGICAL SURVEY

*As part of the operator's responsibility for all aspects of safety and environmental protection during all phases of decommissioning, as required in Ref. [1], para. 3.8, an appropriate safety assessment should be performed:*

- (a) To support the selection of the decommissioning strategy, the development of a decommissioning plan and associated specific decommissioning activities;*
- (b) To demonstrate that exposures of workers and of the public are as low as reasonably achievable (ALARA) and do not exceed the relevant limits or constraints [3]. (WS-G-5.2, para 2.1)*

*The safety assessment for decommissioning should:*

- (a) Document how regulatory requirements and criteria are met to support the authorization<sup>5</sup> of the proposed decommissioning activities;*
- (b) Include a systematic evaluation of the nature, magnitude and likelihood of hazards and their radiological consequences for workers, the public and the environment for planned activities and for accident conditions;*
- (c) Quantify the systematic and progressive reduction in radiological hazards to be achieved through the conduct of the decommissioning activities;*
- (d) Identify the safety measures, limit controls and conditions that will need to be applied to the decommissioning activities to ensure that the relevant safety requirements and criteria are met and maintained throughout the decommissioning;*
- (e) Where relevant, demonstrate that the institutional controls applied after decommissioning will not impose an undue burden on future generations;*
- (f) Provide input to on-site and off-site emergency planning and to safety management arrangements;*
- (g) Provide an input into the identification of training needs for decommissioning and of competences for staff performing decommissioning activities. (WS-G-5.2, para 2.3)*

**DE-51:**

The safety case shall be consistent with the final decommissioning plan and its subsequent updates.

*Related IAEA safety standards:*

*The safety assessment for decommissioning should be consistent with the decommissioning plan [1, 9–11] and with other relevant national and site specific strategies and requirements, for example, with requirements for radioactive waste management and for the release of material and sites from regulatory control. (WS-G-5.2, para 2.2)*

**DE-52:**

The safety case for decommissioning and any updates of the final decommissioning plan shall be submitted to the regulatory body.

*Related IAEA safety standards:*

*Prior to the conduct of decommissioning actions, a final decommissioning plan shall be prepared and shall be submitted to the regulatory body for approval. (GSR Part 6, Requirement 11)*

*The final decommissioning plan and supporting documents shall cover the following: the selected decommissioning strategy; the schedule, type and sequence of decommissioning actions; the waste management strategy applied, including clearance, the proposed end state and how the licensee will demonstrate that the end state has been achieved; the storage and disposal of the waste from decommissioning; the timeframe for decommissioning; and financing for the completion of decommissioning. (GSR Part 6, para 7.10)*

*The safety assessment should employ a systematic methodology to demonstrate compliance with safety requirements and criteria for decommissioning throughout the decommissioning process, including the release of material, buildings and sites from regulatory control. In addition, the safety assessment should be used to help ensure that interested parties are confident of the safety of decommissioning. Once developed by the operator, the safety assessment should be reviewed by the regulatory body to ensure compliance with the relevant safety requirements and criteria. (WS-G-5.2, para 1.3)*

**DE-53:**

To support the safety case for decommissioning, the licensee shall examine records and conduct surveys and measurements to verify the inventory and locations of radioactive, fissile or other hazardous materials in the facility and the surrounding potentially affected areas.

*Related IAEA safety standards:*

*The responsibilities of the licensee shall include:*

- *Performing safety assessments and environmental impact assessments in support of decommissioning actions.*
- *Performing radiological surveys in support of decommissioning. (GSR Part 6, para 3.4)*

*During the preparation and updating of the final decommissioning plan, the extent and type of radioactive material at the facility (e.g. activated and contaminated structures and components) shall be determined by means of a detailed characterization survey and on the basis of records collected during the operational period. If contamination or radioactive waste from operations remains at the facility (and/or in subsurface soils and groundwater), such radioactive material shall be included in the characterization survey. (GSR Part 6, para 7.13)*

#### **DE-54:**

The licensee shall review and as appropriate update the safety case for decommissioning

- at major steps in the decommissioning project and
- when changes of the decommissioning plan are intended or changes of regulatory requirements or other safety relevant information arise

to ensure the safety case is still valid and appropriate to support the safe conduct of the decommissioning work.

*Related IAEA safety standards:*

*The safety assessment for decommissioning should be consistent with the decommissioning plan [1, 9–11] and with other relevant national and site specific strategies and requirements, for example, with requirements for radioactive waste management and for the release of material and sites from regulatory control. (WS-G-5.2, para 2.2)*

*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. (WS-G-5.2, para 2.4)*

*At facilities for which a phased (step by step) approach to decommissioning has been selected, account should be taken in the safety assessment of the phases, the nature of the decommissioning activities and the hazards they entail, which may differ for each phase. A graded approach should be applied to each decommissioning phase. (WS-G-5.2, para 3.4)*

#### **DE-55:**

The licensee shall carry out at regular intervals a review of the safety of the facility under decommissioning at a frequency established by the regulatory body.

An update of the safety case according to DE-54 that also fulfils the requirements of DE-56 is equivalent to the review required above.

**DE-56:**

The review according to DE-55 shall confirm the compliance of the decommissioning activities and states with regulatory requirements and any deviations shall be resolved. It shall also identify and evaluate the safety significance of deviations from applicable current safety standards and best practices and take into account the cumulative effects of changes to procedures, modifications to the facility and the decommissioning organization, technical developments, decommissioning experience accumulated and ageing of SSCs. The safety case shall be updated accordingly.

**2.4.2 Safety issue: Decommissioning reporting****DE-57:**

The licensee shall review the progress in decommissioning against the plan and shall report periodically on the results to the regulator as required.

*Related IAEA safety standards:*

*The responsibilities of the licensee shall include:*

- ...
- Keeping and retaining records and submitting reports as required by the regulatory body. (GSR Part 6, para 3.4)

**DE-58:**

The licensee shall prepare a final decommissioning report to demonstrate, that the decommissioning has been completed and the proposed end state of the facility or site has been achieved.

*Related IAEA safety standards:*

*A final decommissioning report shall be prepared by the licensee to demonstrate that the end state of the facility as specified in the approved final decommissioning plan has been reached. This report shall be submitted to the regulatory body for review and approval (GSR Part 6, para 9.1)*

*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.*

*(GSR Part 6, para 9.7)*

#### DE-59:

The licensee shall ensure that relevant records and the final decommissioning report are available and accessible at the end of decommissioning according to the national regulatory system.

*Related IAEA safety standards:*

*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 (GSR Part 6, para 9.7)*

*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.*

*(GSR Part 6, para 9.7)*

### 2.4.3 Safety issue: License termination conditions

#### DE-60:

Before a facility or site can be released from regulatory control, the licensee shall perform a final survey to demonstrate that the end-state, as approved by the regulatory body, has been met.

*Related IAEA safety standards:*

*The responsibilities of the licensee shall include:*

- ...
- Verifying that end state criteria have been met by performing a final survey. (GSR Part 6, para 3.4)

*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 (GSR Part 6, Requirement 15)*

#### DE-61:

At the completion of decommissioning, the licensee shall not be relieved of responsibility for the facility or site unless the regulatory body has agreed.

*Related IAEA safety standards:*

*On the basis of this review and evaluation, the regulatory body shall decide on the termination of the authorization for decommissioning and on the release of the facility and/or the site from regulatory control (GSR Part 6, para 9.2)*

**DE-62:**

In the case of restricted use the licensee shall provide a long term impact assessment, an appropriate surveillance regime and any proposed land use restrictions.

*Related IAEA safety standards:*

*If the approved decommissioning end state is release from regulatory control with restrictions on the future use of the remaining structures, appropriate controls and programmes for monitoring and surveillance shall be established and maintained for the optimization of protection and safety, and protection of the environment. These controls shall be subject to approval by the regulatory body. Responsibility for implementing and maintaining these controls and programmes shall be clearly assigned. The regulatory body shall ensure that a mechanism is put in place to ensure compliance with the restrictions on the future use of the facility and/or the site. (GSR Part 6, para 9.3)*

# Appendix A:

## Safety Case for Decommissioning (example)

A typical safety case for decommissioning includes:

- description of the site, the facility layout (including the radiological characterisation plan of the facility) and facility performance during decommissioning activities,
- demonstration how safety is achieved (for normal operation and accidental situations, addressing radiological hazards and conventional hazards<sup>1</sup>), that may result in radiological consequences, and related scenario<sup>2</sup>)),
- detailed descriptions of the safety functions; all safety systems and safety-related SSCs; their design basis and functioning in all decommissioning states including anticipated decommissioning occurrences and accidents identify applicable regulations codes and standards,
- description of the relevant aspects of the decommissioning organization and the management of safety,
- documentation on the evaluation of the safety aspects related to the site,
- outline of the general safety objectives of decommissioning, design concept and the approach adopted to meet the fundamental safety objectives,
- description of the safety analyses performed to assess the safety of the facility in response to postulated initiating events against safety criteria and radiological release limits (see Appendix B),
- description of the on-site emergency operation procedures and accident management guidelines, the inspection and testing provisions, the qualification and training of personnel, the decommissioning experience feedback programme, and the ageing management,
- technical bases for and description of the operational limits and conditions (OLCs),
- description of the policy, strategy, methods and provisions for radiation protection,
- description of the emergency preparedness arrangements,
- description of the on-site radioactive waste management provisions.

<sup>1</sup>) *Significant conventional hazards that are of particular importance in the case of decommissioning are e.g. include: lifting and handling of heavy loads, use of hazardous materials for decontamination, stability of decontaminated structures, demolition.*

<sup>2</sup>) *Scenario related to radiological hazards that are of particular importance in the case of decommissioning are e.g. include: extensive cutting of activated and contaminated material, modification of safety barriers, entry into areas of the plant that were normally inaccessible, decontamination of large items, dispersion of contamination during demolition.*



# Appendix B:

## Postulated Initiating Events

As part of the safety assessment for decommissioning the consequences from postulated initiating events (PIE) will be addressed. Following is a typical list of postulated initiating events:

### **External postulated events**

#### Natural phenomena

- Extreme weather conditions (precipitation: rain, snow, ice, frazil, wind, lightning, high or low temperature, humidity)
- Flooding
- Earthquake
- Natural fires
- Effect of terrestrial and aquatic flora and fauna (blockage of inlet and outlets, damages on structure)
- Possible combinations of such conditions

#### Human induced phenomena

- Fire, explosion or release of corrosive/hazardous substance (from surrounding industrial and military installations or transport infrastructure)
- Aircraft crash (accidents)
- Missiles due to structural/mechanical failure in surrounding installations
- Flooding (failure of a dam, blockage of a river)
- Power supply and potential loss of power
- Civil strife (infrastructure failure, strikes and blockages)
- Possible combinations of such conditions

Special attention should be given to complex sites, where external events are likely to affect also neighbouring installations which could cause additional stress on the safety of the facility under decommissioning.

### **Internal postulated events**

- Loss of energy and fluids: Electrical power supplies, air and pressurised air, vacuum, super heated water and steam, coolant, chemical reagents, and ventilation;
- Improper use of electricity and chemicals
- Mechanical failure including drop loads, rupture (pressure retaining vessels), leaks (corrosion), plugging
- Instrumentation and control, human failures
- Internal fires and explosions (gas generation, process hazards)
- Flooding, vessel overflows

*Related IAEA safety standards:*

*Appendix I – EXAMPLE OF A CHECKLIST OF HAZARDS AND INITIATING EVENTS (WS-G-5.2, Annex I)*

### **Internal initiating events**

#### *Radiological initiating events*

##### *Criticality*

- *Residue of fissile material in equipment and process lines*
- *Residue of fissile radioactive liquid in tanks*
- *Presence of moderators (e.g. water, polyvinylchloride) in the vicinity of fissile material*

##### *Spread of contamination*

- *Loss of containment integrity, loss of barriers*
- *Dismantling of containment or barriers*
- *Dropping of radioactive material and packages and radioactive waste*
- *Cleanup of buildings (e.g. activated or contaminated)*

##### *External exposure*

- *Activated material and equipment*
- *Direct radiation sources*

##### *Internal exposure*

- *Physical and chemical state of the radioactive material*

##### *Contamination, corrosion, etc.*

- *Spectrum, activity, emitters (e.g. presence of alpha emitters)*
- *Gaseous and liquid effluents*

#### *Non-radiological initiating events*

##### *Fire*

- *Thermal cutting techniques (e.g. using zircaloy)*
- *Decontamination process (e.g. chemical, mechanical or electrical methods or mixed methods for removing contamination from metal, concrete or other surfaces)*
- *Accumulation of combustible materials and radioactive waste*
- *Flammable gases and liquids Explosion*
- *Decontamination process*
- *Dust (e.g. graphite, zircaloy)*
- *Radiolysis (e.g. in the storage or transport of radioactive waste)*
- *Compressed gases*
- *Explosive substances*

*Flooding*

- *Leakage of liquid storage*
- *Leakage of pipes*
- *Pipe breaks*

*Toxic and hazardous materials*

- *Asbestos, glass wool in thermal insulation systems*
- *Lead in paint shielding*
- *Beryllium and other hazardous metals*
- *Polychlorinated biphenyls*
- *Oils*
- *Pesticides in use*
- *Biohazards*

*Electrical hazards*

- *Loss of power supply*
- *High voltage*
- *Non-ionizing radiation (e.g. lasers)*

*Physical hazards*

- *Falling of heavy loads*
- *Loads falling on SSCs important to safety*
- *Loads falling on radioactive material (e.g. packages)*
- *Collapse of structures (e.g. due to ageing)*
- *Demolition activities*
- *Working at heights*
- *High noise levels*

*Human and organizational initiating events*

- *Operator errors, violations*
- *Inadvertent entry into radiation areas*
- *Misidentification of actions*
- *Actions by contractors and subcontractors*
- *Performance of incompatible actions*
- *Disabling of services to other facilities*
- *Poor ergonomic conditions*

*External initiating events*

*Earthquake*

*External flooding*

- *River*
- *Sea*
- *Infiltration of groundwater*

*External fire (e.g. oil storage)*

*Extreme weather conditions (e.g. temperature, winds, snow)*

*Industrial hazards (e.g. explosion)*

*Other initiating events*

*High temperatures and pressures*

*Corroded barriers*

*Unknown or unmarked materials*

*Selected postulated initiating events (NS-R-5, Appendix 1)*

## **EXTERNAL POSTULATED INITIATED EVENTS**

### **Natural phenomena**

*Natural phenomena would include:*

- (a) Extreme weather conditions:  
precipitation including rain, hail, snow, ice; frazil ice; wind including tornadoes, hurricanes, cyclones,  
dust storms or sand storms; lightning, extreme high or low temperatures; extreme humidity;*
- (b) Flooding;*
- (c) Earthquake and eruption of volcanoes;*
- (d) Natural fires;*
- (e) Effect of terrestrial and aquatic flora and fauna (leading to blockages of inlets and outlets and  
damages to structures)*

### **Human induced phenomena**

- (a) Fires, explosions or releases of corrosive or hazardous substances (from surrounding industrial or  
military installations or transport infrastructures);*
- (b) Aircraft crashes;*
- (c) Missile strikes (arising from structural and/or mechanical failure in surrounding installations);*
- (d) Flooding (e.g. failure of a dam, blockage of a river);*
- (e) Loss of power supply;*
- (f) Civil strife (leading to infrastructure failure, strikes and blockages).*

### **Internal postulated events**

*Internal events would include:*

- (a) Loss of energy and fluids (e.g. loss of electrical power supplies, compressed air, vacuum,  
superheated water and steam, coolant, chemical reagents, and ventilation);*
- (b) Failure in use of electricity and chemicals;*
- (c) Mechanical failure, including drop loads, rupture (of pressure retaining vessels or pipes), leaks (due  
to corrosion), plugging;*
- (d) Failures of, and human errors with, instrumentation and control systems;*
- (e) Internal fires and explosions (due to gas generation and process hazards);*
- (f) Flooding, (e.g. vessel overflows).*

## Appendix C:

# Explanation of the relationship between Final Decommissioning Plan and Safety Case

The WENRA WGWD applies in its reference levels for the safety during decommissioning a concept of decommissioning plan and safety case for decommissioning to address aspects of importance for safety of decommissioning in all phases of a facility lifetime.

During the operational period the initial and updated decommissioning plan is addressing on a low level of details basic aspects of a future decommissioning of the facility. At the time of application for authorisation the aspects of planning of the individual decommissioning activities are addressed in the final decommissioning plan. Typical elements of the final decommissioning plan are:

- a detailed description of the intended decommissioning activities,
- information on the timeframe for the decommissioning,
- a description of the end-state of decommissioning,
- description of the content of phases, in case of a decommissioning project structured in different phases, and
- a description of the waste management programme.

Those parts relevant for safety during decommissioning, e.g. description of the intended decommissioning activities, are subject to a safety assessment and become part of the safety case for decommissioning which is the collection of arguments and evidence in support of the safety during decommissioning. An example of a safety case for decommissioning is already provided in Appendix A. Typical elements of a safety case are:

- a description of the legal framework,
- a facility description (incl. the radioactive and hazardous materials inventory),
- a description on the safety assessment for normal operation and accident situations and its results,
- a description of structures, systems and components and operational limits and conditions,
- the radiation protection programme,
- description of the on-site emergency planning.

Often large decommissioning projects are divided into different phases. In such cases the final decommissioning plan addresses in detail the first phase while the subsequent phases are

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addressed on a lower level; following figure illustrates this situation. Accordingly, the level of detail for future phases needs further evolution during conduct of decommissioning resulting in updates of the decommissioning plan for the specific phases. The safety relevant elements of the updated decommissioning plan become subject to related safety assessments which might result in revisions of the safety case for decommissioning.

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## Part 3

# NAP Benchmarking Results

Part III of the Decommissioning Report provides information on the process of benchmarking, i.e. the verification of the application of decommissioning SRLs in WENRA Member States using a systematic appraisal procedure in the working group taking into account the national action plans (NAPs), a process for carrying out corrective actions when-ever any deficiencies had been identified in the previous benchmarking process.



## 3.1

# Benchmarking of original decommissioning SRLs (V.1)

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The benchmarking process compassed two main steps of evaluation. In the first step all participating countries performed a self-assessment of their national regulatory system with regard to the WENRA safety reference levels (SRLs). In accordance with WENRA's Reactor Harmonisation Working Group (RHWG) a code of three degrees for evaluation has been applied:

- A – The requirement is covered explicitly by national regulatory system: no action required.
- B – A difference exists, but can be justified from the safety point of view: no action required.
- C – A difference exists and should be addressed by the member.

For the self-assessment each country had to perform the rating level by level and to justify the proposed rating by quoting the relevant text sections from the corresponding national regulatory requirement in an evaluation table.

In the second step of the benchmarking the results of the self-assessment were reviewed by other countries. In order to review the rating and justifications, the seventeen participating WENRA Member States were subdivided in the same four sub-groups already established during the Radioactive Waste Storage benchmarking exercise. Each country had to justify its self-assessment to the members of the review group. In the sub-group sessions, the self-assessment of the group members were reviewed in detail and up- or downgraded if appropriate. The group sessions took place during the WGWD meetings, starting at the 19th meeting in Den Haag end of November 2007 and formally ending at the 22nd meeting in Brussels in April 2009.

The evaluation process outlined here above in brief shortness is referred to as **legal benchmarking**. With respect to the benchmarking exercise performed for spent fuel and radioactive waste storage, in the case of decommissioning the benchmark addressing the implementation of the SRLs in existing facilities was not carried out. The WGWD took this decision having considered that in some countries the decommissioning activity is not well developed.

## 3.2

# Benchmarking Results of SRLs (V.1)

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The summary of results presented in the following tables is based on the summary tables, which were prepared by the secretaries of the sub-groups.

Table 1 gives an overview of the legal benchmarking results by country and SRL for decommissioning. The results of legal benchmarking are presented for each country. The rating is represented by the colours green for A, blue for B and red for C.

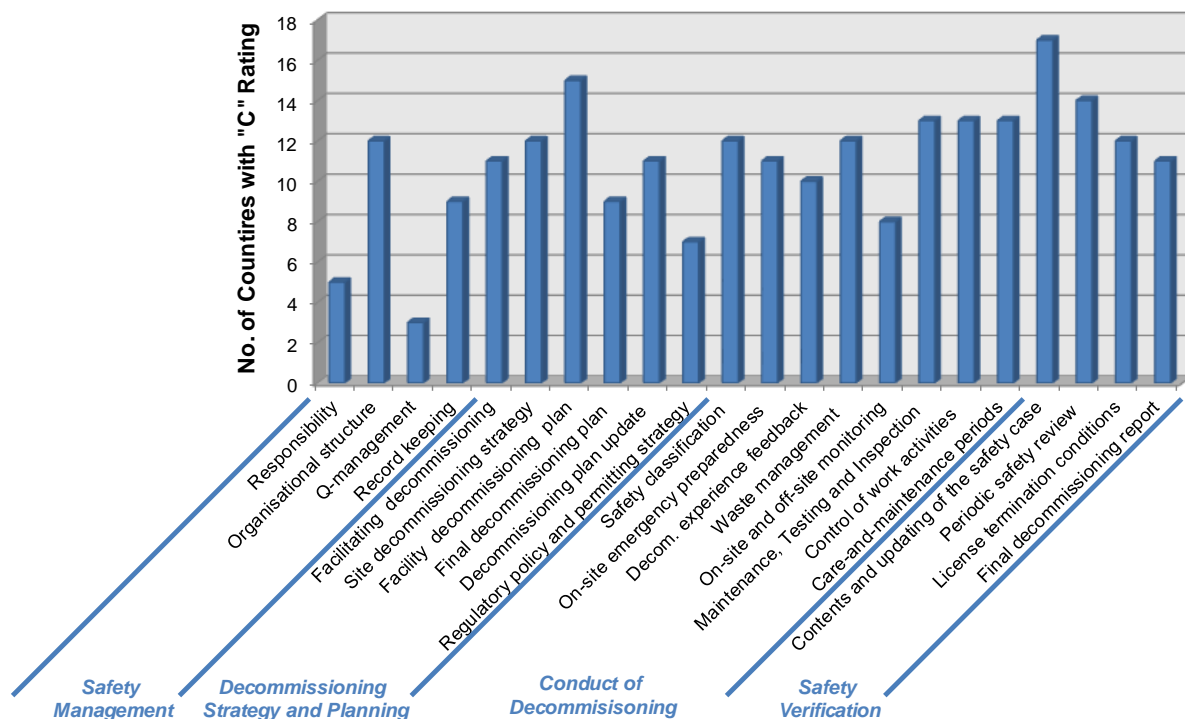
As agreed by the WGWD, the C-ratings of the regulatory benchmarking for each country are listed in the table without further comment. The compilation of the C-ratings is the basis for development of the national action plans.

Figure 1 provides a compilation of the legal benchmarking results with regard to the C-ratings. Each column corresponds to one safety issue, which comprises several SRLs. The height of the column represents the number of countries, which have at least one (or more) C-ratings for the respective safety issue. As the number of participating countries is 17, one can see from the figure that for the safety issues “Contents and updating of the safety case” (D-60 to D-70) all countries received at least one C-rating. It emphasised again that the benchmarking results presented here are reflecting the SRLs and the legal and licensing status as of the year 2007.

**Table 1** Overview on the legal benchmarking results for decommissioning by countries (SRLs V.1 as of March 2007)

		SRL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Safety Management	responsibility	1																	
		2																	
		3																	
	organisational structure	4																	
		5																	
		6																	
		7																	
	8																		
	Q-management	9																	
record keeping	10																		
	11																		
Decommissioning strategy and planning	Facilitating decommissioning	12																	
		13																	
	Site decommissioning strategy	14																	
		15																	
		16																	
		17																	
		18																	
	Facility decommissioning plan	19																	
		20																	
		21																	
		22																	
		23																	
		24																	
	Final decommissioning	25																	
		26																	
		27																	
	Decommissioning plan update	28																	
		29																	
	Regulatory policy and permitting strategy	30																	
		31																	
32																			
33																			
34																			
35																			
Conduct of decommissioning	Safety classification	36																	
	On-site emergency preparedness	37																	
		38																	
		39																	
	Decom. experience feedback	40																	
		41																	
		42																	
	Waste management	43																	
		44																	
		45																	
	On-site and off-site	46																	
		47																	
48																			
Maintenance, Testing and Inspection	49																		
	50																		
	51																		
	52																		
	53																		
Control of work activities	54																		
	55																		
	56																		
Care-and-maintenance periods	57																		
	58																		
	59																		
Safety Verification	contents and updating of the safety case	60																	
		61																	
		62																	
		63																	
		64																	
		65																	
		66																	
		67																	
	Periodic safety review	68																	
		69																	
		70																	
		71																	
		72																	
	License termination conditions	73																	
		74																	
		75																	
Final decommissioning	76																		
	77																		
	78																		
sum	79																		
	80																		
	81																		
sum	A	35	13	39	13	46	40	58	19	77	28	35	62	55	36	44	42	76	
sum	B	2	5	2	0	0	3	4	0	1	0	0	0	3	0	2	2	0	
sum	C	44	63	40	68	35	38	19	62	3	53	46	19	23	45	35	37	0	

**Figure 1** Number of countries with C-ratings sorted by safety issues



### 3.3

## Preparation of National Action Plans, SRL-update

—

After final conclusion of the regulatory benchmarking procedure in 2009, the WGWD members were requested in accordance with the approach of the RHWG to develop and present national actions plans (NAPs) of their countries, in order to demonstrate the planned activities and efforts for harmonising their national regulatory requirements with the WENRA safety reference levels (SRLs). The need for harmonisation was derived from the results of the legal benchmarking for each country, where existing differences in the national regulatory requirements with respect to the WENRA SRLs have been identified.

The NAP initially had to provide information on planned modification and amendments of relevant national regulatory requirements. It had to be treated as a “living document” and be improved and completed stepwise in line with ongoing process for harmonisation of the national regulatory requirements. Finally, it provides a document that demonstrates the respective national regulatory requirements being in line with the WENRA SRLs. This activity was initiated by the WGWD chairman at the 22<sup>nd</sup> meeting in Brussels in April 2009 and had to be performed in parallel to other tasks of the WGWD, for instance a review of the decommissioning report. At the following meetings, the country representatives regularly gave short oral reports on the status and progress of their NAPs.

The deadline for implementation of NAP-actions had originally been set at the end of 2012 but was by later decision of WENRA directors extended to the end of 2013 and later until 2014. This extension was deemed necessary because the requirements in the original draft set of 81 decommissioning V.1-SRLs (referred to as V.1) had been reworded and rearranged resulting in a finally approved set of only 62 decommissioning V.2-SRLs. It is to be emphasised that in doing so no basic objective of requirements of the original V.1-SRLs had been lost. In some cases, however, the degree of detail was adjusted to the general character of WENRA SRLs. For some SRLs, the details of the requirements have been transferred to Appendix A and B. Furthermore the new V.2-SRLs took into account the most recent developments in IAEA publications especially the modified approach to quality (“management system” approach replaced “quality management” / “quality control” / “quality assurance”). This resulted in the formulation of several new SRLs in V.2.

Before taking any action, obviously the results of the benchmarking exercise, which referred to the V.1-SRLs had first to be related to the updated V.2-set of SRLs. To support member countries in this translation procedure WGWD prepared the following cross reference table (Table 2) indicating the relation between old and new SRLs and providing information on changes of the addressed requirements.

**Table 2** Cross reference table indicating the relation between SRLs V.1 and SRLs V.2; SRLs with relevant modifications are highlighted in green colour coding

SRL V.1	Requirement (short description)	SRL V.2
D-01	Responsibilities	DE-01
	Prime responsibilities, safety policy	DE-02
D-02	Maintaining safety, controlling contractors	DE-03
D-03	Ownership	DE-04
D-04	Organisational structure	DE-05
D-05	Licensee's capabilities	DE-06
D-06	Allocation of authorities	DE-07
D-07	Defining qualification	DE-08
D-08	Knowledge keeping during life time	DE-09
D-09	Application of management system	DE-12
D-10	Knowledge keeping during life time	DE-09
D-11	Record system	DE-10
	Implementation of management system	DE-11
	Procurement and quality	DE-13
	Documentation of management system	DE-14
D-12	Need to decommissioning	DE-15
D-13	Baseline survey	DE-16
D-14	Establishing decommissioning strategy, multi-facility site	DE-17, DE-22
D-15	Documentation of decommissioning strategy	DE-18
D-16	Establishing decommissioning strategy	DE-17
D-17	Initial decommissioning strategy	
D-18	Proposition of end-state	
D-19	Review of decommissioning strategy	
D-20	Establishing initial decommissioning plan	DE-19
D-21	Submitting initial decommissioning plan	DE-20
D-22	Content of initial decommissioning plan	DE-21
D-23	Review of decommissioning plan	DE-23
D-24	Safety assessment, graded approach	DE-24
D-25	Classification of systems	DE-25
D-26	Informing regulatory body of planned shut down	DE-26
D-27	Submitting final decommissioning plan	DE-27
	Content of final decommissioning plan	DE-28
D-28	Review of final decommissioning plan	DE-29
D-29	Modification of planned activities	DE-47
D-30	Procuring safety	

SRL V.1	Requirement (short description)	SRL V.2
D-31	Regulatory framework	
D-32	Licensing decommissioning	
D-33	Permitting commencement of decommissioning	
D-34	Permitting decommissioning operations	
D-35	Review of progress	DE-57
D-36	Re-classification of systems	DE-30
D-37	Responding to events, preparing on-site emergency plan	DE-31, DE-32
D-38	Responding to events, preparing on-site emergency plan	DE-31, DE-32
D-39	Performing on-site emergency exercises	DE-34
D-40	Review of on-site emergency plan	DE-33
D-41	Implementing experience feedback arrangements	DE-35
D-42	Pro-active implementation of corrective actions	DE-36
D-43	Waste characterisation	DE-38
D-44	Waste segregation	DE-39
D-45	Record keeping of waste	DE-40
D-46	Record keeping of waste	DE-40
D-47	Review of monitoring program	DE-41
D-48	Inspection of SSCs	DE-42
D-49	Aging management	DE-43
D-50	Periodic inspections of SSCs	
D-51	Record keeping of inspections	DE-44
D-52	Repairs to SSCs	
D-53	Implementing corrective actions after events	DE-37
D-54	Record keeping of inspections	DE-44
D-55	Assessing decommissioning activities	DE-46
D-56	Work authorisation procedures	DE-45
D-57	Work authorisation procedures	DE-45
D-58	Passive-safety of deferment	DE-48
D-59	Care-and-maintenance of deferment	DE-49
D-60	Content of safety case	DE-50
D-61	Content of safety case	DE-50
D-62	Content of safety case	DE-50
D-63	Content of safety case	DE-50
D-64	Safety case and decommissioning plan	DE-51
	Submitting safety case	DE-52
D-65	Radiological characterisation	DE-53
D-66	Comparing survey results with records	
D-67	Review of safety case	DE-54

<b>SRL V.1</b>	<b>Requirement (short description)</b>	<b>SRL V.2</b>
D-68	Reviewing operational limits and conditions	
D-69	Update of safety case	
D-70	Consolidating the safety case	
D-71	Review of safety of facility under decommissioning	DE-55
D-72	Expected results of review	DE-56
D-73	Taking improvement measures	
D-74	Periodic safety review	
D-75	Content of safety review	
D-76	Relieving responsibility of facility or site	DE-61
D-77	Final survey of facility or site	DE-60
D-78	Possible end-states of decommissioning	
D-79	Ending decommissioning with restrictions	DE-62
D-80	Preparation of final decommissioning report	DE-58
D-81	Record keeping at the end of decommissioning	DE-59



## 3.4

# Benchmarking of National Action Plans

—

As previously explained it was understood that all agreed C-ratings in the individual national regulatory systems would require actions in order to reach full compatibility with the set of WENRA SRLs. The whole procedure included the following successive steps:

1. Preparation of comprehensive list of C-ratings (Table 1)
2. For each C-rated SRL of V.1:
  - a. Find corresponding new SRL of V.2 (Table 2)
  - b. Use the new V.2 text of this SRL for updating national regulatory system
3. Follow step 2b also for any new SRLs and any SRL with relevant requirement changes in the transformation procedure from V.1 to V.2
4. Supply reference for actions as carried out and report to WGWD

The final objective of the NAPs was to provide the necessary arguments to WGWD that missing requirements had been fully included in each country's national regulatory system. For the final approval a second benchmarking exercise was performed specifically concentrating on those NAPs which were claimed to be finally concluded. For this review process WGWD used the same techniques as for the original legal benchmarking, sometimes working in the plenary and sometimes in up to four sub-groups, as appropriate. The first group benchmarking of NAPs took place at the 30th meeting in Prague on 26<sup>th</sup> – 28<sup>th</sup> February 2013. In total eight NAPs ready for benchmarking had been submitted in advance of or during this meeting. After discussion and agreement on the rules for evaluation, the benchmarking was commenced in plenary. Further evaluations of NAPs have been done in the following WGWD meetings until the 34th meeting in Paris in March 2015. Some countries were not able to fulfil their NAP within this time frame, in particular due to time-consuming procedures needed to implement the requirements of the SRLs in their national regulatory systems.

In the following section 5, the results of the NAP benchmarking are presented for each country as far as available in two parts. The first part (text) consists of a short description on the measures taken for fulfilment of the NAP, provided by each country. The second part is a table, which lists in the first column the SRLs for which differences had been identified initially, whereas columns two and three show the status of harmonisation. An A-rating in the second column indicates that the required harmonisation has been implemented in the national regulatory system and was agreed by the WGWD. For countries, whose NAP benchmarking

procedure could not yet be concluded by the WGWD at least at their meeting in March 2015 information as provided by the respective country representative is presented. In an update for this version 2.3 of the report, specific country reports were updated as of autumn 2023. Previously agreed improvement actions taken before end of March 2015 were deleted from the action plans, so as to display only recent and still pending activities.

## 3.5

# Country Implementation Reports

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The following country specific information reflects the status as of autumn 2023. In the tables on the results of NAP benchmarking any actions which had been approved in benchmarking prior to summer 2015 (edition of report version 2.2) have been deleted. For explanations of earlier activities please consult earlier versions of this report. Hence the tables display all harmonization activities between mid 2015 and mid 2023 as well as any open issues.

### 3.5.1 BELGIUM

#### **Regulatory changes taken for the National Action Plan**

In Belgium, many of the WENRA decommissioning safety reference levels are covered by the generic chapter 2 of the Royal Decree “Safety requirements for nuclear installations”, published on 30th November 2011. This chapter 2 includes the WENRA reactor safety reference levels that Belgium considered to be applicable to all its major nuclear installations (class I installations), which includes installations in decommissioning.

At the 32<sup>nd</sup> WGDW meeting in Rome in February 2014, Belgium reported its regulatory implementations for benchmarking; 23 C-ratings were remaining. To comply with the remaining decommissioning safety reference levels, an additional subsection on Decommissioning to the Royal Decree on 30th November 2011 was drafted. The draft text was already taken into account for at the benchmarking during WGWD 32 and accepted for 22 SRLs just waiting for confirmation of the decree’s publication. The addition to the Royal decree was finally published on August 28<sup>th</sup> 2015. Belgian regulations are now in full agreement with the requirements mandated by the WGWD SRLs, except for reference level DE-20 (see Table).

Regarding this reference level DE-20, basic expectations are included in the Royal Decree “Safety requirements for nuclear installations”, Ch. 2, Art. 7.6, but expectations for an actual initial decommissioning plan, while existing, need to be formalised. On June 28<sup>th</sup> 2018 an amendment of the General Radiation Protection Decree (Decree of July 20<sup>th</sup> 2001) was signed which requires that from now on, all licensees must submit basic information on the future decommissioning as part of the license application for new installations (compiled in a so called “sub-file decommissioning”). However, this “sub-file decommissioning” is not yet as detailed as an initial decommissioning plan.

## Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-20	C	
DE-30	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/3 : Systems, structures et components)
DE-33	A	FANC 30/11/2011 as amended 28/08/2015 : Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/9 : On-site emergency plan)
DE-35	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/7 : Experience management)
DE-36	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/7 : Experience management)
DE-38	A	FANC 30/11/2011 as amended 28/08/2015 : Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/5 Waste management)
DE-39	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/5 : Waste management)
DE-40	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/6 : Documents management)
DE-46	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/10 : Dismantling safety case); Royal Decree of 20 July 2001: General Radioprotection Regulation for the protection of the workers, the population and the environment

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
		against the danger of ionising radiations(Chapter 2, Article 17 : Cessation of activity and dismantling)
DE-48	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/2 : Deferred dismantling)
DE-49	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/2 : Deferred dismantling)
DE-50	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/10 : Dismantling safety case)
DE-51	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/10 : Dismantling safety case)
DE-52	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/10 : Dismantling safety case)
DE-53	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/10 : Dismantling safety case)
DE-54	A	FANC 30/11/2011 as amended 28/08/2015 : Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/10 : Dismantling safety case)
DE-55	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/11 : Periodic safety review during dismantling).
DE-56	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2,

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
		Section VI Decommissioning, Article 17/11 : Periodic safety review during dismantling).
DE-58	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/12 : End state characterisation and final dismantling report)
DE-59	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/12 : End state characterisation and final dismantling report)
DE-60	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/12 : End state characterisation and final dismantling report)
DE-61	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/12 : End state characterisation and final dismantling report)Royal Decree of 20 July 2001: General Radioprotection Regulation for the protection of the workers, the population and the environment against the danger of ionising radiations (Chapter 2, Article 17 : Cessation of activity and dismantling)
DE-62	A	FANC 30/11/2011 as amended 28/08/2015: Royal Decree of 30 November 2011 on the safety requirements for nuclear installations (Chapter 2, Section VI Decommissioning, Article 17/12 : End state characterisation and final dismantling report)

### 3.5.2 BULGARIA

#### **Regulatory changes taken for the National Action Plan**

In connection with the amendment of the Act on the Safe Use of Nuclear Energy (ASUNE) (amended 86/02.08.2013) a review of the existing secondary legislation for its implementation has been carried out, which has imposed the development of a new Regulation on Safety during Decommissioning of nuclear facilities. The ASUNE contains the general safety requirements for decommissioning of nuclear facilities.

Some of the specific requirements for safe decommissioning are included in the Regulation on the Procedure for Issuing Licenses and Permits or Safe Use of Nuclear Energy (amended 76/05.10.2012) and mainly in the draft Regulation on Safety in Decommissioning of nuclear facilities. All the requirements necessary for the achievement of the WENRA safety reference levels are included in the draft regulation. The regulation has been developed and at present discussions are being held on its internal approval in the BNRA. Due to the complicated procedure of amendments to the legislation and the ongoing discussions with stakeholders its promulgation is expected this year. It is expected that the 41 pending SRLs can undergo a benchmarking thereafter and the NAP of Bulgaria can be closed.

Although the Regulation on Safety during Decommissioning has not been promulgated, the process of issuing by the BNRA of licenses for decommissioning of Kozloduy NPP Units 1 and 2 takes into account the WENRA SRLs.

The license conditions are in compliance with the SRLs and address some requirements, which have not been yet introduced in the legislation.

## Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-02	C	Art. 3 of the ASUNE and Draft Regulation on Decom of NF (not yet in force)
DE-06	C	Art. 40 (3) and Art. 45 (1) of the Draft Regulation on Decom of NF (not yet in force)
DE-11	C	Art. 31, Art. 32 (1) and Art. 38 (1), (2), (4) of the Draft Regulation on Decom of NF (not yet in force)
DE-13	C	Art. 32 (4) of the Draft Regulation on Decom of NF (not yet in force)
DE-14	C	Art. 36 (1) , points: 4, 5, 6, 7, 8 of the Draft Regulation on Decom of NF (not yet in force)
DE-16	C	Art. 30 (2) of the Draft Regulation on Decom of NF (not yet in force)
DE-17	C	Art. 10 (1), (2) of the Draft Regulation on Decom of NF (not yet in force)
DE-18	C	Art. 10 (3) of the Draft Regulation on Decom of NF (not yet in force)
DE-19	C	Art. 12 (1) of the Draft Regulation on Decom of NF (not yet in force)
DE-20	C	Art. 12 (5) of the Draft Regulation on Decom of NF (not yet in force)
DE-21	C	Art. 12 (4) and (6) of the Draft Regulation on Decom of NF (not yet in force)
DE-22	C	Art. 10 (9) of the Draft Regulation on Decom of NF (not yet in force)
DE-23	C	Art. 13 (1) and (2) of the Draft Regulation on Decom of NF (not yet in force)
DE-24	C	Art. 17 (1) of the Draft Regulation on Decom of NF (not yet in force)
DE-25	C	Art. 16 (6) of the Draft Regulation on Decom of NF (not yet in force)
DE-26	C	Art. 16 (1) of the Draft Regulation on Decom of NF (not yet in force)
DE-27	C	Art. 16 (2) of the Draft Regulation on Decom of NF (not yet in force)
DE-28	C	Art. 16 (6) of the Draft Regulation on Decom of NF (not yet in force)
DE-30	C	Art. 19 (3) of the Draft Regulation on Decom of NF (not yet in force)
DE-35	C	Art. 38 (2) of the Draft Regulation on Decom of NF (not yet in force)
DE-36	C	Requirements will be added in the Draft Regulation on Decom of NF (not yet in force)
DE-37	C	Art. 40 (6) of the Draft Regulation on Decom of NF (not yet in force)



# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-40	C	Art. 27 (30) of the Draft Regulation on Decom of NF (not yet in force)
DE-42	C	Art. 19 (6) of the Draft Regulation on Decom of NF (not yet in force)
DE-43	C	Art. 19 (8) of the Draft Regulation on Decom of NF (not yet in force)
DE-44	C	Art. 19 (7) of the Draft Regulation on Decom of NF (not yet in force)
DE-45	C	Art. 44 (4) of the Draft Regulation on Decom of NF (not yet in force)
DE-46	C	Art. 17 (9) of the Draft Regulation on Decom of NF (not yet in force)
DE-47	C	Art. 12 (10) of the Draft Regulation on Decom of NF (not yet in force)
DE-48	C	Art. 20 (3) of the Draft Regulation on Decom of NF (not yet in force)
DE-49	C	Art. 20 (1) of the Draft Regulation on Decom of NF (not yet in force)
DE-50	C	Art. 17 (2) and (3) of the Draft Regulation on Decom of NF (not yet in force)
DE-52	C	Art. 16 (4) of the Draft Regulation on Decom of NF (not yet in force)
DE-53	C	Requirements will be added in the Draft Regulation on Decom of NF (not yet in force)
DE-54	C	Art. 13 (2) of the Draft Regulation on Decom of NF (not yet in force)
DE-56	C	Draft Regulation on Decom of NF (not yet in force)
DE-58	C	Art. 16 (1), (2), (3), (4), (5), (6) of the Draft Regulation on Decom of NF (not yet in force)
DE-59	C	Art. 30 (10) of the Draft Regulation on Decom of NF (not yet in force)
DE-60	C	Art. 30 (4) of the Draft Regulation on Decom of NF (not yet in force)
DE-61	C	Requirements will be added in the Draft Regulation on Decom of NF (not yet in force)
DE-62	C	Art. 30 (6) Draft Regulation on Decom of NF (not yet in force)

### 3.5.3 THE CZECH REPUBLIC

#### Regulatory changes taken for the National Action Plan

The Czech Republic has reported the implementation of safety reference levels according to the former legal documents developed in late 1990's during the 19th WGWD meeting in the Den Haag in November 2007. The benchmarking process identified that less than a half of safety reference levels are not implemented and that for two safety reference levels difference exists, but can be justified from the safety point of view.

Considering the results of benchmarking process, a national action plan has been defined. The plan had to consider the timeframe for the preparation of new legal documents. When preparing the new legal documents such as Act No. 263/2016 Coll. and consecutive decrees, all WENRA WGWD SRLs, not only decommissioning ones, were considered and implemented.

From January 2017 the new legal framework went into the force in the Czech Republic. Following the national action plan a new self-assessment has been prepared and pre-screened by the WENRA WGWD representatives from Slovenia and Switzerland. Benchmarking has been performed at 39<sup>th</sup> WGWD meeting in Kiev, in September 2017. The conclusion was that all requirements of WENRA WGWD SRL's on decommissioning are fully covered by the Czech legal system. Only a part of SRL DE-50 was B-rated, as the national regulatory body, SÚJB, does not regulate conventional safety. However, this area is regulated and assessed by the State Labour Inspection Office as a part of the decommissioning authorisation process controlled by a special Construction Office.

#### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-01	A	Article 30 (263/2016 Coll.)
DE-02	A	Article 30 (263/2016 Coll.), Article 29 (263/2016 Coll.), Article 14 (408/2016 Coll.)
DE-03	A	Article 5, Section (4) (263/2016 Coll.), Article 14 (408/2016 Coll.)
DE-04	A	Article 51 (263/2016 Coll.), Article 53 (263/2016 Coll.), Article 54 (263/2016 Coll.)
DE-05	A	Article 14 (408/2016 Coll.)
DE-06	A	Article 14, letter b), item 1 (408/2016 Coll.), Article 8 (408/2016 Coll.), Article 10 (408/2016 Coll.)
DE-07	A	Article 14, letter b), item 3 (408/2016 Coll.)
DE-08	A	Article 49 (263/2016 Coll.)

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-09	A	Article 29, Section (1), letter a) (263/2016 Coll.), Article 29 (263/2016 Coll.), Article 24 (263/2016 Coll.), Article 22 (162/2017 Coll.)
DE-10	A	Article 55 (263/2016 Coll.)
DE-11	A	Article 3, Section (1), (3), (5) (408/2016 Coll.)
DE-12	A	Article 29, Section (1), (3) (263/2016 Coll.), Article 7 (408/2016 Coll.)
DE-13	A	Article 29, Section (1), (3) (263/2016 Coll.)
DE-14	A	Article 14, letter a), b) (408/2016 Coll.), Article 29, Section (3) (263/2016 Coll.),
DE-15	A	Article 46, Section (4) (263/2016 Coll.), Article 49, Section (1) (263/2016 Coll.)
DE-16	A	Article 47, Section (1) (263/2016 Coll.)
DE-17	A	Article 13, Section (1) (377/2016 Coll.)
DE-18	A	Article 13, Section (1), letter a), b) and c) (377/2016 Coll.)
DE-19	A	Article 13, Section (3) (377/2016 Coll.), Article 5 (263/2016 Coll.)
DE-20	A	Annex 1, Section 1, letter a), b) (263/2016 Coll.)
DE-21	A	Article 49, Section (1), letter b 1.) (263/2016 Coll.), Article 13, Section (2), (3) (377/2016 Coll.)
DE-22	A	Article 13, Section (2) (377/2016 Coll.)
DE-23	A	Article 13, Section (4) (377/2016 Coll.)
DE-24	A	Article 13, Section (2) (377/2016 Coll.); Article 5, Section (8) (263/2016 Coll.)
DE-25	A	Article 13, Section (2) (377/2016 Coll.)
DE-26	A	Article 54, Section (1) (263/2016 Coll.)
DE-27	A	Article 54, Section (1) (263/2016 Coll.)
DE-28	A	Article 13, Section (1), (3), (5) (377/2016 Coll.), Annex 1, Section 1, letter h) (263/2016 Coll.)
DE-29	A	Article 13, Section (4) (377/2016 Coll.)
DE-30	A	Article 13, Section (5) (377/2016 Coll.)
DE-31	A	Article 5 (263/2016 Coll.), Article 49 (263/2016 Coll.), Article 153 (263/2016 Coll.), Annex 1, Section 2, letter b) (263/2016 Coll.), Article 151, letter a) (263/2016 Coll.), Article 156, Section (2) (263/2016 Coll.)
DE-32	A	Article 5, Section 1, letter a), Article 49, Section 1, letter r), Article 153, Section 2, Annex 1, Section 2, letter b), item 7 (263/2016 Coll.), Article 5 (359/2016 Coll.)
DE-33	A	Article 49, Section (1), letter r) (263/2016 Coll.), Article 5, Section (7) (263/2016 Coll.), Article 14 (359/2016 Coll.)

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-34	A	Article 49, Section (1), letter r) (263/2016 Coll.), Annex 1, Section 2, letter b) (263/2016 Coll.), Article 156, Section (2), letter h) (263/2016 Coll.), Article 156, Section (2) (263/2016 Coll.), Article 12, Section (6) (359/2016 Coll.), Article 18, Section (1) (359/2016 Coll.)
DE-35	A	Article 5 (263/2016 Coll.), Article 13 (162/2016)
DE-36	A	Article 49, Section (1) (263/2016 Coll.),
DE-37	A	Article 24, Section (1) (162/2017 Coll.), Article 25, Section (1) (162/2017 Coll.)
DE-38	A	Article 55 (263/2016 Coll.), Article 1-10 (377/2016 Coll.), Article 13, Section (1) (377/2016 Coll.)
DE-39	A	Article 111 (263/2016 Coll.)
DE-40	A	Article 55, Section (1) (263/2016 Coll.)
DE-41	A	Article 11, Section (4) (377/206 Coll.), Annex 1, Section 1, letter g) (263/2016 Coll.), Article 55 (263/2016 Coll.)
DE-42	A	Article 55 (263/2016 Coll.), Article 49 (263/2016 Coll.), Annex 1, Section 1, letter g) (263/2016 Coll.), Article 22 (21/2017 Coll.)
DE-43	A	Article 49, Section (1), letter s) (263/2016 Coll.)
DE-44	A	Article 7 (358/2016 Coll.), Article 8 (358/2016 Coll.)
DE-45	A	Article 49 (263/2016 Coll.), Article 15 (408/2016 Coll.)
DE-46	A	Article 48 (263/2016 Coll.), Annex 1, Section 1, letter g) (263/2016 Coll.), Article 4, Section (1), (4) (162/2017 Coll.)
DE-47	A	Article 9 (263/2016 Coll.), Annex 1, Section 1, letter h) (263/2016 Coll.)
DE-48	A	Article 55, Section (1), letter c) (263/2016 Coll.)
DE-49	A	Article 55, Section (1), letter a) (263/2016 Coll.)
DE-50	3xA, 1xB	Article 13, Section (5) (377/2016 Coll.), Annex 1, Section 1, letter g) (263/2016 Coll.) / Conventional safety out of the scope of activity of nuclear regulator, however it is assessed by the State Labour Inspection Office as a part of decommissioning authorisation of special Construction Office.
DE-51	A	Article 13, Section (5) (377/2016 Coll.)
DE-52	A	Article 16 (263/2016 Coll.), Article 24 (263/2016 Coll.)
DE-53	A	Article 13, Section (3), (5) (377/2016 Coll.)
DE-54	A	Article 15, Section (3) (162/2017 Coll.)
DE-55	A	Article 13, Section (2) (162/2017 Coll.)
DE-56	A	Article 15, Section (1) (162/2017 Coll.), Article 18, Section (1) (162/2017 Coll.)
DE-57	A	Article 55, Section (1) (263/2016 Coll.)
DE-58	A	Annex 1, Section 7 (263/2016 Coll.)

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-59	A	Article 55, Section (1), letter f) (263/2016 Coll.)
DE-60	A	Article 3, Section (2) (263/2016 Coll.), Annex 1, Section 7 (263/2016 Coll.)
DE-61	A	Article 9, Section (7) (263/2016 Coll.)
DE-62	A	Article 105, Section (2) (263/2016 Coll.)

### 3.5.4 FINLAND

#### Regulatory changes taken for the National Action Plan

The Finnish Radiation and Nuclear Safety Authority STUK regulates use of nuclear energy in Finland and gives detailed guidance in the form of guides called YVL Guides. When the WGWD safety reference levels for decommissioning were published, STUK had already begun a full revision of the regulatory guides. When performing the revision, the 41 c-rated WENRA decommissioning reference level requirements were implemented into the new Finnish regulations. The revision of the Finnish Guides was finalised in 2013 and they came into force at 1<sup>st</sup> December 2013. Decommissioning is handled by Guide YVL D.4.

Finland reported its regulatory implementations of the benchmarking based on drafts of the Guides at the 30<sup>th</sup>, 31<sup>st</sup> and 32<sup>nd</sup> WGDWD meetings in Prague and Trnava in 2013 and in Rome 2014. The requirements presented in the new YVL Guides were approved and the Finnish regulations were found to be in agreement with the requirements mandated by the WGWD SRLs.

#### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
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### 3.5.5 FRANCE

#### **Regulatory changes taken for the National Action Plan**

Since the publication of the WGWD safety reference levels for decommissioning, France has continued to fulfil its obligations to implement necessary changes into its national regulations.

The ministerial order of 7<sup>th</sup> February 2012 setting general rules relative to basic nuclear installations entered into effect on 1<sup>st</sup> July 2013. This order – which follows the “Transparency and Nuclear Safety” act of 2006 – enables an important update of the French regulatory framework that used to rely mainly on two older texts: the “quality” order of 1984 and the “environment” order of 1999.

The order of 7<sup>th</sup> February 2012 also permits to transpose directly a number of important safety reference levels identified by WENRA, such as those concerning the safety policy, the integrated management system or the safety verification. Additionally, this ministerial order contains a dedicated title on waste management and requirements for decommissioning of facilities. However, this ministerial order sets generic requirements that have to be further developed in resolutions to be issued by ASN and then approved by the Minister for nuclear safety, to give them a regulatory status.

Since the order of 7<sup>th</sup> February came into effect, several resolutions have been published : ASN Resolution of 16<sup>th</sup> July 2013 relative to control of nuisance effects and the impact of basic nuclear installation, ASN Resolution of 21<sup>st</sup> April 2015 on waste management, ASN Resolution of 13<sup>th</sup> June 2017 on preparedness for and management of emergency situations, etc. Other resolutions, regarding periodic safety review for instance, are still under preparation.

At the 30<sup>th</sup> WGWD meeting in Prague in February 2013, France reported its regulatory implementations for benchmarking, relying on provisions of the Ministerial order of 7<sup>th</sup> February 2012 and on early drafts of the decisions under validation or preparation. Thereby 24 out of 27 C-rated decommissioning SRLs could be agreed to be closed by the working group. SRLs DE-10 and DE-22 currently remain C-rated. However, the next update of the order of 7<sup>th</sup> February 2012 is expected to address these two SRLs. The third remaining SRL DE-48 will not be implemented since its content is incompatible with the French law which imposes immediate dismantling.

### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-10	C	
DE-22	C	
DE-48	C	



### 3.5.6 GERMANY

#### Regulatory changes taken for the National Action Plan

The implementation of the decommissioning safety reference levels (SRLs) was assessed with respect to their consideration during licensing and supervision of nuclear facilities, which are based on § 7 of the German Atomic Energy Act (AtG).

The regulations of nuclear law are basically geared to the requirements of the operation of nuclear power plants, but they apply to the decommissioning of nuclear power plants, research reactors and facilities of the fuel cycle as well. WGWD considered SRLs DE-15, DE-19, DE-20 – DE-24 to be fulfilled by the German Decommissioning Guide, which classifies all elements of the nuclear regulatory framework with respect to their relevance and analogous application to the decommissioning of any nuclear facility that is licensed under § 7 AtG.

For the SRLs DE-26, DE-27, DE-55, and DE-56, the C-ratings remained in the last report after re-assessment. However, no deficiency at all with respect to safety is existent in practice, as the licensee has to ensure the safety of the facility at any time by fulfilling the requirements of the license as well as of the nuclear technical regulations, which is checked within the regulatory supervision according to § 19 AtG on both a regular and an event-driven basis.

Due to the regulations of § 19 Para. 1 Sentence 2 AtG the competent supervisory authority is obliged to supervise that all legal provisions and ordinances, the orders of the competent supervisory authority, the terms and conditions of the license and subsequently imposed conditions are followed. Due to the continuous change of the status of the nuclear facility with regard to dismantling activities, nuclear facilities under decommissioning and dismantling are subject to frequent supervisory measures. As a consequence, the frequency of the assessment of the planning of the decommissioning and dismantling measures is high and exceeds that of a periodic concept, which is proposed by WENRA. The competent supervisory authority satisfies itself appropriately that the dismantling is performed according to the license and that safety is ensured all the time. Therefore, the requirements of the remaining SRLs rated as C are implemented in substance within the German regulatory system in the regulatory bodies' supervision.

The results of the German self-assessment described above were reported and agreed on during the 32<sup>nd</sup> WGDWD meeting in Rome and the 33<sup>rd</sup> WGWD meeting in Vilnius, only leaving 4 out 14 originally C-rated decommissioning SRLs.

To further address SRLs DE-55 and DE-56 a new paragraph was added to the German Decommissioning Guide in 2021: "In the case of immediate dismantling, the supervisory authority conducts safety reviews at least every ten years depending on the hazard potential

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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.”

SRLs DE-26 and DE-27 are addressed in the AtG as follows: Licensees with a licence under § 7 AtG need for the purpose of final shutdown and decommissioning a license (§ 7 (3) AtG). The commercial use of NPPs is regulated separately in § 7 (1a) AtG as their amount of electricity to produce as well as final commercial operation end date is given within the AtG directly. Therefore, the regulatory body is informed about permanent shut down either by statement in law (NPPs) or by submitting an application for granting a license for decommissioning. NPPs have to be decommissioned immediately after ending commercial operation according to § 7 (3) sentence 4 AtG; this change was made with an amendment of the AtG in 2017 by the “Gesetz zur Neuordnung der Verantwortung in der kerntechnischen Entsorgung” (Act on Reassignment of Responsibilities in the Field of Nuclear Waste Management) of 27th January 2017.

The results of the German self-assessment were reported and agreed on for DE-26 and DE-55 during the 50<sup>th</sup> WGDWD virtual meeting. However, DE-27 and DE-56 remain at status “C”. For DE-56 it was found at the meeting, that there is improvement, but still not every aspect of this SRL is clearly covered (e.g. cumulative effects) as there is no single German regulatory document mentioning all requirements of DE-56.

#### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-26	A	see regulations in § 7 Atomic Energy Law
DE-27	C	
DE-55	B	BMUV and the competed authorities of the Länder have supplemented the Decommissioning Guide in July 2021.
DE-56	C	

### 3.5.7 HUNGARY

#### Regulatory changes taken for the National Action Plan

The Hungarian Atomic Energy Authority (HAEA) regulates the decommissioning of nuclear facilities in Hungary and provides detailed regulation.

The WENRA safety reference levels for decommissioning were covered in the “Govt. Decree 118/2011. (VII.11.) on the nuclear safety requirements of nuclear facilities” and in the “Act CXVI of 1996 on Atomic Energy”. There is a specific Volume for decommissioning – “Annex 8 of Govt. Decree 118/2011. (VII.11). Nuclear Safety Code Decommissioning of nuclear facilities” – which came into force on 11<sup>th</sup> July 2011 and was modified on 6<sup>th</sup> July 2013. These regulations are defining the nuclear safety requirements applicable during the planning and execution of a nuclear facility decommissioning, as well as dismantling of safety important structures, systems and components and demolition of nuclear facility buildings in order to cease operations and to terminate the supervision of the nuclear safety authority.

HAEA performed the self-benchmarking of the Hungarian legal system to the WGWD safety reference levels for decommissioning and it was found that the SRLs are fully included in the Hungarian national regulatory system. All of the decommissioning SRLs were evaluated by HAEA as A-ratings.

At the 33<sup>rd</sup> WGWD meeting in Vilnius in September 2014 HAEA reported its regulatory implementations and compliances for benchmarking to the WENRA members. Most of our requirements were found to be in agreement with the requirements mandated by the WGWD SRLs. For 15 SRLs WENRA members asked for some corrections. HAEA reported on improvements during the 34<sup>th</sup> WGWD meeting in Paris in March 2015, which resulted in A-ratings for all of the Safety Reference Levels. As the Hungarian regulatory framework has been found to be in full compliance with the WENRA requirements defined by the Decommissioning Report, no further actions remain to be taken regarding this part.

In 2022 the previous Govt. Decree (Govt. Decree 118/2011. (VII.11.)) was replaced by the HAEA Presidential Decree, but the requirements have not changed in the meantime. The official name of the effective legislation is the following: *1/2022 (IV. 29.) HAEA Decree on the nuclear safety requirements of nuclear facilities and on related regulatory activities.*

#### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
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### 3.5.8 ITALY

#### Regulatory changes taken for the National Action Plan

After benchmarking the Italian legal system to the WGWD safety reference levels for decommissioning Italy had a total of 32 of C-ratings.

To comply with the remaining decommissioning safety reference levels, a Technical Guide has been drafted within ISIN, which regulates the use of nuclear energy in Italy and gives detailed guidance in the form of guides. The publication of the final guide is foreseen by mid 2015.

At the 32<sup>nd</sup> WGDWD meeting in Rome in February 2014, Italy reported the regulatory implementations of the 32 SRLs for benchmarking. All (proposed) changes were endorsed by the WENRA WGWD. The guide was published for public consultation (May – July 2021) and the final version of the guide was finally published on March 2022. The requirements of the remaining SRLs rated as C are implemented in the Technical Guide n. 31 “Safety and radiation criteria for de nuclear installations decommissioning”.

The results of the Italian self-assessment were reported and agreed on during the 50th WGDW virtual meeting.

#### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-04	A	Reg. Guide n. 31(published March 2022)
DE-09	A	Reg. Guide n. 31(published March 2022)
DE-14	A	Reg. Guide n. 31(published March 2022)
DE-15	A	Reg. Guide n. 31(published March 2022)
DE-17	A	Reg. Guide n. 31(published March 2022)
DE-19	A	Reg. Guide n. 31(published March 2022)
DE-20	A	Reg. Guide n. 31(published March 2022)
DE-21	A	Reg. Guide n. 31(published March 2022)
DE-22	A	Reg. Guide n. 31(published March 2022)
DE-23	A	Reg. Guide n. 31(published March 2022)
DE-24	A	Reg. Guide n. 31(published March 2022)
DE-25	A	Reg. Guide n. 31(published March 2022)
DE-26	A	Reg. Guide n. 31(published March 2022)
DE-27	A	Reg. Guide n. 31(published March 2022)
DE-29	A	Reg. Guide n. 31(published March 2022)
DE-30	A	Reg. Guide n. 31(published March 2022)
DE-35	A	Reg. Guide n. 31(published March 2022)
DE-36	A	Reg. Guide n. 31(published March 2022)
DE-37	A	Reg. Guide n. 31(published March 2022)

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-40	A	Reg. Guide n. 31(published March 2022)
DE-41	A	Reg. Guide n. 31(published March 2022)
DE-42	A	Reg. Guide n. 31(published March 2022)
DE-43	A	Reg. Guide n. 31(published March 2022)
DE-44	A	Reg. Guide n. 31(published March 2022)
DE-48	A	Reg. Guide n. 31(published March 2022)
DE-49	A	Reg. Guide n. 31(published March 2022)
DE-50	A	Reg. Guide n. 31(published March 2022)
DE-54	A	Reg. Guide n. 31(published March 2022)
DE-55	A	Reg. Guide n. 31(published March 2022)
DE-56	A	Reg. Guide n. 31(published March 2022)
DE-59	A	Reg. Guide n. 31(published March 2022)
DE-61	A	Reg. Guide n. 31(published March 2022)

### 3.5.9 LITHUANIA

#### Regulatory changes taken for the National Action Plan

After benchmarking Lithuanian legal system to the WGWD safety reference levels for decommissioning in 2013 Lithuania had 4 of C-ratings (DE-15, DE-25, DE-46, DE-50). Two remaining issues of this benchmarking were related with the planning of decommissioning and the two others with the safety case for decommissioning.

In 2013 the Requirements for decommissioning of nuclear facilities P-2009-02 had been revised, and a new version of nuclear safety requirements for decommissioning of nuclear facilities has been prepared in 2014 (BSR-1.5.1 Regulation on the Decommissioning of nuclear facilities) in order to meet the requirements of WENRA safety reference levels for the decommissioning of nuclear facilities.

The final version of these requirements for decommissioning of nuclear facilities – the Nuclear Safety Requirements BSR-1.5.1-2015 „Decommissioning of nuclear facilities“, was approved by Order No. 22.3-216 of the Head of VATESI of 30 November 2015 „On the approval of nuclear safety requirements BSR-1.5.1-2015 „Decommissioning of nuclear facilities“ and come into force on 1st May 2016.

The requirements presented in the Nuclear Safety Requirements BSR-1.5.1-2015 covered all remaining C-ratings (DE-15, DE-25, DE-46, DE-50) and now the Lithuanian regulations are in compliance with the SRLs.

In 2019 the Nuclear Safety Requirements BSR-1.5.1-2015 „Decommissioning of nuclear facilities“ have been updated and a new version of Nuclear Safety Requirements BSR-1.5.1-2019 „Decommissioning of nuclear facilities“ was approved in 2019. After approval of Nuclear Safety Requirements BSR-1.5.1-2019 „Decommissioning of nuclear facilities“ all A-ratings for all SRLs are sustained.

### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-15	A	Nuclear Safety Requirements BSR-1.5.1-2019 „Decommissioning of nuclear facilities“
DE-25	A	Nuclear Safety Requirements BSR-1.5.1-2019 „Decommissioning of nuclear facilities“
DE-46	A	Nuclear Safety Requirements BSR-1.5.1-2019 „Decommissioning of nuclear facilities“
DE-50	A	Nuclear Safety Requirements BSR-1.5.1-2019 „Decommissioning of nuclear facilities“

### 3.5.10 THE NETHERLANDS

#### Regulatory changes taken for the National Action Plan

The Netherlands committed itself in 2011 to implement the WGWD safety reference levels on decommissioning in its legal system.

The most relevant elements of the Dutch legal system are given by the Nuclear Energy Act, together with the Radiation Protection Decree, the Nuclear Installations, Fissionable Materials and Ores Decree, the ordinance on implementation of the Nuclear Safety Directive and the ordinance on decommissioning. This legislation provides for a system of mainly general goal oriented rules and regulations. It also establishes a licensing system.

The implementation of the SRLs into the Dutch legal system was benchmarked for the first time at the 21<sup>st</sup> WGWD meeting.

At the 29<sup>th</sup> WGWD meeting in Stockholm in September 2012, the Netherlands reported its progress in the legal implementations for re-benchmarking. In total, 26 SRLs were now rated as A and 3 as B. The remaining 27 SRLs will be implemented by means of licence conditions in individual decommissioning licenses.

There are no planned nuclear decommissioning projects, requiring a decommissioning licence, in the near future in the Netherlands, so the Netherlands was not able to implement the remaining 27 SRLs.

The recent IRRS mission and the upcoming ARTEMIS mission, both in 2023, might lead to new insights concerning decommissioning. This could lead to a re-evaluation of how the Netherlands will implement the remaining SRLs.

#### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-01	C	
DE-03	C	
DE-11	C	
DE-13	C	
DE-14	C	
DE-19	C	Bkse-decree, Art. 27, 29
DE-22	C	
DE-30	C	
DE-31	C	



# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-32	C	
DE-33	C	
DE-34	C	
DE-36	C	
DE-37	C	
DE-41	C	
DE-42	C	
DE-43	C	
DE-44	C	
DE-46	C	
DE-47	C	
DE-50	C	
DE-51	C	
DE-52	C	
DE-53	C	
DE-54	C	
DE-56	C	

### 3.5.11 ROMANIA

#### Regulatory changes taken for the National Action Plan

Nuclear safety legislation in Romania was subject to a continuous development process both due to the planning of new nuclear facilities and due to implementation of European legislation. Romania committed itself to implement the WGWD safety reference levels on decommissioning in its legal system.

In order to meet the requirements of COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, CNCAN as nuclear regulatory authority of Romania developed new regulations and revised the existing regulations in the field of predisposal and disposal of radioactive waste and in the field of decommissioning of nuclear and radiological facilities.

In order to meet the requirements of Council Directive 2014/87/EURATOM from 6 July 2014, establishing a common European framework for nuclear safety CNCAN developed new basic regulation on nuclear safety for nuclear facilities (CNCAN Order No. 114/2017 - NSN 21).

The Council Directive 2013/59/EURATOM of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom has been transposed and implemented into legal and regulatory framework by issuing a series of new regulations and revision of the existing ones.

The nuclear regulatory control in Romania is established by the Law no. 111/1996 on the safe deployment, regulation, licensing and control of nuclear activities and on the regulations issued by CNCAN Orders. The law clearly stipulates that the prime responsibility for the safety rests with the licensees.

Romania has completed the revision of the entire regulatory framework on the safety of predisposal and disposal of radioactive waste and on the safety of decommissioning of nuclear facilities.

In the field of decommissioning, the process was finalized in 2017 by publishing the Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, approved by the CNCAN Order no. 115/2017. The new order abrogates the older Order 181/2001.

The safety and licensing requirements on decommissioning cover both nuclear and radiological facilities. The regulation is based on the IAEA recommendations provided in General Safety

Requirements Part 6 Decommissioning of Facilities, as well as on the Safety Reference Levels developed by WENRA on decommissioning. The end state criteria, responsibilities of the licensees, integrated management system, safety culture, record keeping system, reporting to CNCAN are described in this regulation. The regulation defines the requirements for decommissioning strategies, planning of decommissioning activities, as well as the transition from operation to decommissioning phase and conducting of decommissioning actions. The regulation introduces the concepts of safety case and safety assessment, their contents being provided in the Annexes to the regulation. The requirements for final radiological verification are also provided. The content of the final radiological survey report as well as the final decommissioning report are provided in the Annexes to the regulation. The licensing requirements are based on the provisions of the nuclear law.

At the 39<sup>th</sup> WGWD meeting in Kiev, in September 2017, CNCAN reported its regulatory implementations and compliances for benchmarking to the WENRA members. All the requirements were found to be in line with the WGWD SRLs.

As result of this activities the original C-ratings turned into A-ratings, as approved by the WGWD benchmarking process.

#### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-02	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-05	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-06	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-07	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-08	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-09	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-10	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-11	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-12	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-13	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-14	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-15	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-16	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-17	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-18	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-19	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-20	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-21	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-22	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-23	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-24	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-25	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-26	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-27	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-28	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-29	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-30	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-31	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-32	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-33	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-35	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-36	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-37	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-38	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-39	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-40	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-41	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-42	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-43	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-44	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-46	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-47	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-48	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-49	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-50	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-51	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-52	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-53	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-54	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-55	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-56	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-57	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-58	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-59	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-60	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-61	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017
DE-62	A	Regulation on the safety requirements on decommissioning of nuclear and radiological facilities, CNCAN Order no. 115/2017

### 3.5.12 SLOVAKIA

#### Regulatory changes taken for the National Action Plan

Slovakia started up legal benchmarking of decommissioning SRLs at the 19<sup>th</sup> meeting in Den Haag in the end of November 2007 and ended up this legal benchmarking at the 22<sup>nd</sup> meeting in Brussels in April 2009. During this legal benchmarking 5 SRLs were evaluated with rating C and Slovakia consequently prepared NAP to address these differences.

During first plenary benchmarking of NAPs for decommissioning, which took place in Prague on 26<sup>th</sup> - 28<sup>th</sup> February 2013, Slovakia submitted its NAP.

Since Slovakia has already an extensive decommissioning programme in place, only 5 SRLs were identified to be addressed in its NAP.

All differences were harmonised by the update of Atomic Act No. 541/2001 as amended in 2013 (amendment No. 143/2013) and update of respective regulations:

- Regulation No. 58/2006 on details concerning the scope, content and method of preparation of nuclear installation documentation needed for certain decisions, which came into force in March 2012 (No. 31/2012) and
- Regulation No. 430/2011 on details on nuclear safety requirements for nuclear facilities, which valid from 1<sup>st</sup> January 2012.

By updating these regulations all decommissioning SRLs are now covered in the Slovak regulatory system.

#### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
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### 3.5.13 SLOVENIA

#### Regulatory changes taken for the National Action Plan

Slovenian Nuclear Safety Administration (SNSA) as the competent authority in the field of radioactive waste and spent fuel storage continuously takes all necessary actions for implementation of changes in obligations into the national regulatory requirements. Slovenian regulatory framework in the pertinent field consists mainly of the Ionizing Radiation Protection and Nuclear Safety Act, Resolution on the 2023-2032 National Programme for Managing Radioactive Waste and Spent Nuclear Fuel and a list of rules, which regulate specific areas of waste and spent fuel management in detail. Slovenia made the main step forward to the full consistency of its regulatory framework with the new international standards and recommendations when in 2009 published two new regulations namely Rules on radiation and nuclear safety factors (JV5) and the Rules on operational safety of radiation and nuclear facilities (JV9). The rules set detail requirements for design bases, contents of applications and main safety documentation, management system, modification management, periodic safety reviews and others.

At the 31<sup>st</sup> WGWD meeting in Trnava, Slovenia reported on the implementation of decommissioning SRLs and its action plan. The majority of the SRLs were implemented through new rules JV5 and JV9. Therefore, all changes were approved except for two SRLs, where better reference was required. The DE-22 refers to decommissioning plan in case several facilities are located at the same site.

The requirement was implemented with modifications of Article 50 of JV5. A new paragraph was added. The amended rules JV5 were published at the end of 2016.

The DE-33 refers to updates of the emergency plan. The amendment of the Art. 107 of the Law was proposed. During the finalization of the new text of the Law, it was found out that the requirement is implemented through the Decree on the contents and elaboration of protection and rescue (Official Gazette of RS, No. 24/2012 – in Slovene language). Therefore, the amendments of the Law were not necessary anymore.

According to the benchmarking results of the NAP-related activities the 29 original C-rated decommissioning SRLs are now either A-rated (25) or B-rated (3)

#### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-22	A	JV5, Art. 50, Para. 8 (in force since December 2016)

### 3.5.14 SPAIN

#### **Regulatory changes taken for the National Action Plan**

The benchmarking exercise of version 2.1 WGWD Decommissioning Safety Reference Levels Report resulted with 22 decommissioning SRL's already harmonised in Spain, covered by generic requirements of regulations applicable to all nuclear installations, which includes installations under decommissioning. In total 40 SRLs were rated as C and need to be harmonised in the field of decommissioning.

Seven SRLs previously qualified as C, to be implemented before the decommissioning period, on safety requirements during the design, construction and operation phases to facilitate the future safe dismantling of these facilities, have been recently implemented in CSN Instruction IS-45. The results of the benchmarking of the IS-45 Instruction called "On the safety requirements during the design, construction and operation phases of nuclear and radioactive facilities of the nuclear fuel cycle, to provide for their dismantling and, where appropriate, their decommissioning and closure" were presented at the 49<sup>th</sup> WGWD meeting in March 2023 in Cologne.

The Spanish National Action Plan for compliance with the remaining SRLs focuses mainly on an in-depth review of the Royal Decree with the Regulation of nuclear and radioactive installations currently in force and the new CSN Instruction. IS-XX "On Safe Decommissioning of Nuclear Facilities and Radioactive Facilities of the Nuclear Fuel Cycle" which will cover all remaining decommissioning SRLs to be implemented during decommissioning activities.

The review of the Royal Decree and the entry into force of this Instruction of the CSN IS-XX is assumed in the next year 2024.

Spanish regulations will be fully in accordance with the WGWD safety reference levels for decommissioning, once this Safety Instruction is finally approved.

## Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-01	C	IS-XX, 3.1.1 (not yet published)
DE-09	A	IS-45, 3.2 (in force since January 2022)
DE-10	C	IS-XX, 5.4.1 (not yet published)
DE-17	C	IS-XX, 4.1.1 (not yet published)
DE-18	C	IS-XX, 4.1.2 (not yet published)
DE-19	A	IS-45, 4.6 (in force since January 2022)
DE-20	A	IS-45, 4.7 (in force since January 2022)
DE-21	A	IS-45, 4.8 (in force since January 2022)
DE-22	A	IS-45, 4.9 (in force since January 2022)
DE-23	A	IS-45, 4.10 (in force since January 2022)
DE-25	A	IS-45, 4.3 (in force since January 2022)
DE-28	C	IS-XX, 4.2.1 (not yet published)
DE-29	C	IS-XX, 4.2.2 (not yet published)
DE-30	C	IS-XX, 5.2.1 (not yet published)
DE-31	C	IS-XX, 5.8.1 (not yet published)
DE-32	C	IS-XX, 5.8.2 (not yet published)
DE-33	C	IS-XX, 5.8.3 (not yet published)
DE-34	C	IS-XX, 5.8.4 (not yet published)
DE-35	C	IS-XX, 5.3.1 (not yet published)
DE-36	C	IS-XX, 5.3.2 (not yet published)
DE-37	C	IS-XX, 5.3.3 (not yet published)
DE-39	C	IS-XX, 5.4.3 (not yet published)
DE-40	C	IS-XX, 5.4.4 (not yet published)
DE-42	C	IS-XX, 5.6.1 (not yet published)
DE-43	C	IS-XX, 5.6.2 (not yet published)
DE-44	C	IS-XX, 5.6.3 (not yet published)
DE-45	C	IS-XX, 5.1.2 (not yet published)
DE-46	C	IS-XX, 5.1.3 (not yet published)
DE-47	C	IS-XX, 5.1.4 (not yet published)
DE-48	C	IS-XX, 5.7.1 (not yet published)
DE-50	C	IS-XX, 6.1.1 (not yet published)
DE-51	C	IS-XX, 6.1.3 (not yet published)
DE-52	C	IS-XX, 6.2.4 (not yet published)
DE-54	C	IS-XX, 6.2.2 (not yet published)
DE-55	C	IS-XX, 6.2.2 (not yet published)
DE-56	C	IS-XX, 6.2.3 (not yet published)
DE-57	C	IS-XX, 6.2.1 (not yet published)
DE-58	C	IS-XX, 7.1.2 (not yet published)
DE-59	C	IS-XX, 7.1.3 (not yet published)
DE-62	C	IS-XX, 7.1.2 (not yet published)

### 3.5.15 SWEDEN

#### **Regulatory changes taken for the National Action Plan**

When the WENRA Decommissioning Reference Levels Report revision 1.0 was issued in November 2007 there were 16 safety reference levels which the Swedish regulations on nuclear decommissioning did not fully cover (i.e. they were rated C). Subsequently one additional SRL was proposed to be rated as C by the Swedish Radiation Safety Authority. When the WENRA Decommissioning Safety Reference Levels Report was reviewed and updated to version 2.1 in December 2012, three of the 17 C-rated SRLs were deleted as part of the revision.

New Swedish regulations on decommissioning came into force on the 1<sup>st</sup> November 2012 whereby nine of the remaining C-rated SRLs were addressed and covered. Also, new Swedish regulations on clearance came into force in January 2012, whereby one of the remaining SRLs was addressed and covered. Benchmarking of the 14 SRLs against the WENRA Decommissioning Safety References Report version 2.1, took place at the 33rd WGWD meeting in Vilnius in September 2014. This resulted in eleven of the SRLs agreed as A, and three C-rated SRLs remaining.

The Swedish Radiation Safety Authority is currently (2015) working on major changes to its regulations, both with regard to content and structure. The WENRA SRLs are considered in this work which will continue at least until 2018. The three remaining C-rated SRLs concerning decommissioning will be considered and included in the review and update of the revised Swedish regulations.

In contrast to previous plans, the Swedish Radiation Safety Authority decided not to issue more specific conditions for decommissioning as formal regulations, but imposed relevant conditions by means of additional license conditions for each licensee. The formal basis for issuing such license conditions were formalised in 2017 and revised in 2018.

The remaining C-rated SRLs were re-evaluated against existing regulations and the above mentioned additional license conditions and approved by the WGWD benchmarking process at the 42nd WGWD meeting in Prague in March 2019.

### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-16	A	SSMFS 2008:1 (rev. 2011:3), Ch. 9, Section 5, Appendix 5 SSMFS 2008:23, Sections 20-23
DE-41	A	SSMFS 2008:23, Sections 20-23 SSMFS 2008:51, Sections 11-12 Facility specific license conditions (SSM2016-5886-26)
DE-45	A	SSMFS 2008:1 (rev. 2011:3), Ch. 2, Section 8 Facility specific license conditions (SSM2016-5886-26)

### 3.5.16 SWITZERLAND

#### Regulatory changes taken for the National Action Plan

The basis for the Swiss benchmarking exercise was the updated nuclear legislation as of February 2005. In this legislation quite elaborated requirements for decommissioning projects had already been implemented, especially regarding the planning for decommissioning during design, construction and operation. Detailed requirements on the conduct of decommissioning activities (3rd safety area), however, led to a number of C-ratings, as well as those on the safety verification (4th safety area) during ongoing decommissioning. ENSI decided to cover most of the C-ratings in a new regulatory guide (ENSI-G17: “Decommissioning of Nuclear Facilities”) which was finally published in April 2014. A smaller number of C-ratings had already been covered by an update of the regulatory guide ENSI-G07: “Organization of Nuclear Facilities” in July 2013.

According to ENSI procedures the draft of ENSI-G17 had been published for stakeholder involvement before the final editing. Response and subsequent discussions were more extensive than with any previous guideline project, the reason for this being a consequence of a change in Swiss energy policy. This change caused the decision of one of the NPP operators to declare the final shutdown of their plant by 2019. As this was the first commercial NPP decommissioning project and the first application of the newly implemented WENRA SRLs on decommissioning in Switzerland, the draft of ENSI-G17 was biased against the most up to date planning of this decommissioning project by a great number of utility personnel. The process of stakeholder involvement added about one year to the total project duration.

Guideline ENSI-G17 on Decommissioning of nuclear facilities, 2014, provides requirements concerning protection and safety for the decommissioning and the application documents for decommissioning, as well as requirements on the content of the documentation to be delivered to the competent authority upon reaching the final status defined in the decommissioning order (final report). The guideline ENSI-G17 is being applied in the decommissioning project of the first Swiss nuclear power plant which is still under decommissioning.

#### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
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### 3.8.17 UKRAINE

#### Regulatory changes taken for the National Action Plan

The State Nuclear Regulatory Inspectorate of Ukraine (SNRIU) regulates the decommissioning of nuclear facilities in Ukraine and establishes requirements for decommissioning.

The regulatory system contains a quite big number of documents that regulate decommissioning which have been developed at different periods of time.

The SNRIU performed the self-assessment of the Ukrainian regulations and presented the results of self-assessment at the 37<sup>th</sup> meeting of the WGWD in September 2016 in The Hague.

#### 16 safety reference levels had mark “C”.

The self-assessment was based on the documents:

- NP 306.2.02/1.004-1998 – “General Safety Provisions for Decommissioning of Nuclear Power Plants and Nuclear Research Reactors” (1998) (expired in 2020)
- Law of Ukraine “On Nuclear Energy Use and Radiation Safety” (1995)
- Law of Ukraine “On Radioactive Waste Management” (1995)
- NP 306.2.141-2008 – “General Safety Provisions for Nuclear Power Plants” (2008)
- NP 306.1.190-2012 – “General Requirements for the Management System in Nuclear Energy” (2012)
- NP 306.1.182-2012 – “Requirements for the Management System for Activities of the Operating Organization (Operator)” (2012).

In December 2020 the new document **“General Safety Provisions for Decommissioning of Nuclear Facilities” NP 306.2.230-2020** came into force and aims to harmonize the Ukrainian regulations with the European Union requirements and the WENRA reference levels.

It was aimed to cover the above-mentioned 16 reference levels with mark “C”.

The SNRIU updated the complete self-assessment for decommissioning SRLs and presented it during the 49th WGWD Meeting in Cologne. The whole self-assessment was benchmarked at that meeting again taking into account the new Ukrainian normative documents to follow WENRA decommissioning reference levels: “General Safety Provisions for Decommissioning of Nuclear Facilities” (2020) and “Requirements for structure and content of documents submitted by operator for obtaining a license to carry out activities at stage of decommissioning of nuclear facility” (2023 on register in the Ministry of Justice of Ukraine)”. The left C-ratings after this benchmarking exercise were discussed during the 50<sup>th</sup> WGWD virtual Meeting and the final ratings are shown in the next table.

## Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
DE-4	A	
DE-31 (a)	A	
DE-34	B	
DE-40	A	
DE-49	A	
DE-56	A	
DE-61	A	
DE-41	A	
DE-59	A	



### 3.5.18 UNITED KINGDOM

#### Regulatory changes taken for the National Action Plan

The initial benching for the decommissioning SRLs showed that the UK regulatory system was largely compliant with the SRLs, as there were only 2 SRLs rated C out of a total of 81. For version 2.2 of this report (which was published in 2015), the Office for Nuclear Regulation (ONR) had reviewed and updated its Technical Assessment Guides (TAGs) and Technical Inspection Guides (TIGs), in particular its Technical Assessment Guide on decommissioning (NS-TAST-GD-026). ONR also reviewed and updated its Safety Assessment Principles.

One SRL was incorporated in the updated Technical Assessment Guide on decommissioning. Evidence for compliance with the second SRL was obtained from the consolidated guidance on emergency planning prepared by the UK Nuclear Emergency Planning Liaison Group. The evidence to support the categorisation was peer reviewed by the WGWD pre-2015. The UK's regulatory system remains fully compliant with the decommissioning SRLs.

#### Results of the NAP Benchmarking

# SRL (new or changes req.)	Current status	Actions taken / relevant regulations
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