

**WENRA  
WORKING GROUP ON WASTE AND  
DECOMMISSIONING (WGWD)**

**DECOMMISSIONING  
SAFETY  
REFERENCE LEVELS  
REPORT**

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## Executive Summary

The Western European Nuclear Regulator's 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. The main objectives of WENRA is 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 of chief nuclear safety regulators in Europe exchanging experience and discussing significant safety issues.

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

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 these activities, which were based on RHWG report and corresponding IAEA documents (requirements, guidances, etc). Although the IAEA safety standards establish an essential basis for safety of all nuclear installations covering also their decommissioning, the WENRA safety reference levels incorporate more this activity specific requirements.

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## WENRA Policy Statement

We, the heads of the national Nuclear Safety Authorities, members of WENRA, commit ourselves to a continuous improvement of nuclear safety in our respective countries.

Nuclear safety and radiation protection are based on the principle of the prime responsibility of the operators. The role of national regulators is to ensure that this responsibility is fully secured, in compliance with the regulatory requirements.

In order to work together, we created the Western European Nuclear Regulators' Association (WENRA) with the following main objectives:

- to build and maintain a network of chief nuclear safety regulators in Europe;
- to promote exchange of experience and learning from each other's best practices;
- to develop a harmonized approach to selected nuclear safety and radiation protection issues and their regulation, in particular within the European Union;
- to provide the European Union Institutions with an independent capability to examine nuclear safety and its regulation in Applicant Countries.

In order to develop a harmonized approach, we are:

- sharing our experience feedback and our vision;
- making efforts to further exchange of personnel, allowing an in-depth knowledge of working methods of each other;
- developing common reference safety levels in the fields of reactor safety, decommissioning safety, radioactive waste and spent fuel management facilities in order to benchmark our national practices.

We recognise the IAEA standards form a good basis for the continuous improvement of national nuclear regulatory systems and nuclear safety.

The reference levels that we have developed represent good practices in our countries from which we can also seek to learn from each other to further improve nuclear safety and its regulation. Hence, we are committed:

- by the year 2010 to improve and harmonise our nuclear regulatory systems, using as a minimum the reference levels;
- to influence the revision of the IAEA standards when appropriate;
- to regularly revise the reference levels when new knowledge and experience are available.

We strive for openness and improvement of our work. For that purpose we will:

- keep the European Nuclear Safety and Radiation Protection Bodies not belonging to WENRA, and the EU Institutions, informed of the progress made in our work;
- make our public reports available on the Internet ([www.wenra.org](http://www.wenra.org));
- invite stakeholders to make comments and suggestions on these reports.

## Glossary

### Ageing

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

#### Ageing degradation

*Ageing* effects that could impair the ability of a *structure, system or component* to function within its *acceptance criteria*.

#### Ageing management

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

### analysis, Deterministic

Analysis using, for key parameters, single numerical values (taken to have a probability of 1), leading to a single value of the result.

- In nuclear safety, for example, this implies focusing on accident types, releases and consequences, without considering the probabilities of different event sequences.
- Typically used with either ‘best estimate’ or ‘worst case’ values, based on expert judgement and knowledge of the phenomena being modelled.

### Clearance

Removal of radioactive materials or radioactive objects within authorized practices from any further control by the regulatory body. (Removal from control in this context refers to control applied for radiation protection purposes.)

### 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.

### 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.

**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.

## Licensee

The *licensee* is the 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

## 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 *radioactive materials* are produced, processed, used, handled, stored or disposed of on such a scale that consideration of *safety* is required.

## **Nuclear material**

Plutonium except that with isotopic concentration exceeding 80% in plutonium-238; uranium-233; uranium enriched in the isotope 235 or 233; uranium containing the mixture of isotopes as occurring in nature other than in the form of ore or ore-residue; any material containing one or more of the foregoing.

- Nuclear material is necessary for the production of nuclear weapons or other nuclear explosive devices. Under comprehensive safeguards agreements, the IAEA verifies that all nuclear material subject to safeguards has been declared and placed under safeguards. Certain non-nuclear materials are essential for the use or production of nuclear material and may also be subject to IAEA safeguards under certain agreements.
- The Statute of the IAEA uses the term special fissionable material, with the meaning essentially of nuclear material as defined here, but explicitly excluding source material.
- For the purposes of IAEA safeguards agreements, nuclear material is defined as “any source material or special fissionable material as defined in Article XX of the Statute of the IAEA”. The meaning is essentially the same as that of nuclear material as defined here.
- The Paris Convention on Third Party Liability in the Field of Nuclear Energy uses the term nuclear substances, which means nuclear fuel (other than natural uranium and depleted uranium) and radioactive products or radioactive waste.

## **Nuclear safety**

See ‘Protection and Safety’

## **Operation**

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

## **Post-operational phase**

Phase of a nuclear facility, starting with the final shutdown and extending over the entire decommissioning process.

## **Probabilistic analysis**

Often taken to be synonymous with stochastic analysis. Strictly, however, stochastic conveys directly the idea of randomness (or at least apparent randomness), whereas probabilistic is directly related to probabilities, and hence only indirectly concerned with randomness. Therefore, a natural event or process might more correctly be described as stochastic (as, for example, in stochastic effect), whereas probabilistic would be more appropriate for describing a mathematical analysis of stochastic events or processes and their consequences (such an analysis would, strictly, only be stochastic if the analytical method itself included an element of randomness, e.g. Monte Carlo analysis).

## 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.

## Quality management system

The new term reflects the evolution in the approach from the initial concept of ‘*Quality Control*’ (controlling the quality of products) through ‘*Quality Assurance*’ (the system to assure the quality of products) and ‘*Quality Management*’ (the system to manage quality). The ‘*Quality Management System*’ is a set of interrelated or interacting elements (system) to establish policy and objectives and to achieve those objectives.

## 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

1. *Assessment* of all aspects of the *siting, design* and *operation* of an *authorized facility* that are relevant to *protection and safety*.
2. The systematic process that is carried out throughout the *design* process to ensure that all the relevant safety requirements are met by the proposed (or actual) *design*. *Safety assessment* includes, but is not limited to, the formal *safety analysis*.

## 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.

## Safety policy

A documented commitment by the licensee to a high nuclear safety performance supported by clear safety objectives and targets and a commitment of necessary resources to achieve these targets. The safety policy is issued as separate safety management document or as visible part of an integrated organisation policy.

## 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.

## Waste characterization

Determination of the physical, chemical and radiological properties of the *waste* to establish the need for further adjustment, *treatment* or *conditioning*, or its suitability for further handling, *processing*, *storage* or *disposal*.

## Waste minimization

The process of reducing the amount and *activity* of *radioactive waste* to a level as low as reasonably achievable, at all stages from the *design* of a *facility* or *activity* to *decommissioning*, by reducing *waste* generation and by means such as recycling and reuse, and *treatment*, with due consideration for secondary as well as primary *waste*.

## List of Abbreviations

AMP	ageing management programme
EIA	environmental impact assessment
EU	European Union
IAEA	International Atomic Energy Agency
NEA	Nuclear Energy Agency (OECD)
NPP	nuclear power plant
OEF	operational experience feedback
OLC	operational limits and conditions
PIE	postulated initiating event
PSR	periodic safety review
QM	quality management
R&D	research and development
RHWG	(WENRA) Reactor Harmonisation Working Group
SSCs	structures, systems and components
SRLs	safety reference levels
DA-N	Decommissioning SRLs numbered uniquely in Subpart A; where N is a number.
DB-N	Decommissioning SRLs numbered uniquely in Subpart B; where N is a number.
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators
WGWD	(WENRA) Working Group on Waste and Decommissioning

## *Part I.*

# **Introduction and Used Methodology**

# 1. Introduction

This report is the result of an effort by the Working Group on Waste and Decommissioning of WENRA, from 2002 to 2005. It presents the safety reference levels (SRLs) for decommissioned facilities that are thought to be a good basis for future harmonisation on a European level.

The SRLs can not 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. 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 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 and the United Kingdom.

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 1 May 2004, when most of these candidate countries became a 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.

To perform these tasks two working groups within the WENRA have been established - Reactor Harmonisation Working Group (RHWG) and Working Group on Waste and Decommissioning (WGWD). The work of WGWD has started in 2002.

## 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.

Although the SRLs in this report are oriented toward the licensees of decommissioned facilities, who are responsible for their safety, they can also be used by the regulatory body for the review and assessment of decommissioned facilities' safety.

The harmonisation process has the goal to produce harmonised safety reference levels by 2006 in most areas and to implement these levels by 2010 in each country.

### **1.3. Scope**

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

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.

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. However, WGWD members do not all regulate all these matters and in that case, these matters are addressed by other national regulatory organisations. As a result, at this stage, WGWD did not take into account in detail these topics and has therefore concentrated on the nuclear safety requirements.

RHWG of WENRA developed SRLs for nuclear reactors. The principles underlying these levels apply to any type of nuclear facility both during operation and during the decommissioning phase, taking into account the magnitude of the hazard in a graded approach. This document identifies in Subpart A of Part II. areas of common interest and, where appropriate, in Subpart B of Part II. adds SRLs applicable for the purposes of decommissioning.

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 reference levels will need to be implemented in different ways to be appropriate for the particular facility.

### **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 SRLs and to analyse their application in participating countries.

Part II of the report presents the actual decommissioning reference levels grouped into two main subparts.

Subpart A identifies areas of common interest and presents SRLs in original RHWG or modified wording. The SRLs are grouped into following safety areas: safety management, design, operation and safety verification.

In Subpart B new decommissioning specific reference levels are grouped into the same safety areas as in Subpart A. However the addressed safety issues can differ in both subparts as well as in other WENRA documents. Additional safety area “decommissioning strategy and planning” has been introduced into this subpart.

## 2. Methodology

The working methodology of WGWD went through several steps and changes since 2002, when the working group has been established. A list of topics to be covered by WGWD has been defined, so those take into account the common field of responsibility of WENRA members.

During the June 2005 meeting of the WGWD in Switzerland it has been agreed to continue with the preparation of the final version of this report according to the following methodology of SRLs derivation, prepared and agreed by WGWD members:

- the SRLs will be presented in two main subparts,
- Subpart A contains generic reference levels based on RHWG report. The structure of Subpart A follows the structure of RHWG safety issues. The RHWG SRLs were reviewed from the perspective of decommissioned facility features,
- facility specific reference levels are presented in Subpart B, which has a similar structure as Subpart A and is based on previous draft versions of WGWD report.

By the drafting of report versions developed in 2002-2004 the importance of the IAEA documents developed till then has been recognised. Therefore the starting point for the definition of facility specific SRLs, which have been later included into the Subpart B, were the topics addressed by corresponding IAEA documents (requirements, guidances, etc). This list has been carefully reviewed and validated by the WGWD. In the case of decommissioning, the available IAEA references were:

- A System for Feedback of Experience from Events in Nuclear Installations, Safety Guide, DS 288, Vienna (2005),
- Management Systems, Safety Requirements, DS 338, Vienna (2005),
- Decommissioning of Nuclear Power Plants and Research Reactors, Safety Series No. WS-G-2.1, IAEA, Vienna (1999),
- Decommissioning of Medical, Industrial and Research Facilities, Safety Series No. WS-G-2.2, IAEA, Vienna (1999),
- Predisposal Management of Radioactive Waste Including Decommissioning, Safety Standards Series No. WS-R-2, IAEA, Vienna (2000),
- Decommissioning of Nuclear Fuel Cycle Facilities, Safety Series No. WS-G-2.4, IAEA, Vienna (2001).

Then following steps have been performed for the derivation of facility specific SRLs:

- based on a systematic approach, the applicable specific IAEA requirements or guidances have be sought and listed. These are henceforth be called “corresponding IAEA statements” and are written in italics after each reference level,
- an analysis grid has been applied to each of the above-defined “corresponding IAEA statements” (see grid model in Appendix). Each member country (referring as appropriate to national contributions to the Joint Convention) has made this systematic analysis. It contains:
  - an analysis of the present situation on each country
  - whether future plans are made to change the regulatory situation of the country
  - a proposal for future action by WGWD

The answers of each countries to this questionnaire have been brought together and synthesised.

- SRLs taking into account the best practise in Europe, and envisioned as a reference level that could be applied at the end of the decade (2010) were defined.

**APPENDIX  
TO PART I.**

**The questionnaire of the analysis grid model applied to IAEA statements**

<b>WENRA WGWD – decommissioning regulations harmonisation</b>		Country:
<b>IAEA statement analysis grid</b>		
IAEA statement reference:	IAEA doc reference:	Statement number:
<i>IAEA statement quotation</i>		
<b>PRESENT SITUATION IN THE COUNTRY</b>		
Is it a requirement? YES : <input type="checkbox"/>	Requirement part of general regulations? YES : <input type="checkbox"/>	
	Case-by-case license condition? YES : <input type="checkbox"/>	
Comments on requirement level including possible sanctions for licensee :		
Is it guidance (not mandatory)? YES : <input type="checkbox"/>	Comments :	
Is it specific to decomm. or general? specific <input type="checkbox"/>	Comments :	
Is it different for different types of facilities? YES : <input type="checkbox"/>	Comments :	
<b>PROJECTS OF THE COUNTRY</b>		
Will this situation change in the near future? YES : <input type="checkbox"/>		
Comments :		
<b>GENERAL COMMENTS UPON SITUATION IN THE COUNTRY :</b>		
<b>PROPOSAL FOR WGWD</b>		
Omit statement? YES : <input type="checkbox"/>	Take statement as it is? YES : <input type="checkbox"/>	Modify statement? YES : <input type="checkbox"/>
Not within regulator scope <input type="checkbox"/>		Relaxing <input type="checkbox"/>
Not useful or applicable <input type="checkbox"/>		Editorial change only <input type="checkbox"/>
		Strengthening <input type="checkbox"/>
		Grading for different type of facilities <input type="checkbox"/>
Proposal for WGWD requirement (if statement is to be modified) :		
Additional statement on topic not covered by IAEA needed? YES : <input type="checkbox"/>		
Proposal :		
<b>GENERAL COMMENTS ON WGWD REQUIREMENT PROPOSAL :</b>		

This questionnaire was answered by the members of WGWD as a basis for selection of preliminary set of IAEA statements for further analysis (see Chapter 2.1)

*Part II.*

**Decommissioning Safety Reference Levels**

For the purposes of this document, the normal operational phase is assumed to include the removal of the bulk of fuel and radioactive materials from the facility in accordance with the safety case for normal operations. 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 separate decommissioning license.

The point at which decommissioning starts will vary from country to country depending on national arrangements.

For further reference, decommissioning safety reference levels are numbered unequivocally DA-N (Subpart A) or DB-N (Subpart B) where N is a number.

## ***Subpart A (Generic SRLs)***

### **1. Safety area: Safety management**

#### ***1.1. Safety issue: Safety policy***

**DA-01:** A written safety policy shall be issued by the licensee. A safety policy is understood as a documented commitment by the licensee to a high nuclear safety performance supported by clear safety objectives and targets and a commitment of necessary resources to achieve these targets. The safety policy is issued as separate safety management document or as a visible part of an integrated organisational policy.

*Related IAEA safety standards:*

*The operating organisation...shall establish and effect policies that give safety matters the highest priority (NS-R-2, paras 2.2, 2.9)*

**DA-02:** The safety policy shall be clear about giving safety first priority in all plant activities.

*Related IAEA safety standards:*

*The policy shall give safety the utmost priority at the plant, overriding if necessary the demands of production and project schedules (NS-R-2, para 2.9)*

**DA-03:** The safety policy shall include a commitment to continuously develop safety.

*Related IAEA safety standards:*

*The policy shall include a commitment to excellent performance in all activities important to safety and shall encourage a questioning attitude (NS-R-, 2.9). The operating organisation should demonstrate a commitment to achieving improvements in safety wherever it is reasonable practicable to do so as part of a continuing commitment to the achievement of excellence (NS-G-2.4, para 5.11)*

**DA-04:** The safety policy shall be communicated to all staff, with tasks important to safety, in such a way that the policy is understood and applied.<sup>1</sup>

**DA-05:** Key elements of the safety policy shall be communicated to subcontractors, in such a way that the policy is understood and applied in their on-site activities.

*Related IAEA safety standards (as well for DA-04):*

*...the policy shall be applied by all site personnel (NS-R-2, para 2.9)*

**DA-06:** The safety policy shall include directives for implementing the policy and monitoring safety performance.

*Related IAEA safety standards:*

*..the safety policy requires the ownership and active support of senior managers who should be involved in disseminating the policy throughout the organisation...The operating organisation should develop safety standards that define expectations for the arrangements that are significant to the implementation of the safety policy...The organisation's improvement strategy .....should be based on a well defined programme with clear objectives and targets against which to monitor progress (NS-G-2.4, paras 5.8, 5.9, 5.11)*

**DA-07:** The safety policy shall require safety objectives and targets, clearly formulated in such a way that they can be easily monitored and followed up by the plant management.

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<sup>1</sup> This is addressing the licensee's own staff. For subcontractor's personnel see the following DA-05

*Related IAEA safety standards:*

*Where practicable, suitable objective performance measures shall be used. The results shall be made available to plant management and appropriate corrective actions shall be taken (NS-R-2, para 2.13)*

**DA-08:** The adequacy and the implementation status of the safety policy shall be evaluated by the licensee on a regular basis, more frequent than the periodic safety reviews.

*Related IAEA safety standards:*

*An adequate audit and review system should be established to provide the assurance that the safety policy of the operating organisation is being implemented effectively ... (NS-G-2.4, para 5.17)*

## **1.2. Safety issue: Operating organization**

**DA-09:** The organizational structure for safe and reliable decommissioning of the facility, and for ensuring an appropriate response in emergencies, shall be justified and documented.<sup>2</sup>

*Related IAEA safety standards:*

*A document describing the plant's organizational structure and the management arrangements for discharging all responsibilities shall be made available to the regulatory body for review (NS-R-2, para 2.5). The operating organisation ... should establish an organizational structure to meet the general requirements for the safe and reliable operation of the plant, taking into consideration any particular situation or conditions involved (NS-G-2.4, para 2.4)*

**DA-10:** The adequacy of the organizational structure, for its purposes according to DA-09, shall be assessed when organizational changes are made which might be significant for safety. Such changes shall be justified in advance, carefully planned and evaluated after implementation.<sup>3</sup>

*Related IAEA safety standards:*

*... The organisational plan should be regularly assessed, and if necessary updated to reflect developments in safe operation (NS-G-2.4, para 2.7))*

**DA-11:** Responsibilities, authorities and lines of communication shall be clearly defined and documented for all staff with duties important to safety.

*Related IAEA safety standards:*

*..Clear lines of authority shall be established to deal with matters bearing on plant safety. Functional responsibilities, levels of delegated authority and lines of internal and external communication for the safe operation of plants in all operational states, for mitigating the consequences of accident conditions and for ensuring an appropriate response in emergencies shall be clearly defined in writing (NS-R-2, para 2.6)*

**DA-12:** The licensee shall ensure that decommissioning is performed in a safe manner and in accordance with all applicable legal and regulatory requirements.

*Related IAEA safety standards:*

*The management of the plant shall ensure that the plant is operated in a safe manner and in accordance with all legal and regulatory requirements (NS-R-2, para 2.1)*

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<sup>2</sup> The arguments shall be provided that the organisational structure supports safety and an appropriate response in emergencies

<sup>3</sup> In this case evaluation means a verification that the implementation of the organizational change has accomplished its safety objectives

**DA-13:** Safety issues shall be subjected to appropriate safety review, by a suitably qualified independent review function.

*Related IAEA safety standards:*

*Liaison shall be established with the regulatory body, public authorities, organisations for design, construction, manufacturing, operation and others for ensuring understanding of and compliance with safety requirements...and to ensure proper transfer of information, expertise and experience needed for response to safety issues (NS-R-2, para 2.4). Safety related activities should be properly planned to ensure that they can be carried out safely and efficiently (NS-G-2.4, para 5.12)*

**DA-14:** The licensee shall ensure that the staff are provided with the necessary facilities and working conditions to carry out work in a safe manner.

*Related IAEA safety standards:*

*Adequate resources, services and facilities shall be provided (NS-R-2, para 2.4)*

**DA-15:** The licensee shall ensure that safety performance is continuously monitored through an appropriate review system in order to ensure that safety is maintained and improved as needed.

*Related IAEA safety standards:*

*The licensee shall ensure that safety performance is continuously monitored through an appropriate review system in order to ensure that safety is maintained and improved as needed*

**DA-16:** The licensee shall ensure that relevant decommissioning experience, international development of safety standards and new knowledge gained through R&D-projects are analysed in a systematic way and continuously used to improve plant activities.

*Related IAEA safety standards:*

*Operating experience shall be evaluated in a systematic way...Abnormal events with safety implications shall be investigated to establish the direct and root causes...Information shall be obtained and evaluated on experiences at other plants to derive lessons for its own operations. ..Carefully examination by competent persons so that adequate corrective actions can be taken...All personnel shall be required to report all events and encouraged to report near misses.. Feed back of information to designer in order to obtain advice (NS-R-2, paras 2.21-2.25)*

**DA-17:** The required number of staff for safely carrying out decommissioning, and their competence, shall be analysed in a systematic and documented way.

*Related IAEA safety standards:*

*...a proper definition and detailed analysis of tasks and activities to be performed should be made; the appropriate staffing and qualification requirements at the different levels in the organisation should be determined and the selection, training and retraining requirements should be specified (NS-G-2.4 para 6.12)*

**DA-18:** The sufficiency of staff for safe decommissioning, their competence and suitability for safety work shall be verified on a regular basis and documented.

*Related IAEA safety standards:*

*The operating organisation shall be staffed with competent managers and suitably qualified personnel having a proper awareness of the technical and administrative requirements for safety and motivated to be safety conscious.( NS-R-2, para 2.8). A training programme should ensure that personnel involved in all levels of operation of nuclear power plants have the requisite competence (NS-G-2.4, para 6.20)*

**DA-19:** A long term staffing policy<sup>4</sup> shall exist for activities which are important to safety.

*Related IAEA safety standards:*

*A long term staffing programme tied to the long-range objectives should be developed... to anticipate future personnel needs (NS-G-2.4 para 6.11)*

**DA-20:** Changes to the number of staff which might be significant for safety shall be justified in advance, carefully planned and evaluated after implementation.

*Related IAEA safety standards:*

*...proposed changes to the (organisational) structure and management arrangements which might be significant to safety shall be systematically reviewed by the operating organisation and submitted to the regulatory body for review (NS-R-2 para 2.5)*

**DA-21:** The licensee shall always have, in house, sufficient and competent staff and resources to understand the licensing basis of the facility (e.g. Safety Analysis Report or Safety Case and other documents based thereon), as well as to understand the actual design and history of the facility.

*Related IAEA safety standards:*

*...the management should recognise that a nuclear programme ...require highly qualified personnel capable of ensuring efficient and safe operation under normal conditions and proper response during emergency conditions (NS-G-2.4, para 6.13)*

**DA-22:** The licensee shall maintain, in house, sufficient competent staff and resources to specify, set standards manage and evaluate safety work carried out by contractors.

*Related IAEA safety standards:*

*The operating organisation should contain adequate personnel, possessing the knowledge, training and skills necessary to supervise and evaluate work of contractor personnel (NS-G-2.4, para 4.7)*

### **1.3. Safety issue: Quality management**

**DA-23:** Throughout the life of a nuclear facility the licensee shall develop, implement, and maintain a documented quality management system that defines the required quality and safety objectives applicable to work that is important to safety, health and environment and is carried out by any organization, unit, or individual who can affect nuclear safety.<sup>5</sup>

*Related IAEA safety standards:*

*The operating organisation shall prepare and put in place a comprehensive quality assurance programme covering all activities which may affect the safety operation of the plant. Quality assurance shall be an integral part of every activity that may affect safety. (NS-R-2; Para 2.19)*

*The Code provides the basic requirements for establishing and implementing quality assurance programmes for the stages of siting, design, construction, commissioning, operation and decommissioning of nuclear power plants<sup>1</sup>. These basic requirements apply to all individuals and organizations, including designers, suppliers, constructors, manufacturers and operators. (50-C/SG-Q Code; Para 106)*

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<sup>4</sup> Long term staffing policy has to address any foreseen loss of experienced personnel by adequate recruitment and training measures in advance.

<sup>5</sup> Such organizations include all those within the licensee's company as well as designers, vendors, contractors, suppliers, and service providers employed directly or indirectly on work for the licensee.

**Note:** *Typical work to be addressed includes research and development, designing, purchasing, fabricating, manufacturing, handling, storing, cleaning, erecting, installing, testing, inspecting, maintaining, repairing, operation, technical support, refuelling and disassembly.*

*The documentation of the QA programme is a set of documents that describe the overall measures established by an organization to achieve management goals and objectives. These goals and objectives apply to every unit and individual within the organization. (50-C/SG-Q Code; Annex, Basic Requirement 1; Para 2)*

**DA-24:** The quality management system shall grade the requirements set out in it to reflect their relative importance to nuclear safety with respect to each item, service, or process covered.

*Related IAEA safety standards:*

*...A graded approach based on the relative importance to nuclear safety of each item, service or process shall be used. The graded approach shall reflect a planned and recognized difference in the applications of specific quality assurance requirements. (50-C/SG-Q Code; Para 204)*

*This graded approach should be applied throughout the supply chain. (50-C/SG-Q-5; Para 205)*

*Whilst the QA principles remain the same, the extent to which the QA requirements are to be applied shall be consistent with the importance to nuclear safety of the item, service or process. A graded approach which can satisfy the necessary requirements and ensure the required quality and safety shall be used. (50-C/SG-Q-1; Para 209)*

**DA-25:** The quality management system shall enable the licensee to evaluate compliance with nuclear safety standards and to identify potential safety improvements.

*Related IAEA safety standards:*

*Information... ..should include a description of the quality assurance system established to ensure that all items are designed, manufactured, constructed, assembled, tested, qualified, operated, maintained and replaced in compliance with the relevant safety requirements... (50-C/SG-Q Code; Para 206)*

*During all stages in the life of the nuclear power plant, work shall be planned and performed in accordance with established codes, standards, specifications, practices and administrative controls... (50-C/SG-Q Code; Para 301)*

*The objective of this Code is to establish basic requirements for quality assurance in order to enhance nuclear safety by continuously improving the methods employed to achieve quality. The Code recognizes that all work is a process that can be planned, performed, assessed and improved. (50C/SG-Q Code; Para 105)*

*The safety management system should comprise such organizational elements as: ...improvements of safety performance on the basis of lessons learned at the plant concerned and at other plants... (NS-G-2.4; Para 5.3)*

*QA programme effectiveness shall be assessed and reviewed at all stages of implementation. The information gained from assessments should be used to achieve continuing improvements in work performance. (50-C/SG-Q-1; Para 401)*

**DA-26:** The quality management system shall use nuclear as the fundamental consideration for identifying items, services, and processes that are important to safety and establishing relevant resources, specifications, codes, and safety requirements, including those required for procurement and use of equipment, components, and consumables.

*Related IAEA safety standards:*

*Nuclear safety shall be the fundamental consideration in the identification of the items, services and processes to which the quality assurance programme applies... (50-C/SG-Q Code; Para 204)*

*Design, including subsequent changes, shall be carried out in accordance with established engineering codes and standards, and shall incorporate applicable requirements and design bases. Design interfaces shall be identified and controlled. (50-C/SG-Q Code; Para 304)*

*Requirements necessary to ensure the quality of items and services shall be developed and specified in the procurement documents. Evidence that purchased items and services meet procurement requirements shall be available before they are used. (50-C/SG-Q Code; Para 307)*

*Inspection and testing of specified items, services and processes shall be conducted using established acceptance and performance criteria. The level of inspection and testing and the degree of independence of personnel shall be established. (50-C/SG-Q Code; Para 309)*

**DA-27:** The quality management system shall ensure that the organisational structure, functional responsibilities, levels of authority, and interfaces for all organisations<sup>6</sup>, units, or individuals who can affect nuclear safety are described in a document available for people involved in safety issues.

Related IAEA safety standards:

*...The QA programme assigns responsibility to the line organization to carry out the work to achieve the organization's goals and objectives and empowers the individuals in the organization to perform the tasks they have been assigned. Line management is responsible for achieving quality in the items and services provided by the organization. Individual workers are responsible for the quality of their own work... (50-C/SG-Q Code; Annexe Basic Requirement 1)*

**DA-28:** The quality management system shall require that any organizational change that may affect safety is evaluated, classified with regard to its importance to safety, and justified.

Related IAEA safety standards:

*The change process shall identify any organizational change that may have an effect on safety. Such changes shall be evaluated, classified with regard to the importance to safety and justified. Implementation of such changes shall be monitored to ensure that:*

- Safety is not compromised,
- The integrity of the Management System is maintained, and
- Changes achieve their objectives. (DS 338; Para 314)

*Items and services shall be identified and controlled to ensure their proper use. Items shall be shipped, stored, handled, maintained, operated and used as specified to prevent their damage, loss or deterioration. (50-C/SG-Q Code; Para 302)*

**DA-29:** The person holding the most senior management position shall be responsible and accountable for ensuring that an effective quality management system is being implemented and that the senior management team is committed to and meeting its responsibility for reviewing and ensuring the success of the programme.

Related IAEA safety standards:

*The person in the most senior management position in the organization shall be responsible for ensuring that the QA programme is implemented... Satisfactory implementation requires good planning and the deployment of adequate resources... QA programme effectiveness shall be assessed and reviewed at all stages of implementation. The information gained from assessments should be used to achieve continuing improvements in work performance. (50-C/SG-Q-1; Para 401)*

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<sup>6</sup> Such organisations include all those within the licensee's company as well as designers, vendors, contractors, suppliers, and service providers employed directly or indirectly on work for the licensee.

*Management should demonstrate its commitment to the quality policy through its actions and provide firm and unambiguous support for its implementation. The actions should foster a corresponding commitment to high levels of performance by all personnel, who in turn should be expected to demonstrate their commitment to the policy. Annex I provides an example of the key points of the quality policy. (50-C/SG-Q Code; Para 208)*

**DA-30:** The licensee shall establish and maintain sufficient resources and processes to define, achieve, analyse, and preserve the quality of items that are important to safety, and to take timely and effective corrective or preventive action to respond to deviations from required standards.

*Related IAEA safety standards:*

*...Satisfactory implementation requires good planning and the deployment of adequate resources... QA programme effectiveness shall be assessed and reviewed at all stages of implementation. The information gained from assessments should be used to achieve continuing improvements in work performance. (50-C/SG-Q-1; Para 401)*

**DA-31:** The licensee shall ensure that procured items and services meet established requirements and perform as specified and that selected suppliers continue to provide acceptable items and services during the fulfilment of their procurement obligations. Licensees may delegate procurement activities to other organizations, but shall remain responsible for the overall effectiveness of these activities.

*Related IAEA safety standards:*

*The responsible organization shall ensure that procured items and services meet established requirements and perform as specified and that selected suppliers continue to provide acceptable items and services during the fulfilment of their procurement obligations. The responsible organization may delegate procurement activities to other organizations, but shall retain the responsibility for the overall effectiveness of these activities. (50-C/SG-Q-6; Para 201)*

**DA-32:** Products and processes that do not conform to specified requirements shall be identified and reported to an appropriate level of management within the organization. The safety implications of the non-conformances shall be evaluated and the actions taken shall be recorded, where appropriate.

*Related IAEA safety standards:*

*Products and processes that do not conform to specified requirements shall be identified and reported to an appropriate level of management within the organization. The impact of the non-conformances shall be evaluated and the products or processes either:*

- *accepted or,*
- *some form of corrective action taken within a specified time period or,*
- *rejected to prevent their inadvertent use. (DS 338; Para 6.8)*

**DA-33:** The quality management system shall be developed and implemented in collaboration between the management, those performing the work, and those assessing the work.

*Related IAEA safety standards:*

*...Implementing the QA programme requires the collaborative effort of management, those performing the work and those assessing the work. (50-C/SG-Q-1; Para 401)*

**DA-34:** Work that is important to safety shall be controlled and performed using approved current instructions, procedures, drawings, or other means, that have been appropriately validated before first use and are periodically reviewed to ensure adequacy and effectiveness.

*Related IAEA safety standards:*

*...Work shall be performed under controlled conditions, using approved current instructions, procedures, drawings or other appropriate means that are periodically reviewed to ensure adequacy and effectiveness. (50-C/SG-Q Code; Para 301)*

*The quality assurance programme shall include measures, which ensure that documentation is available in language appropriate to the users. (50-C/SG-Q Code; Para 205)*

*One aspect of review involves validating the implementation of the document through simulation, mock-up, walk-throughs or the like. This validating process is usually applied to significant working level instructions and procedures. (50-C/SG-Q-3; Para 311)*

**DA-35:** Personnel shall be trained in the requirements of the quality management system, so that they are competent to perform their assigned work and understand the safety consequences of their activities.

*Related IAEA safety standards:*

*Personnel shall be trained and qualified so that they are competent to perform their assigned work and understand the safety consequences of their activities. (50-C/SG-Q Code; Para 206)*

**DA-36:** The licensee shall assess the quality management system from time to time to ensure that it provides the required level of safety and shall, where appropriate, incorporate lessons from peer review, decommissioning experience, safety-related research findings, experience from other safety-related events, and developments in science and technology.

*Related IAEA safety standards:*

*Management should periodically analyse available information, such as non-conformance reports, audit reports, maintenance reports, operating logs, significant event registers, plant safety reviews, etc. This analysis should seek out trends in order to identify problem areas requiring root cause analysis, to confirm that appropriate actions have been taken to prevent repetition of the non-conformances and to enhance plant safety and performance. Information on incidents, events or quality related problems available from other nuclear power plants/organizations (operational experience feedback) should be assessed in order that suitable preventive measures can be developed and implemented. (50-C/SG-Q-2; Para 405)*

*Other types of assessment such as peer evaluation are more subjective, based on comparison with good practices and judgements against expert opinions. The results of such activities should be evaluated by senior management before proposed actions are adopted. (50-C/SG-Q-5; Para 403)*

*Peer evaluation is a critical examination of specific nuclear safety related subjects by senior staff from one or more other nuclear power plants to seek improvements and to promote good practices. The evaluation team should consist of experts in all areas of evaluation in order to promote the sharing of experience and to develop relationships between the peers and the people at the nuclear power plants. (50-C/SG-Q-5; Para 613)*

*The feedback of operational events at nuclear power plants is necessary to improve safety. Management should provide sufficient resources and dedicated personnel for the evaluation and feedback of operating events, including those from other plants. Management should clearly define responsibilities and should be sufficiently involved to ensure completion of any improvements and corrective actions arising. (50-C/SG-Q-13; Para 405)*

**DA-37:** An organisational unit shall be established, or an outside agency assigned, that is responsible for independently assessing the adequacy of management processes and work

performed that has sufficient authority and organisational freedom to carry out its responsibilities. People who conduct independent assessments shall not participate directly in the work being assessed.<sup>7</sup>

*Related IAEA safety standards:*

*An organizational unit shall be established, or an outside agency assigned, with the responsibility to conduct independent assessments. It shall have sufficient authority and organizational freedom to carry out its responsibilities. (50-C/SG-Q Code; Para 403)*

*The independent assessment need not necessarily be carried out always by the assessment unit. It may be beneficial for independent assessment to be carried out by other staff brought together for a specific assessment or by a joint team, including members of the assessment unit. (50-C/SG-Q Code; Para 309)*

*Independent assessments shall be conducted on behalf of management to measure the effectiveness of management processes and the adequacy of work performance...and to promote improvement. Independent assessments consists of audits, reviews, checks and other methods. An organisational unit shall be established...to conduct independent assessments. It shall have sufficient authority and organisational freedom to carry out its responsibilities. Persons conducting independent assessments shall not participate directly in the work being assessed (50-C-Q, Paras 402-404)*

*Persons conducting independent assessment shall not participate directly in the work being assessed. (50-C/SG-Q Code; Para 404)*

**DA-38:** All managers shall regularly carry out self-assessment and review of the processes for which they are responsible to determine their efficiency and effectiveness with establishing, promoting, and achieving nuclear safety objectives, and shall take any necessary corrective actions.

*Related IAEA safety standards:*

*Management at all levels shall regularly assess the processes for which it is responsible. Management shall determine its effectiveness in establishing, promoting and achieving nuclear safety objectives. Management process weaknesses and barriers that hinder the achievement of the nuclear safety objectives shall be identified and corrected. (50-C/SG-Q Code; Para 401)*

#### **1.4. Safety issue: Staff training**

**DA-39:** The licensee shall establish an overall training policy and a comprehensive training plan on the basis of long-term training needs and goals that acknowledges the critical role of safety. The plan shall be kept up to date.

*Related IAEA safety standards:*

*The operating organization should formulate an overall training policy. This policy is the commitment by the operating organization and plant management to the training of personnel and an acknowledgement of the critical role that training plays in the safe, reliable operation and maintenance of the plant (NS-G-2.8, para 4.2).*

*A training plan should be prepared on the basis of the long term needs and goals of the plant. This plan should be evaluated periodically in order to ensure that it is consistent with current (and future) needs and goals. Factors which can change a training plan include: commissioning experience, operational experience and decommissioning experience at the plants of the operating organization; feedback of operational experience from other plants; significant modifications to the plant or to the operating organization; changes in regulatory requirements; and changes in the State's education system.(NS-G-2.8, para 4.4)*

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<sup>7</sup> However, it is important that the audit team is familiar with the work being assessed. The aim of this requirement is to avoid any conflict of interest on the part of the assessor

**DA-40:** A systematic approach to training shall be used to provide a logical progression, from identification of the competences required for performing a job, to the development and implementation of training programmes including respective training materials for achieving these competences, and to the subsequent evaluation of this training.

*Related IAEA safety standards:*

*A systematic approach to training should be used for the training of plant personnel (see Ref. [5]). The systematic approach provides a logical progression, from identification of the competences required for performing a job, to the development and implementation of training towards achieving these competences, and to the subsequent evaluation of this training. The use of a systematic approach to training offers significant advantages over more conventional, curricula driven training in terms of consistency, efficiency and management control, leading to greater reliability of training results and enhanced safety and efficiency of the plant.( NS-G-2.8., para 4.13)*

**DA-41:** Only qualified persons that have the necessary knowledge, skills and safety attitudes shall be allowed to carry out tasks important to safety. The licensee shall ensure that all personnel performing safety-related duties, including contractors, have been adequately trained and qualified.

*Related IAEA safety standards:*

*Only qualified persons should be entrusted with functions important to the safe supervision, operation and maintenance of a nuclear power plant. These functions and the related duties and responsibilities should be clearly indicated in the description of the operating organization and of each position (work assignment).( NS-G-2.8, para 3.9) The competence of each individual should be assessed against established requirements before that individual is assigned to a position. The competence of all individuals should be fully assessed periodically by various means while they perform the duties allocated to their position; the assessment should also cover the actual individual performance in the workplace. The requirements should be established in such a way as to ensure that the competences are appropriate to the tasks and activities to be performed. (NS-G-2.8, para 3.7)*

**DA-42:** The Licensee shall define and document the necessary competence requirements for its staff.

*Related IAEA safety standards:*

*Only qualified persons should be entrusted with functions important to the safe supervision, operation and maintenance of a nuclear power plant. These functions and the related duties and responsibilities should be clearly indicated in the description of the operating organization and of each position (work assignment).( NS-G-2.8, para 3.9).*

**DA-43:** Appropriate training records and records of assessments against competence requirements shall be established and maintained for each individual with tasks important to safety.

*Related IAEA safety standards:*

*Appropriate records of assessments against competence and qualification requirements should be established and maintained for each individual at the plant.(NS-G-2.8, para3.8)*

**DA-44:** Performance based training programmes shall be established for all staff with tasks important to safety. The programmes shall cover basic training in order to qualify for a certain position and refresher training as needed.

*Related IAEA safety standards:*

*Performance based programmes for initial and continuing training shall be developed and put in place for each major group of personnel. The content of each programme should be based on a systematic approach. Training programmes shall promote attitudes which help to ensure that safety issues receive the attention that they warrant. (NS-R-2, para 3.8)*

**DA-45:** All plant staff including contractors shall have an appropriate level of understanding of nuclear safety (*see the definition of nuclear safety*) and personal safety depending on their levels and tasks.

*Related IAEA safety standards:*

*All new employees starting work at a plant should be introduced to the organization and their working environment in a systematic and consistent manner. General personnel training programmes should give new employees a basic understanding of their responsibilities and of safe work practices, the importance of quality programmes and of following procedures, and the practical means of protecting themselves from the hazards associated with their work. Hands-on training in means of radiation protection that are common to all plant personnel should be provided to all those who work in controlled areas. The amount of training to be provided on each topic should be commensurate with the individual's position and duties. The basic principles of safety culture should be taught to all employees, and refresher training on general topics should also be periodically provided. (NS-G-2.8, para 5.1)*

**DA-46:** Maintenance and technical support staff including contractors shall have practical hands-on-training on the required safety critical activities.

*Related IAEA safety standards:*

*Maintenance and technical support personnel should have access to workshops, laboratories and facilities that are equipped with mock-ups, models and actual components that enable them to be trained in activities that cannot be practised with installed equipment (because of high dose rates, for example). (NS-G-2.8, Para 6.6)*

## 2. Safety area: Design

These SRLs apply to a wide range of nuclear facilities, for which the complexity of the decommissioning task, the hazards posed, and the stage of decommissioning reached will vary significantly. In particular, reference level DB-38 requires that a facility should be made passively safe before entering a care and maintenance period, which means that the need for active safety systems, monitoring, and human intervention to ensure safety should be minimised. Consideration therefore needs to be given as to whether individual reference levels are relevant in specific circumstances, and when they are relevant they need to be applied in a proportionate manner, taking account of the magnitude of the hazard.

### 2.1. Safety issue: Safety classification of systems, structures and components (SSC) and related requirements

**DA-47:** All SSCs important for safety shall be identified and classified on the basis of their importance for safety. They shall be designed, constructed and maintained such that their quality and reliability is commensurate with this classification.

*Related IAEA safety standards:*

*All structures systems and components including software for I&C that are items important for safety shall be first identified and then classified on the basis of their function and significance with regard to safety. They shall be designed, constructed and maintained such that their quality and reliability is commensurate with this classification. (NSR-1 5.1)*

**DA-48:** The classification of SSCs shall be based on deterministic methods, complemented where appropriate by engineering judgment and/or probabilistic methods.

*Related IAEA safety standards:*

*The method for classifying safety significance of an SSC shall be primarily based on deterministic methods, complemented where appropriate by probabilistic methods and engineering judgment, with account taken of factors such as*

- *the safety function to be performed by the item ;*
- *the consequences of failure to perform its function ;*
- *the time following a PIE at which, or period throughout which, it will be called upon (NSR-1 5.2).*

*PSA can be used in the design phase to confirm the appropriate classification of SSCs (NSG-1.2 3.30)*

*The importance to safety of all SSCs should be established and a safety classification system should be set up in order to identify for each safety class:*

- *the appropriate codes and standards, and hence the appropriate provisions to be applied in design, manufacturing, construction and inspection of a component ;*
- *system related characteristics like degree of redundancy, need for emergency power supply and for qualification to environmental conditions ;*
- *the availability or unavailability status of systems for PIEs to be considered in deterministic safety analysis ;*
- *QA provisions (NS-G 1.2 3.26).*

*In general, the following classification should be established and should be verified for adequacy and consistency :*

- *classification of systems on the basis of the importance of the affected safety function ;*
- *classification for pressure components, on the basis of the severity of the consequences of their failure, mechanical complexity and pressure rating ;*
- *classification for resistance to earthquakes, on the basis of need for the structure or component considered to retain its integrity and to perform its function during and after an earthquake, taking into account aftershocks and consequent incremental damage ;*

- *classification of electrical, instrumentation and control systems on the basis of their safety or safety support functions, which may be different from the classification of the other plant systems owing to the existence of field specific, widely used classification schemes ;*
- *classification for QA provisions. (NS-G 1.2 3.27).*

**DA-49:** SSCs important to safety shall be designed to withstand all relevant PIEs with sufficient reliability.

*Related IAEA safety standards:*

*SSCs important to safety shall be designed to be capable of withstanding all identified PIEs with sufficient reliability (NSR-1 5.32).*

*The potential for common cause failure of items important to safety shall be considered to determine where the principles of diversity, redundancy and independence should be applied to achieve the necessary reliability. (NSR-1 5.33)*

*Appropriately designed interfaces shall be provided between SSCs of different classes to ensure that any failure in a system classified in a lower class will not propagate to a system classified in a higher class. (NSR-1 5.3).*

*The failure of a system and/or component in one safety class should not cause the failure of the other systems and/or component of a higher safety class. The adequacy of the isolation and separation of different and potentially interacting systems assigned to different safety classes should be assessed (NS-G 1.2 3.31).*

*Auxiliary services that support equipment forming part of a system important to safety shall be considered part of that system and shall be classified accordingly. Their reliability, redundancy, diversity and independence and the provision of features for isolation and for testing of functional capability shall be commensurate with the reliability of the system that is supported. (NSR-1 5.41)*

**DA-50:** The failure of a SSC in one safety class shall not cause the failure of other SSCs in a higher safety class. Auxiliary systems supporting equipment important to safety shall be classified accordingly.

*Related IAEA safety standards:*

*Appropriately designed interfaces shall be provided between SSCs of different classes to ensure that any failure in a system classified in a lower class will not propagate to a system classified in a higher class. (NSR-1 5.3).*

*The failure of a system and/or component in one safety class should not cause the failure of the other systems and/or component of a higher safety class. The adequacy of the isolation and separation of different and potentially interacting systems assigned to different safety classes should be assessed (NS-G 1.2 3.31).*

**DA-51:** The design of SSCs important to safety and the materials used shall consider the effects of operational conditions and the effects of design basis accidents on their characteristics and performance.

*Related IAEA safety standards:*

*Materials should meet the standards and requirements for their design and fabrication. The design lifetime of the materials should be determined considering the effects of operational conditions (radiological and chemical environment, single and periodic loads). In addition, effects of design basis accidents on their characteristics and performance should be considered (NSG-1.2 3.63)*

**DA-52:** A qualification procedure shall be adopted to confirm that SSCs important to safety meet throughout their design operational lives the demands for performing their function, taking into account environmental.

*Related IAEA safety standards:*

*A qualification procedure shall be adopted to confirm that the items important to safety are capable of meeting, throughout their design operational lives, the demands for performing their functions while being subject to the*

*environmental conditions (of vibration, temperature, pressure, jet impingement, electromagnetic interference, irradiation, humidity or any likely combination thereof) prevailing at the time of need. The environmental conditions to be considered shall include the variations expected in normal operation, anticipated operational occurrences and design basis accidents. In the qualification programme, consideration shall be given to ageing effects caused by various environmental factors (such as vibration, irradiation and extreme temperature) over the expected lifetime of the equipment. Where the equipment is subject to external natural events and is needed to perform a safety function in or following such an event, the qualification programme shall replicate as far as practicable the conditions imposed on the equipment by the natural phenomenon, either by test or by analysis or by a combination of both (NSR-1 5.45)*

## **2.2. Safety issue: Operation/operational limits and conditions**

**DA-53:** OLCs shall be developed to ensure that facilities are decommissioned in accordance with assumptions and intentions as documented in the safety case.

*Related IAEA safety standards:*

*OLCs shall be developed to ensure that plants are operated in accordance with design assumptions and intent. In order to achieve this requirement the plant safety analysis report should be developed in such a manner as to identify ... (NS-G-2.2. Para 3.1)*

**DA-54:** The OLCs define the conditions that must be met to prevent situations that might lead to accidents or to mitigate the consequences of accidents should they occur.

*Related IAEA safety standards:*

*In order to achieve this requirement the plant safety analysis report should be developed in such a manner as to identify clearly the OLCs that must be met to prevent situations from arising which might lead to accident conditions or to mitigate the consequences of accidents if they do occur. (NS-G-2.2. Para 3.1)*

**DA-55:** Each established OLC shall have detailed justification based on facility design, facility status according to the progress of decommissioning and safety case.

*Related IAEA safety standards:*

*The OLCs shall be based on a safety analysis of the individual plant and its environment in accordance with provisions made in the design. [...] The safety analysis report and OLCs should be reviewed and amended when necessary on the basis of the results of commissioning testing. (NS-G-2.2. Paras 3.8).*

*The necessity for each of the OLCs shall be substantiated by a written statement of the reason for its adoption. (NS-R-2. Para 5.6)*

**DA-56:** The process for making modifications or temporary modifications of OLCs shall be defined. Such modifications of OLCs shall be adequately justified

*Related IAEA safety standards:*

*Where modifications to the OLCs become necessary, the same approach as that described in paras 3.8-3.12 should be followed. (NS-G-2.2. Paras 3.13).*

*Any modifications to the OLCs should be subject to assessment and approval by the regulatory body.*

*When it is necessary to modify OLCs on a temporary basis [...], particular care should be taken to ensure that the effects of change are analysed, ... (NS-G-2.2. Paras 3.14).*

*Probabilistic assessment together with operating experience may be used for justification and modifications of OLCs. (NS-G-2.2. Paras 3.16).*

*When a reasonable alternative approach is available, this should be preferred to a temporary modification of an OLC. (NS-G-2.2. Paras 3.14).*

**DA-57:** Operational staff shall be highly knowledgeable of the OLCs and their technical basis and relevant decision-makers shall be aware of their significance for the safety of decommissioning.

**DA-58:** OLCs cover all decommissioning phases and shall include:

- (a) safety limits;
- (b) safety systems settings;
- (c) equipment required and
- (d) action to be taken in the case of deviations from OLCs.

*Related IAEA safety standards:*

*The OLCs shall include requirements for different operational states, including shutdown. (NS-R-2. Para 5.1).  
The OLCs shall contain operational requirements for different operational states including shutdown. These operational states should include starting up, power production, shutting down, and maintenance, testing and refuelling. (NS G 2.2 Paras 3.2)*

*The OLCs may be classified as :*

*Safety limits;*

*Limits on safety systems settings;*

*Limits and condition for normal operation and for safe transient operational states;*

*Surveillance requirements; (NS-R-2. Paras 5.3)*

*The OLCs at the power plant should include the following items:*

*Safety limits;*

*Limiting safety system settings,*

*Limits and conditions for normal operation,*

*Surveillance requirements,*

*Action statements for deviations from the OLCs. (NS G 2.2 Paras 3.5)*

**DA-59:** Adequate margins shall be provided between safety limits, safety systems settings, alarms and operational limits to avoid activating safety systems too frequently.

*Related IAEA safety standards:*

*Acceptable margins should be ensured between normal operating values and the established safety systems settings to avoid undesirably frequent actuation of safety systems. (NS-G-2.2. Para 6.1)*

*The limits are chosen with the objective of maintaining the integrity of the fuel cladding and the integrity of the pressure boundary of the reactor coolant system under all conditions (...) (NS-G-2.2. Paras, 4.2,)*

**DA-60:** Safety limits shall be established using a conservative approach to take uncertainties in the safety analyses into account.

*Related IAEA safety standards:*

*The safety limits should be established by means of conservative approach to ensure that all the uncertainties of safety analyses are taken in to account. (NS-G-2.2. Paras 4.1)*

*Established safety system settings should ensure automatic action of safety systems within the parameter values assumed in the SAR, despite possible errors that could occur adjusting the nominal set point. (NS-G-2.2. Paras 5.2)*

**DA-61:** Limits and conditions for decommissioning shall include limits on operating parameters, stipulation for minimum amount of operable equipment, staffing levels, actions to be taken by the operating staff in the event of deviations from the OLCs and time allowed to complete these actions.

*Related IAEA safety standards:*

*Limits and conditions for normal operation should include limits on operating parameters, stipulations for minimum amount of operable equipment, minimum staffing levels, prescribed actions to be taken by the operating staff in the event of deviations from the OLCs and time allowed to complete these actions. The limits should also include parameters important to safety, such as the chemical composition of working media, their activity contents and limits on radioactive discharges to the environment. (NS-G-2.2. Para 6.2)*

**DA-62:** Where OLCs have been contravened, the actions to bring the decommissioning activities to a safer state, shall be specified, and the time allowed to complete the action shall be stated.

*Related IAEA safety standards:*

*Where operability requirements cannot be met to the extent intended, the actions to be taken to manoeuvre the plant to a safer state, such as power reduction or reactor shutdown, should be specified, and the time allowed to complete the action should also be stated. (NS-G-2.2. Paras 6.3)*

**DA-63:** Minimum staff levels to ensure safe decommissioning shall be stated in the OLCs

*Related IAEA safety standards:*

*Operability requirements should state for the various modes of normal operation the number of systems or components important to safety that should be either in operating condition or in standby condition. These operability requirements together define the minimum safe plant configuration for each mode of normal operation (NS-G-2.2. Paras 6.3)*

**DA-64:** The licensee shall ensure that an appropriate surveillance program is established and implemented to ensure compliance with OLCs and shall ensure that results are evaluated and retained.

*Related IAEA safety standards:*

*The operating organization shall ensure that an appropriate surveillance program is established and implemented to ensure compliance with OLCs, and that results are evaluated and retained. (NS-R-2. Para 5.5). Records of plant operation and demonstrations of compliance with OLCs and OPs should be made and stored in accordance with IAEA Safety Guide N°50-SG-Q3 on quality assurance. (NS-G-2.2. Paras 10.6)*

**DA-65:** In cases of non-compliance, remedial actions shall be taken immediately to re-establish OLC requirements.

*Related IAEA safety standards:*

*In the event that the operation of the plant deviates from one or more of the established operational limits and conditions, the appropriate remedial actions shall be taken immediately, and the operating organization shall undertake review and evaluation of the case and shall notify the regulatory body in accordance with the established event reporting system. (NS-R-2 Para 5.8)*

**DA-66:** Reports of non-compliance shall be investigated and corrective action shall be implemented in order to help prevent such non-compliance in the future.

*Related IAEA safety standards:*

*Reports of non-compliance should be investigated to ensure that corrective action is implemented and to help prevent such non-compliance in future. (NS-G-2.2. Paras 10.6)*

### 3. Safety area: Operation

#### 3.1. Safety issue: On-site emergency preparedness

Due to the great variety of facilities and the change of potential hazards during the course of decommissioning the content of the site emergency plan may vary from a full scope plan including the involvement of outside agencies to a justification that an emergency plan is not required. The following SRLs therefore need to be applied in proportionate manner.

**DA-67:** The licensee shall provide arrangements for responding effectively to events requiring protective measures at the scene for:

- (a) Regaining control of any emergency arising at their site, including events related to combinations of non-nuclear and nuclear hazards;
- (b) Preventing or mitigating the consequences at the scene of any such emergency; and
- (c) Co-operating with external emergency response organizations in preventing adverse health effects in workers and the public.

*Related IAEA safety standards:*

*The on-site emergency arrangements shall cover emergencies involving combinations of non-nuclear and nuclear hazards, such as a fire in conjunction with significant levels of radiation or contamination, or toxic or asphyxiating gases in conjunction with radiation and contamination, with account taken of the specific site conditions. (NS-R-2; Para 2.34)*

*In a nuclear or radiological emergency, the practical goals of emergency response are:*

- *To regain control of the situation;*
- *To prevent or mitigate consequences at the scene;*
- *To prevent the occurrence of deterministic health effects in workers and the public;*
- *To render first aid and to manage the treatment of radiation injuries;*
- *To prevent, to the extent practicable, the occurrence of stochastic health effects in the population;*
- *To prevent, to the extent practicable, the occurrence of non-radiological effects on individuals and among the population;*
- *To protect, to the extent practicable, property and the environment;*
- *To prepare, to the extent practicable, for the resumption of normal social and economic activity. (GS-R-2; Para 2.3)*

*The practical goal of emergency preparedness may be expressed as:*

*To ensure that arrangements are in place for a timely, managed, controlled, co-ordinated and effective response at the scene, and at the local, regional, national and international level, to any nuclear or radiological emergency. (GS-R-2; Para 2.6)*

**DA-68:** The licensee shall prepare a site emergency plan and establish the necessary organizational structure for clear allocation of responsibilities, authorities, and arrangements for co-ordinating plant activities and co-operating with external response agencies throughout all phases of an emergency.

*Related IAEA safety standards:*

*The emergency arrangements shall include the clear allocation of responsibilities, authorities and arrangements for co-ordination in all phases of the response. These arrangements shall include: ensuring that for each response organization a single position has the authority and responsibility to direct its response actions; clearly assigning the responsibility for the co-ordination of the entire response and for the resolution of conflicts between response organizations; assigning to an on-site position the authority and responsibility for notifying the appropriate organization(s) of an emergency and taking immediate on-site actions; and assigning to an on-site position the responsibility for directing the entire on-site response. (GS-R-2; Para 5.4)*

*The operating organization [of a facility .....] shall prepare an emergency plan that covers all activities under its responsibility, to be adhered to in the event of an emergency. This emergency plan shall be co-ordinated with those of all other bodies having responsibilities in an emergency, including public authorities, and shall be submitted to the regulatory body. (GS-R-2; Para 5.19 or NS-R-2; Para 2.31)*

**DA-69:** The licensee shall provide for:

- Prompt recognition and classification of emergencies;
- Timely notification and alerting of response personnel;
- Ensuring the safety of all persons present on the site, including the protection of the emergency workers
- Informing the authorities and the public, including timely notification and subsequent provision of information as required;
- Performing assessments of the situation on the technical, & radiological points of view (on and off site);
- Monitoring radioactive releases;
- Treatment and first aid of a limited number of contaminated and/or overexposed workers/persons; and
- Plant management and damage control<sup>8</sup>.

*Related IAEA safety standards:*

*Arrangements shall be made to assess promptly: abnormal conditions at the facility; exposures and releases of radioactive material; radiological conditions on and off the site; and any actual or potential exposures of the public. These assessments shall be used for mitigatory actions by the operator, emergency classification, urgent protective actions to be taken on the site, the protection of workers and recommendations for urgent protective actions to be taken off the site. (GS-R-2; Para 4.70)*

*All practicable steps shall be taken to provide the public with useful, timely truthful, consistent and appropriate information throughout a nuclear or radiological emergency. (GS-R-2; Para 4.82)*

*Arrangements shall be made for taking all practicable measures to provide protection for emergency workers for the range of anticipated hazardous conditions in which they may have to perform response functions on or off the site. This shall include: arrangements to assess continually and to record the doses received by emergency workers; procedures to ensure that doses received and contamination are controlled in accordance with established guidance and international standards; and arrangements for the provision of appropriate specialized protective equipment, procedures and training for emergency response in the anticipated hazardous conditions. (GS-R-2; Para 4.62)*

*Arrangements shall be made to treat a limited number of contaminated or overexposed workers, including arrangements for first aid, the estimation of doses, medical transport and the initial medical treatment of contaminated or highly exposed individuals in local medical facilities. (GS-R-2; Para 4.78)*

*The on-site emergency plan shall include arrangements to ensure the safety of all persons on the site in the event of a nuclear or radiological emergency. This shall include arrangements: to notify people on the site of an emergency; for all persons on the site to take appropriate actions immediately upon notification of an emergency; to account for those on the site; to locate and recover those unaccounted for; to take urgent protective action; and to provide immediate first aid. The facility shall provide suitable assembly points for all persons on the site and shall be provided with a sufficient number of safe escape routes, clearly and durably marked, with reliable emergency lighting, ventilation and other building services essential to the safe use of these routes. (GS-R-2; Para 4.51)*

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<sup>8</sup> Urgent mitigatory repairs, controls, and other actions that are carried out, primarily at the site, while the emergency is still in progress.

**DA-70:** The site emergency plan shall be based upon an assessment of reasonably foreseeable events and situations that may require protective measures on- or off-site. The plan shall also be co-ordinated with all other involved.

*Related IAEA safety standards:*

*In designing a threat category I, II or III facility “[a] comprehensive safety analysis is carried out to identify all sources of exposure and to evaluate radiation doses that could be received by workers at the [facility] and the public, as well as potential effects on the environment... The safety analysis examines... event sequences that may lead to [an emergency]. On the basis of this analysis... requirements for emergency [preparedness and] response can be established.” (Ref. [11], Para. 2.7.)<sup>5</sup> (GS-R-2; Para 3.14)*

*Reactors: Operation, Safety Series No. 35-S2, IAEA, Vienna (1992), Para. 1604; this Code is to be superseded by a Safety Requirements publication on the Design and Operation of Nuclear Research Reactors (in preparation).*

*“The nature and extent of emergency arrangements [for preparedness and response] shall be commensurate with the potential magnitude and nature of the [threat]... associated with the facility or activity.” (Ref. [10], Para. 6.4.) The full range of postulated events shall be considered in the threat assessment. In the threat assessment, emergencies involving a combination of a nuclear or radiological emergency and a conventional emergency such as an earthquake shall be considered<sup>6</sup>. Any threat associated with nuclear facilities in other States shall also be considered. In the threat assessment any populations at risk shall be identified and, to the extent practicable, the likelihood, nature and magnitude of the various radiation related threats shall be considered. The threat assessment shall be so conducted as to provide a basis for establishing detailed requirements for arrangements for preparedness and 10. (GS-R-2; Para 3.15)*

*This emergency plan shall be co-ordinated with those of all other bodies having responsibilities in an emergency, including public authorities, and shall be submitted to the regulatory body. (GS-R-2; Para 5.19 or NS-R-2; Para 2.31)*

*For facilities in threat category I, II or III arrangements shall be made for mitigatory actions by the operator to prevent an escalation of the threat, to return the facility to a safe and stable state, to reduce the potential for releases of radioactive material or exposures and to mitigate the consequences of any actual releases or exposures. These arrangements shall take into account the following aspects of the response to mitigate the consequences of a nuclear or radiological emergency: the operational actions necessary; the operational information needs; the workload and conditions of the operational staff (such as in the control room); the responder actions necessary in the facility; the conditions in the facility in which responder actions are necessary; and the response of the personnel, instrumentation and systems of the facility under emergency conditions. Arrangements shall include emergency operating procedures and guidance for the operator on mitigatory actions for severe conditions, for the full range of postulated emergencies, including accidents beyond the design basis<sup>36, 37</sup>. (GS-R-2; Para 4.39)*

**DA-71:** The licensee shall have people available at all times with the authority and responsibilities to classify and declare an emergency and, upon classification, to initiate promptly the appropriate on-site response.

*Related IAEA safety standards:*

*The on-site emergency plan shall include the following:*

- *The designation of persons for directing on-site activities and for ensuring liaison with off-site organizations;*
- *The conditions under which an emergency shall be declared, a list of job titles and/or functions of persons empowered to declare it, and a description of suitable means for alerting response personnel and public authorities;*
- *The arrangements for initial and subsequent assessment of the radiological conditions on and off the site;*
- *Provisions for minimizing the exposure of persons to ionizing radiation and for ensuring medical treatment of casualties;*
- *Assessment of the state of the installation and the actions to be taken on the site to limit the extent of radioactive release;*
- *The chain of command and communication, including a description of related facilities and procedures;*

- *An inventory of the emergency equipment to be kept in readiness at specified locations;*
- *The actions to be taken by persons and organizations involved in the implementation of the plan; and*
- *Provisions for declaring the termination of an emergency. (NS-R-2; Para 2.33)*

**DA-72:** Sufficient numbers of qualified personnel shall be available at all times for staffing appropriate positions promptly following the declaration and notification of an emergency.

*Related IAEA safety standards:*

*Sufficient numbers of qualified personnel shall be available at all times in order that appropriate positions can be promptly staffed as necessary following the declaration and notification of a nuclear or radiological emergency. (GS-R-2; Para 5.9)*

**DA-73:** Arrangements shall be made to provide technical assistance to operational staff. Teams for mitigating the consequences of an emergency (eg. radiation protection, damage control, fire fighting, etc) shall be available.

*Related IAEA safety standards:*

*For facilities in threat category I, II or III arrangements shall be made to provide technical assistance to the operational staff. Teams for mitigating the consequences of an emergency (damage control, fire fighting) shall be available and shall be prepared to perform actions in the facility. "Any equipment necessary in... response and recovery... shall be placed at the most suitable location to ensure its ready availability at the time of need and to allow human access [to it] in the anticipated [emergency conditions or] environmental conditions." (Ref. [11], Para. 5.30.) The personnel directing mitigatory actions shall be provided with an operating environment, information and technical assistance that allows them to take effective action to mitigate the consequences of the emergency. Arrangements shall be made to obtain support promptly from police, medical and fire fighting services off the site. Off-site support personnel shall be afforded prompt access to the facility and shall be informed of on-site conditions and the necessary protective actions. (GS-R-2; Para 4.40)*

**DA-74:** Arrangements shall be made to alert police, medical, and off-site fire-fighting services and other responsible authorities and/or organisations promptly.

*Related IAEA safety standards:*

*Emergency plans shall include, as appropriate: ..... (d) procedures, including communication arrangements, for contacting any relevant [response organizations] and for obtaining assistance from fire fighting, medical, police and other relevant organizations; ..... (GS-R-2; Para 5.18)*

**DA-75:** The licensee shall identify those who are authorized to carry out the response functions assigned in the emergency plan.

*Related IAEA safety standards:*

*The emergency arrangements shall include the clear allocation of responsibilities, authorities and arrangements for co-ordination in all phases of the response. These arrangements shall include: ensuring that for each response organization a single position has the authority and responsibility to direct its response actions; clearly assigning the responsibility for the co-ordination of the entire response and for the resolution of conflicts between response organizations<sup>72</sup>; assigning to an on-site position the authority and responsibility for notifying the appropriate organization(s) of an emergency and taking immediate on-site actions; and assigning to an on-site position the responsibility for directing the entire on-site response. (GS-R-2; Para 5.4)*

**Note:** *This responsibility would typically be assigned to a position in the organization with a primary role during each phase of the response. As the emergency progresses, the responsibility would typically pass from the operator or first responders to a local official and finally to a national official or to a command group (composed of representatives of the facility and other principal responders) for events involving several jurisdictions or ministries*

**Note:** *The responsibility may be transferred to different positions as the emergency develops and as the on-site staff are augmented.*

*The positions responsible within each operating and response organization for the performance of the response functions specified in Section 4 shall be assigned in the emergency plans. (GS-R-2; Para 5.7)*

*Personnel shall be assigned to appropriate positions in all operating and response organizations in order to perform the functions necessary to meet the requirements established in Section 4. (GS-R-2; Para 5.8)*

**DA-76:** Appropriate emergency facilities shall be designated for responding to events on site and that will provide off-site monitoring and assessment throughout different phases of an emergency response.

*Related IAEA safety standards:*

*Adequate tools, instruments, supplies, equipment, communication systems, facilities and documentation (such as procedures, checklists, telephone numbers and manuals) shall be provided for performing the functions specified in [Section 4]. These items and facilities shall be selected or designed to be operational under the postulated conditions (such as the radiological, working and environmental conditions) that may be encountered in the emergency response, and to be compatible with other procedures and equipment for the response (such as the communication frequencies of other response organizations), as appropriate. These support items shall be located or provided in a manner that allows their effective use under postulated emergency conditions. (GS-R-2; Para 5.25)*

**DA-77:** Important information shall be available in the emergency facility about the facility and radiological conditions on and around the site.

*Related IAEA safety standards:*

*An “on-site emergency control centre”, separated from the [facility] control room, shall be provided to serve as [a] meeting place for the emergency staff who will operate from there in the event of an emergency. Information about important [facility] parameters and radiological conditions in the [facility] and its immediate surroundings should be available there. The room should provide means of communication with the control room, the supplementary control room and other important points in the [facility], and with the on-site and off-site emergency response organizations. Appropriate measures shall be taken to protect the occupants for a protracted time against hazards resulting from a severe accident. (GS-R-2; Para 5.27)*

**DA-78:** Instruments, tools, equipment, documentation, and communication systems for use in emergencies shall be kept available and tested sufficiently frequently to demonstrate that they are in good working condition where they are unlikely to be affected by postulated accidents.

*Related IAEA safety standards:*

*Instruments, tools, equipment, documentation and communication systems to be used in emergencies shall be kept available and shall be maintained in good operating condition, in such a manner that they are unlikely to be affected by or made unavailable by the postulated accidents. (NS-R-2; Para 2.38)*

**DA-79:** Arrangements shall be made to identify the knowledge, skills, and abilities needed for personnel to perform their assigned response functions.

*Related IAEA safety standards:*

*The operator and the response organizations shall identify the knowledge, skills and abilities necessary to be able to perform the functions specified in [Section 4]. The operator and the response organizations shall make arrangements for the selection of personnel and for training to ensure that the personnel have the requisite knowledge, skills, abilities, equipment, and procedures and other arrangements to perform their assigned response functions.... (GS-R-2; Para 5.31)*

**DA-80:** Arrangements shall be made to inform all employees and all other persons present on the site of the actions to be taken in the event of an emergency.

*Related IAEA safety standards:*

*All employees and all other persons on the site shall be instructed in the arrangements for them to be notified of an emergency and their actions when notified of an emergency. (GS-R-2; Para 5.32)*

**DA-81:** Training arrangements shall include basic emergency training and ongoing refresher training on an appropriate schedule and shall ensure that emergency response personnel meet the training obligations.

*Related IAEA safety standards:*

*.... The arrangements shall include ongoing refresher training on an appropriate schedule and arrangements for ensuring that personnel assigned to positions with responsibilities for emergency response undergo the specified training. (GS-R-2; Para 5.31)*

*Site personnel shall be trained in the performance of their duties in an emergency. There shall be a means of informing all employees and all other persons on the site of the actions to be taken in the event of an emergency. (NS-R-2; Para 2.35)*

**DA-82:** The facility emergency plan shall be exercised on a regular basis. Some exercises shall be integrated to include as many as possible of the off-site organizations concerned.

*Related IAEA safety standards:*

*.... There shall thereafter at suitable intervals be exercises of the emergency plan, some of which shall be witnessed by the regulatory body. Some of these exercises shall be integrated and shall include the participation of as many as possible of the organizations concerned.... (NS-R-2; Para 2.37)*

*The staff responsible for critical response functions for a facility in threat category I, II or III shall participate in a training exercise or drill at least once every year. For facilities, practices or jurisdictions in threat category IV or V the staff responsible for critical response functions shall participate in training exercises or drills on an appropriate schedule<sup>88</sup>. (GS-R-2; Para 5.34)*

**Note:** *Critical response functions are functions that must be performed promptly and correctly in order to classify and declare an emergency effectively, to manage the response, to activate the emergency organization, to take mitigatory actions, to protect emergency workers and to take urgent protective actions on and off the site in accordance with international safety standards.*

**Note:** *A related requirement was established in Ref. [3], Appendix V, Para. V.3.*

**DA-83:** Emergency exercises shall be evaluated systematically, and the emergency preparedness arrangements and the plan shall be subject to review and updating in the light of experience gained.

*Related IAEA safety standards:*

*..... The plans shall be subject to review and updating in the light of experience gained. (NS-R-2; Para 2.37)*

### **3.2. Safety issue: Operational experience feedback**

**DA-84:** The licensee shall establish and conduct a programme to collect, screen, analyse, and document decommissioning experience and events at the facility in a systematic way.

Relevant decommissioning experience and events reported by other facilities shall also be considered.

*Related IAEA safety standards:*

*The operating organization must establish a programme for the collection and analysis of operating experience. (SS N 110, para 513). Operating experience at the plant shall be evaluated in a systematic way. (NS-R-2, para. 2.21).*

*The operating organization and the regulatory body shall agree on and establish complementary programmes to analyse operating experience to determine whether equipment, procedures and/or training or related safety requirements need to be modified and to ensure that lessons are learned and acted upon. (SS N 110, para 513, (21), NS-G-2.4, para 4.4))*

**DA-85:** Decommissioning experience at the facility shall be evaluated to identify any undetected safety relevant events or potential precursors and possible tendencies towards degraded safety performance or reduction in safety margin.

*Related IAEA safety standards:*

*The operating experience at the plant should be evaluated in a systematic way, primarily to make certain that no safety relevant event goes undetected. ( NS-G-2.4, para 6.64) Operating experience should be carefully examined by designated competent persons to detect any precursor signs of possible tendencies adverse to safety, so that corrective action can be taken before serious conditions arise. ( NS-G-2.4, para 6.66). Low level events and near misses should be reported and reviewed thoroughly as potential precursors to degraded safety performance. ( NS-G-2.4, para 6.64).*

**DA-86:** The licensee shall designate staff for carrying out these programmes, for the dissemination of findings important to safety and – where appropriate – for recommendations on actions to be taken. Significant findings and trends shall be reported to the licensee's top management.

*Related IAEA safety standards:*

*Operating experience should be carefully examined by designated competent persons to detect any precursor signs of possible tendencies adverse to safety, so that corrective action can be taken before serious conditions arise. (NS-G-2.4, para 6.66) The operating organization should provide a means for independent safety review. ... The reports resulting from this activity should be formal and should be provided directly to the top management of the operating organization. Particular attention should be paid to the feedback from experience. (NS-G-2.4, para 5.18)*

**DA-87:** Staff responsible for evaluation of decommissioning experience and investigation into events shall receive adequate training, resources, and support from the licensee management.

*Related IAEA safety standards:*

*The responsibilities, qualification criteria and training requirements of personnel performing activities to review operating experience should be clearly defined. Personnel who conduct investigations of abnormal events should be provided with training in investigative root cause analysis techniques such as accident investigation, human factor analysis (including organizational factors), management oversight and risk tree analysis, change analysis and barrier analysis. Event investigators should be knowledgeable of plant design, procedures and operations. (NS-G-2.4, para 6.67). The line management of a plant should be responsible for assisting in the review of operating events and for specifying and taking corrective actions. (NS-G-2.4, para 6.63)*

**DA-88:** The licensee shall ensure that results are obtained, that conclusions are drawn, measures are taken, good practices are considered and that timely and appropriate corrective

actions are implemented to prevent recurrence and to counteract developments adverse to safety.

*Related IAEA safety standards:*

*Overall responsibility for implementing the operating experience review programme can be placed in either the nuclear power plant or the operating organization. However, the involvement and support of senior management of the operating organization are key for an operating experience review programme to be effective. (NS-G-2.4, para 6.63) The investigation shall, where appropriate, result in clear recommendations to the plant management, which shall take appropriate corrective action without undue delay. (NS-R-2, para 2.2.1) Operating organisations should have the objective of improving safety, plant availability and commercial performance by identifying the causes of events and thereby avoiding their recurrence and by evaluating the applicability of good practices used by others. (DS 288(5), para 4.3)*

**DA-89:** Experience which has been regarded as important to the facility (see DA-86) shall be organised, documented, and stored in such a way that it can be easily retrieved and systematically searched, screened and assessed by the designated staff.

*Related IAEA safety standards:*

*Reports in the OEF system should be stored in such a manner that information they contain can be easily sorted and retrieved by both the operating organization/licensee and the regulatory body, as appropriate. (NS-R-2, para 2.26)*

*The information, for example, should be arranged to enable frequently needed searches for: events at similar units; systems or components which failed or were affected; identification of the causes of events; identification of trends or patterns; events with similar consequences to the environment or personnel; identification of failures types or human factor issues and identification of recovery and corrective actions. (DS 288, para 3.12)*

**DA-90:** The licensee shall report incidents and abnormal events of significance to safety in accordance with established procedures and criteria to the national regulatory body.

*Related IAEA safety standards:*

*The operating organization shall report incidents significant to safety to the regulatory body. (SS N.100) The operating organization shall develop and effect a procedure for reporting abnormal events to the regulatory body in accordance with established criteria. (NS-R-2, para 2.17)*

**DA-91:** The personnel shall be required by licensee to report abnormal events and be encouraged to report internally near misses relevant to the safety of the facility.

*Related IAEA safety standards:*

*All plant personnel shall be required to report all events and shall be encouraged to report on any 'near misses' relevant to the safety of the plant. (NS-R-4, para 2.24)*

**DA-92:** Information resulting from the decommissioning experience shall be disseminated to relevant staff and shared with relevant national and international bodies.

*Related IAEA safety standards:*

*Safety significant information needs to be disseminated to its staff and to relevant national and international organizations. (SS N 110, para 513)*

**DA-93:** A process shall be put in place to ensure that decommissioning experience of events at the facility concerned as well as of relevant events at other facilities is appropriately considered in the training programme for staff with tasks related to safety.

*Related IAEA safety standards:*

*A programme shall be put in place to ensure that operating experience of events at the plant concerned as well as of relevant events at other plants is appropriately factored into the training programme. The programme shall ensure that training is conducted on the root cause(s) of the events and on the identification and implementation of corrective actions to prevent their recurrence. (NS-R-2, para 3.14)*

**DA-94:** An initial assessment of events important to safety shall be performed without delay to determine whether urgent actions are necessary.

*Related IAEA safety standards:*

*Actions taken in response to events .... are aimed generally at correcting a situation, preventing recurrence or enhancing safety. Corrective actions can be either immediate, interim or long term necessitating detailed evaluation. Examples of immediate actions are measures to recover from a plant transient or to isolate contaminated areas. (DS 288(5), para. 8.1, 8.6)*

**DA-95:** The licensee shall have procedures specifying appropriate investigation methods. Methods of human performance analysis shall be used to investigate human performance related events.

*Related IAEA safety standards:*

*Abnormal events important to safety should be investigated in depth to establish their direct and root causes. Methods of human performance analysis should be used to investigate human performance related events. ( NS-G-2.4, para 6.64) Accordingly, the operating organization/licensee should have procedures specifying the type of investigation that is appropriate for any particular type of event. Such procedures typically outline the conduct of an investigation in terms of initiation, duration, composition of the investigation team, format of final report and terms of reference for the investigation team. A typical outline for an investigation process is given in Appendix III. (DS 288(5), para. 5.2)*

**DA-96:** Event investigation shall be conducted on a time schedule consistent with the event significance. The investigation shall:

- establish the complete event sequence;
- determine the deviation;
- include direct and root cause analysis;
- assess the safety significance including potential consequences;
- identify corrective actions.

*Related IAEA safety standards:*

*See DA-96*

**DA-97:** The licensee shall maintain liaison as appropriate with the organizations (manufacturer, research organization, designer) involved in design and construction of the facility, with the aims of feeding back information on operating experience to facilitate the decommissioning.

*Related IAEA safety standards:*

*Plant management shall maintain liaison as appropriate with the organizations (manufacturer, research organization, designer) involved in the design, with the aims of feeding back information on operating experience and obtaining advice, if necessary, in the event of equipment failures or abnormal events .(NS-R-2, 2.25)*

**DA-98:** As a result of the analysis timely corrective actions shall be taken such as technical modifications, administrative measures or personnel training to restore safety, to avoid event recurrence.

*Related IAEA safety standards:*

*The investigation shall, where appropriate, result in clear recommendations to the plant management,... .(NS-R-2, 2.25) The investigation should result in clear recommendations to plant management, which should take appropriate corrective action without undue delay to prevent recurrence. (NS-G-2.4, para 6.64)*

**DA-99:** Periodic reviews of the effectiveness of the decommissioning experience feedback process based on performance criteria shall be undertaken and documented either within a self assessment programme by the licensee or by a peer review team.

*Related IAEA safety standards:*

*The effectiveness of the operating experience review programme should be assessed periodically to identify areas of weakness that require improvement. (NS-G-2.4, para 6.62)*

### **3.3. Safety issue: Operation/plant modification**

**DA-100:** The licensee shall ensure that no modification to the planned decommissioning activities, whatever the reason for it, affects the safety of decommissioning.

*Related IAEA safety standards:*

*No modification to a nuclear power plant, whether temporary or permanent, should affect the plant's ability to be operated safely in accordance with the assumptions and intend of the design (NS-G-2.3 Para 2.3) Modifications relating to plant configuration are ..... any permanent or temporary alterations to structures, systems and components, process software, operational limits and conditions, or operating procedures (NS-G-2.3 Para 4.1)*

**DA-101:** The licensee shall control modifications of planned decommissioning activities using a graded approach with appropriate criteria for classification according to their safety significance.

*Related IAEA safety standards:*

*The operating organisation shall establish a procedure to ensure proper design, review, control and implementation of all permanent and temporary modifications. (NS-R-2. Para 7.4). Modifications should be categorized according to their safety significance (NS-R-2.Para 7.2). The criteria applicable in determining the categorization for each specific modification should be defined and documented in order to enable correct assessment of the potential effect on safety. (NS-G-2.3 Para 4.7) A proposed categorization could be....(NS-G-2.3 Para 4.5)*

**DA-102:** Modifications to instructions and procedures, to organisational aspects, to evaluation methods in the safety case shall follow a similar process, as for technical changes.

*Related IAEA safety standards:*

*Modifications to a nuclear power plant may consist of:*

- *Modifications to structures, systems and components;*
- *Modifications to the operational limits and conditions;*
- *Modifications to instructions and procedures; or*
- *A combination of the above; and*
- *Modification of organizations. (NS-R-2, Para 7.1)*

**DA-103:** The licensee shall establish a process to ensure that all modifications are properly designed, reviewed, controlled and implemented, and that all relevant safety requirements are met.

*Related IAEA safety standards:*

*The operating organization shall establish a procedure to ensure proper design, review, control and implementation of all permanent and temporary modifications. This procedure shall ensure that the requirements of the plant safety analysis report and applicable codes and standards are met. (NS-R-2 Para 7.4)*

**DA-104:** This process shall include the following:

- Reason and justification for modification;
- Feasibility study;
- Design;
- Safety assessment;
- Updating plant documentation and training;
- Fabrication, installation and testing; and
- Implementation of the modification.

*Related IAEA safety standards:*

*It should be ensured that the various steps shown in Fig. 1,... have been completed. Appropriate justification should be given for each modification and this should be assessed before the modification is made (NS-G-2.3 Para 2.8)*

**DA-105:** The licensee shall ensure that appropriate safety assessments and reviews have been performed before a modification is implemented.

*Related IAEA safety standards:*

*The operating organization should ensure that the appropriate safety analyses have been performed before the modification is commenced. The operating organization should submit details of the modifications and the safety assessment to the regulatory body for its information, review, approval or concurrence, as appropriate, before proceeding with the modification. (NS-G-2.3 Para 3.3)*

**DA-106:** Before starting a modification, an initial safety assessment shall be carried out to determine any consequences for safety.

*Related IAEA safety standards:*

*An initial safety assessment should be carried out before starting a modification to determine whether the proposed modification has any consequences for safety and whether it is within the regulatory constraints for the plant design and operation. This initial assessment should be carried out by trained and qualified personnel. (NS-G-2.3 Para 4).*

**DA-107:** A detailed, comprehensive safety assessment shall be undertaken, unless the results of the initial safety assessment show that the scope of this assessment can be reduced or it can be omitted if the modifications have no safety significance.

*Related IAEA safety standards:*

*Depending on the results of the initial safety assessment, a more detailed and comprehensive safety assessment may be needed. The extent and complexity of the additional assessment that is necessary will depend on the nature and extent of the consequences of the modification for safety. If the initial assessment has clearly demonstrated that the modification will have no consequences for safety, either as or after the modification is made, then further safety assessment may not be necessary. (NS-G-2.3 Para 4.9)*

**DA-108:** Comprehensive safety assessments shall demonstrate all applicable safety aspects are considered and that the system specifications and the relevant safety requirements are met.

*Related IAEA safety standards:*

*It should be demonstrated by means of the comprehensive safety assessment that the modified plant can be operated safely and complies with the system specifications and safety requirements. (NS-G-2.3 Para 4.11)*

**DA-109:** The scope, safety implications and consequences of proposed modifications shall be reviewed by personnel independent of their design or implementation.

*Related IAEA safety standards:*

*The scope, safety implications and consequences of proposed modifications should be reviewed by personnel not immediately involved in their design or implementation. (NS-G-2.3 Para 4.13)*

**DA-110:** Implementation and testing of modifications of planned decommissioning activities shall be performed in accordance with relevant work control and ~~plant~~ testing procedures.

*Related IAEA safety standards:*

*Implementation and testing of plant modifications shall be performed in accordance with the plant's work control system and appropriate testing procedures. (NS-R-2. Para 7.5)*

**DA-111:** Before implementing a modification personnel shall have been trained, as appropriate, and all relevant documents necessary for decommissioning shall have been updated.

*Related IAEA safety standards:*

*Prior to putting the plant back into operation after modifications, all relevant documents necessary for the operation of the plant after the modifications (in particular the documents for shift operators) shall be updated and personnel shall be trained as appropriate. (NS-R-2. Para 7.7).*

**DA-112:** All modifications shall be clearly identified at the point of implementation and at any relevant control position. Personnel shall be clearly informed of these modifications and of their consequences.

*Related IAEA safety standards:*

*Temporary modifications (including defeat of interlocks, installation of jumpers and lifted leads) shall be clearly identified at the point of application and any relevant control position. Operating personnel shall be clearly informed of these temporary modifications and of their consequences for the operation of the plant, under all operating conditions. (NS-R-2 Para. 7.6)*

### 3.4. Safety issue: Ageing management

**DA-113:** In addition to the maintenance, surveillance and inspection programmes the operating organisation shall have a document (e. g. Ageing Management Programme) identifying all ageing mechanisms important to safety related SSCs, determine their possible consequences and determine necessary activities in order to maintain the operability and reliability of these SSCs.

*Related IAEA safety standards:*

*The operating organisation should determine which additional MSS activities will be necessary as the plant ages. At least two phases of the plant's lifetime should receive special attention in the planning of maintenance: the commencement of operation just after commissioning, and the period when ageing mechanisms could contribute significantly to the deterioration of safety related SSCs. There is no specific moment in time at which safety relevant ageing processes at a plant set in, this time is different for different SSCs. The importance of ageing processes for the safety and availability of a nuclear power plant should be recognised in order to maintain and enhance the plant's long term operating characteristics. Assessments should be made of whether and how the ageing of SSCs would increase the potential for common mode failures and for varying levels of incipient, degraded and catastrophic failures, in order to provide assurance of the availability of aged SSCs important to safety until the end of their service life. Monitoring the reliability and performance of the plant for ageing related degradation should therefore be a feature of the safety management programme, and an appropriate preventive maintenance programme should be in place. (NS-G-2.6, para7.6)*

*The safety assessment should take into account the fact that plant structures, systems and components are affected in varying measure by ageing effects. Some effects of this kind are well known and provisions can be taken to cope with them. Others, by experience, are not foreseeable and suitable testing, inspection and surveillance programmes should be employed in order to detect their possible occurrence. A complete programme of actions during the plant lifetime should be drawn up and technical prerequisites for its implementation established at the design stage. Periodic safety reviews are a good way of determining whether ageing and wear-out mechanisms have been correctly taken into account and to detect unpredicted issues. (NS-G-1.2; paragraph 3.97)*

**DA-114:** The licensee shall assess SSCs important to safety taking into account of relevant ageing and wear-out mechanisms and potential age related degradations in order to ensure the capability of the facility to perform the necessary safety functions throughout decommissioning.

*Related IAEA safety standards:*

*Appropriate margins shall be provided in the design for all structures, systems and components important to safety so as to take into account relevant ageing and wear-out mechanisms and potential age related degradation, in order to ensure the capability of the structure, system or component to perform the necessary safety function throughout its design life. (NS-R-1; paragraph 5.47)*

*Ageing and wear-out effects in all normal operating conditions, testing, maintenance, maintenance outages and plant states in a postulated initiating event (PIE) and post-PIE shall also be taken into account. (NS-R-1; paragraph 5.47)*

**DA-115:** The licensee shall provide as appropriate monitoring, testing, sampling and inspection activities to assess ageing effects to identify unexpected behaviour or degradation.

*Related IAEA safety standards:*

*Provisions shall also be made for monitoring, testing, sampling and inspection, to assess ageing mechanisms predicted at the design stage and to identify unanticipated behaviour or degradation that may occur in service. (NS-R-1; paragraph 5.47)*

*Other possible ageing effects, indicated by past experience, refer to:*

- *Corrosion of vessel internals, and failure by vibration.*
- *Stress corrosion cracking of core nozzles and, in some cases irradiation assisted, reactor internals.*
- *Thermal and pressure transients in nozzles and piping, including thermal mixing and stripping in pipe joint areas.*
- *Thermal stratification in piping and other erosion mechanisms.*
- *Ageing of organic cable insulation or sealing materials.*

*The design of the plant should eliminate these problems during the design stage or include means for timely detection of their inception and for implementing appropriate corrective actions. (NS-G-1.2; paragraph 3.101).*

**DA-116:** Whenever the Periodic Safety Reviews are performed they shall be used to determine whether ageing and wear-out mechanisms have been correctly taken into account and to detect unexpected issues.

*Related IAEA safety standards:*

*Periodic safety reviews are a good way of determining whether ageing and wear-out mechanisms have been correctly taken into account and to detect unpredicted issues. (NS-G-1.2; paragraph 3.97)*

**DA-117:** In its ageing management document the licensee shall take account of environmental conditions, process conditions, duty cycles, maintenance schedules, service life, testing schedules, and on the other hand replacement strategy.

*Related IAEA safety standards:*

*Ageing should be taken into account in the design by the appropriate definition of environmental conditions, process conditions, duty cycles, maintenance schedules, service life, testing schedules, replacement parts and replacement intervals. (NS-G-1.2; paragraph 3.93)*

**DA-118:** The ageing management document shall be reviewed and updated, in order to incorporate new information as it becomes available.

*Related IAEA safety standards:*

*An updating process should be considered when managing ageing, in order to incorporate new information as it becomes available, to address new issues as they arise, to use more sophisticated tools and methods as they become accessible and to assess the performance of maintenance practices considered over the life of the plant. (NS-G-1.2; paragraph 4.6)*

### **3.5. safety issue: *In-service inspection, functional testing and operability control***

**DA-119:** The licensee shall prepare and implement documented programmes of maintenance, testing, surveillance and inspection of SSCs important to safety to ensure that their availability, reliability and functionality remain in accordance with the decommissioning plan. They shall take into account operational limits and conditions and be re-evaluated in the light of experience.

*Related IAEA safety standards:*

*The operating organization shall prepare and implement a programme of maintenance, testing, surveillance and inspection of those structures, systems and components which are important to safety. This programme shall be in place prior to fuel loading and shall be made available to the regulatory body. It shall take into account operational limits and conditions as well as any other applicable regulatory requirements and it shall be re-evaluated in the light of experience. (NS-R-2, 6.1)*

*The maintenance, testing, surveillance and inspection of all plant structures, systems and components important to safety shall be to such a standard and at such a frequency as to ensure that their levels of reliability and effectiveness remain in accordance with the assumptions and intent of the design throughout the service life of the plant. (NS-R-2, 6.2)*

*Effective maintenance, surveillance and inspection (MS&I) are essential for the safe operation of a nuclear power plant. They ensure not only that the levels of reliability and availability of all plant structures, systems and components (SSCs) that have a bearing on safety remain in accordance with the assumptions and intent of the design, but also that the safety of the plant is not adversely affected after the commencement of operation. (NS-G-2.6, 1.1)*

*The maintenance programme for a nuclear power plant should cover all preventive and remedial measures, both administrative and technical, that are necessary to detect and mitigate degradation of a functioning SSC or to restore to an acceptable level the performance of design functions of a failed SSC. The purpose of maintenance activity is also to enhance the reliability of equipment. The range of maintenance activities includes servicing, overhaul, repair and replacement of parts, and often, as appropriate, testing, calibration and inspection. (NS-G-2.6, 2.1)*

**DA-120:** All items of equipment used for examinations and tests together with their accessories shall be qualified and calibrated before they are used. All equipment shall be properly identified in the calibration records, and the validity of the calibration shall be regularly verified by the licensee in accordance with the quality management system.

*Related IAEA safety standards:*

*All equipment used for examinations and tests should be of a quality, range and accuracy that are acceptable according to standards recognized by the regulatory body (NS-G-2.6 10.21). All items of equipment together with their accessories should be calibrated before they are used. All equipment should be properly identified in the calibration records, and the validity of the calibration should be regularly verified by the operating organization in accordance with the quality assurance programme. All items should be calibrated against standards recognized by the regulatory body. (NS-G-2.6 10.23)*

**DA-121:** The programme shall include periodic inspections or tests of SSCs important to safety in order to demonstrate their reliability and to determine whether they are acceptable for continued safe decommissioning or whether any remedial measures are necessary.

*Related IAEA safety standards:*

*The programme shall include periodic inspections or tests of systems, structures and components important to safety in order to demonstrate their reliability and to determine whether they are acceptable for continued safe operation of the plant or whether any remedial measures are necessary. (NS-R-2, 6.3)*

*The systems and components of the plant should be examined for possible deterioration so as to assess whether they are acceptable for continued safe operation of the plant or whether remedial measures should be taken. Emphasis should be placed on examination of the pressure boundaries of the primary and secondary coolant systems, because of their importance to safety and the possible severity of the consequences of failure. (NS-G-2.6, 2.13 and 10.2)*

**DA-122:** The extent and frequency of preventive maintenance, testing, surveillance and inspection of SSCs shall be determined through a systematic approach on the basis of:

- their importance to safety
- their inherent reliability
- their potential for degradation (based on operating experience, research and vendor recommendation)
- operational and other relevant experience and results of condition monitoring.

*Related IAEA safety standards:*

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

- *The importance to safety of the structures, systems and components;*
- *Their inherent reliability;*
- *Their assessed potential for degradation in operation and their ageing characteristics;*
- *Operational experience. (NS-R-2, 6.4)*

*Individual maintenance actions should be prioritised according to their importance, and their probable effects on reliability and risk should be quantified. Different approaches can be used for this, all of which are based firstly on the selection of SSCs important to safety and secondly on specifying risk and performance criteria to ensure that the SSCs remain capable of performing their intended functions. The maintenance work that is most important for ensuring the reliability of components and controlling risks should be identified by these means. (NS-G-2.6, 8.2)*

*In establishing the frequency and extent of preventive maintenance, the following aspects should be considered:*

- *the importance of SSCs to safety,*
- *designers' and vendors' recommendations,*
- *relevant experience available,*
- *results of condition monitoring,*
- *the probability of failure to function properly,*
- *on-line maintenance,*
- *the necessity of maintaining radiation doses as low as reasonably achievable (the ALARA principle). (NS-G-2.6, 8.4)*

**DA-123:** Data on maintenance, testing, surveillance and inspection of SSCs shall be recorded, stored and analysed. Such records shall be reviewed to look for evidence of incipient and recurring failures, to initiate corrective maintenance and review the preventive programme of maintenance accordingly.

*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. (NS-R-2, 6.10)*

*The operating organization should monitor the performance or condition of SSCs against the goals it has set to provide reasonable assurance that the SSCs are capable of performing their intended function. (NSG 2.6 2.7)*

*A brief but complete review of the repairs carried out should be made and documented. This review should explicitly identify the cause of failure, the remedial action taken, the component that failed and its mode of failure, the total repair time and, if different, the outage time and, finally, the state of the system after repair. Even if a system is found to be within its calibration limits, this fact should be recorded, together with details of any replacement or any adjustment carried out at the discretion of maintenance personnel. For major failures of components important to safety, a root cause analysis should be carried out in order to prevent recurrence. (NS-G-2.6, 5.32, 8.47).*

*A common database should be established in order to share relevant data and evaluations of results among the organizations that are involved in the planning and implementation of MS&I activities. (NS-G-2.6, 2.16)*

*An adequate condition monitoring programme should be established in support of optimisation of the maintenance programme. Such a monitoring programme should be based on the following assumptions as a minimum:*

- *that the monitored parameters are appropriate indicators for the condition of the SSCs,*
- *that acceptance criteria are available,*
- *that all potential failure modes are addressed,*
- *that the behaviour of the potential failure is traceable and predictable. (NS-G-2.6, 2.8)*

*The maintenance group should periodically review the maintenance records for evidence of incipient or recurring failures. When a need for remedial maintenance is identified, either in this review or during preventive*

*maintenance of the plant, the maintenance group should initiate remedial maintenance in accordance with the administrative procedures mentioned above. If appropriate, the preventive maintenance programme should be revised accordingly. Replacement of defective items (NS-G-2.6, 8.48)*

**DA-124:** The programme of maintenance shall be periodically reviewed in light decommissioning experience, and any proposed changes to the programme shall be assessed to analyse their effects on system availability, their impact on safety and their conformance with applicable requirements.

*Related IAEA safety standards:*

*In planning activities for MS&I, consideration should be given to potential human failures in the performance of such activities. Particular emphasis should be placed on establishing the best work procedure, providing suitable job aids and using sound principles of human engineering design wherever practicable, to ensure that the potential for errors is minimized at all times. (NS-G-2.6, 4.18)*

*For special tasks, depending on the nature of the work to be performed, its importance for the safety of the plant, the potential risks involved and the safety precautions that are consequently necessary, maintenance personnel should receive a special briefing in addition to the aforementioned training. Relevant personnel should also be appropriately trained and qualified in the quality assurance requirements applicable to their duties. (NS-G-2.6, 4.35)*

*The reliability of SSCs may be degraded by human induced faults (for example, calibration of redundant instruments on the same day by the same individual may introduce similar errors into both components and thus increase the potential for common cause failure). The frequency of such faults may be reduced, for example, by establishing detailed procedures. (NS-G-2.6, 9.27)*

**DA-125:** SSCs important to safety shall be designed to be tested, maintained, repaired and inspected or monitored periodically in terms of integrity and functional capability over the decommissioning phases, without undue risk to workers and significant reduction in system availability. Where such provisions cannot be attained, proven alternative or indirect methods shall be specified and adequate safety precautions taken to compensate for potential undiscovered failures.

*Related IAEA safety standards:*

*Those SSCs important to safety should, except as provided for below, be designed to be tested, maintained, repaired and inspected or monitored periodically in terms of their integrity and functional capability over the lifetime the life of the nuclear power plant. The design should be such that these activities can be performed to standards commensurate with the importance of the safety functions to be performed, without undue exposure to radiation of site personnel and no significant reduction in system availability. When SSCs cannot be designed for testability et al., proven alternative or indirect methods shall be specified and adequate safety precautions shall be taken to compensate for potential undiscovered failures. (NS-R-1, 5.43, 5.4 ; NS-G-1.2, 3.86, 3.87).*

**DA-126:** Procedures shall be established, reviewed and validated for all maintenance, testing, surveillance and inspection tasks.

*Related IAEA safety standards:*

*The operating organization shall establish procedures for all maintenance, testing, surveillance and inspection tasks. These procedures shall be prepared, reviewed, validated, issued and modified in accordance with established administrative procedures. (NS-R-2, 6.6)*

**DA-127:** A comprehensive work planning and control system shall be implemented to ensure that maintenance, testing, surveillance and inspection work is properly authorized, carried out according to the procedures.

*Related IAEA safety standards:*

*A comprehensive work planning and control system shall be implemented to ensure that maintenance, testing, surveillance and inspection work is properly authorized and is carried out in accordance with established procedures. Co-ordination shall be established among different maintenance groups (for mechanical, electrical, instrumentation and control, and civil maintenance), and with operations and support groups (groups for fire protection, radiation protection, physical protection and industrial safety). (NS-R-2, 6.7)*

*The plant management shall ensure the effective performance and control of maintenance activities during planned and forced outages. The tasks and responsibilities of different organizational units and persons in outages shall be clearly defined in writing. (NS-R-2, 6.12)*

*No maintenance procedure should necessitate the bypass or removal from service of systems or components if this would result in the loss of one or more safety functions. (NS-G-2.6, 5.4)*

*The administrative procedure for outage management should ensure effective implementation and control of all activities performed during planned and forced outages. (NS-G-2.6, 5.20)*

*The tasks and responsibilities of different organizational units and persons should be clearly established and understood. This is especially important during outage periods, when the organizational structure may be temporarily changed. Nuclear safety during shutdown periods should be given careful consideration. (NS-G-2.6, 5.22)*

**DA-128:** The licensee shall ensure that equipment is not removed from or returned to service without full consideration and approval of the proposed reconfiguration, followed by a documented confirmation of its correct configuration and, where appropriate, functional testing.

*Related IAEA safety standards:*

*The work control system shall ensure that plant equipment is only released from service for maintenance, testing, surveillance or inspection with the authorization of designated operations staff and in compliance with the operational limits and conditions. It shall also ensure that, following maintenance, the plant is not returned to service before completion of a documented check of its configuration and, where appropriate, a functional test. (NS-R-2, 6.8)*

*Plant items that have been repaired in the workshop should be inspected and tested to ensure, as far as possible, their full return to serviceability. If testing cannot be completed in the workshop, cautionary labels or tags should be applied to the respective item to warn that testing has still to be completed before reuse. When these post-repair processes are complete, items not intended for immediate installation should be returned to the stores through normal receiving processes. (NS-G-2.6, 8.54)*

*Before any system or component is returned to service after maintenance, tests should be performed to ensure that the objective of the maintenance has been achieved, that the limits and conditions for normal operation associated with that system or component are satisfied, and that the plant can be operated safely. This procedure should include testing of connected systems and others systems in the work area that may have been affected by the maintenance action. (NS-G-2.6, 8.55).*

**DA-129:** The actions to be taken in response to deviations from the acceptance criteria of results in the maintenance, testing, surveillance and inspection tasks, shall be defined in procedures.

*Related IAEA safety standards:*

*The MS&I programme should include appropriate actions to be taken in response to postulated deviations from the acceptance criteria, on the basis, primarily, of design information and design analysis. As a general rule, the actions to be taken when a deviation is detected should include, as appropriate: [...] (NS-G-2.6 6.9, 2.16)*

*The need for remedial maintenance may arise when deficiencies or failures are detected during plant operation. The plant's management, in anticipation of such cases, should prepare appropriate procedures detailing how such failures are to be reported to the maintenance group and how plant items are to be withdrawn from service for remedial maintenance (for example, procedures for work order authorizations and equipment isolation work permits). These procedures should require the operating personnel to assign priority to remedial work on the basis of its importance to safety, with account taken of the operational limits and conditions as well as the necessity of preventing the loss of any safety function. (NS-G-2.6, 8.46)*

**DA-130:** Repairs to SSCs shall be identified, authorized, and carried out as promptly as practicable. Priorities shall be established with account taken first of the relative importance to safety of the defective SSC.

*Related IAEA safety standards:*

*Repairs to structures, systems and components shall be performed as promptly as practicable. Priorities shall be established with account taken first of the relative importance to safety of the defective structure, system or component (NS-R-2, 6.5)*

**DA-131:** Following any abnormal event, the licensee shall revalidate the safety functions and functional integrity of any SSC that may have been challenged by the event and carry out any necessary remedial actions, including inspection, testing, maintenance and repair, as appropriate.

*Related IAEA safety standards:*

*Following any abnormal event, the operating organization shall revalidate the safety functions and functional integrity of any component or system which may have been challenged by the event. Necessary remedial shall include inspection, testing and maintenance as appropriate (NS-R-2, 6.9)*

## **4. Safety area: Safety verification**

### **4.1. Safety issue: Contents and updating of the safety case**

**DA-132:** The Licensee shall provide a safety case and use it as a basis for continuous support of safe decommissioning.

*Related IAEA safety standards:*

*NS-R-2 "Safety of NPPs: Operation" contains several requirements referring to the need to maintain consistency with the plant safety analysis report (e.g. §§4.1, 5.1, 7.4). This SAR is expected to be available and approved before plant commissioning.*

*The regulatory body shall issue guidance on the format and content of documents to be submitted by the operator in support of applications for authorization. The operator shall be required to submit or make available to the regulatory body, in accordance with agreed timescales, all information that is specified or requested. This information should be presented in the form of a report, hereinafter referred to as a safety analysis report (SAR). (GS-G-4.1 §1.1)*

*SARs represent an important communication between the operating organization and the regulatory body, and they form an important part of the basis for licensing an NPP and of the basis for the safe operation of the plant. (GS-G-4.1 §2.1)*

**DA-133:** The safety case shall among others:

- describe the site, the facility layout and facility performance during decommissioning activities; and demonstrate how safety is achieved,
- contain 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,
- describe the relevant aspects of the decommissioning organization and the management of safety,
- contain the evaluation of the safety aspects related to the site,
- outline the general safety objectives of decommissioning, design concept and the approach adopted to meet the fundamental
- describe the safety analyses performed to assess the safety of the facility in response to postulated initiating events against safety criteria and radiological release limits,
- describe the 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 management of ageing.
- contain the technical bases for the operational limits and conditions.
- describe the policy, strategy, methods and provisions for radiation protection.
- describe the emergency preparedness arrangements.
- describe the on-site radioactive waste management provisions.

*Related IAEA safety standards:*

*The SAR should contain accurate and sufficiently precise information on the plant and its operating conditions and should typically include information on, for example, safety requirements, the design basis, site and plant characteristics, operational limits and conditions and safety analyses, in such a way that the regulatory body will be able to evaluate independently the safety of the plant. (GS-G-4.1 §2.1)*

**DA-134:** The licensee shall update the safety case to reflect modifications and new regulatory requirements and relevant standards, as soon as practicable after the new information is available and applicable.*Related IAEA safety standards:*

*The plant management shall establish a procedure for updating documents as soon as possible after modification, installation and testing. Responsibilities for the revision of all documents such as ...safety analysis report... shall be clearly assigned (NS-R-2, §7.8).*

*It shall be determined by means of the Periodic Safety Review to what extent the existing safety analysis report remains valid. The PSR shall take into account the actual status of the plant, operating experience, predicted end-of-life state, current analytical methods, applicable safety standards and the state of knowledge. (NS-R-2, §10.3).*

*Systematic updating of the SAR would then become a requirement for the operating organization during the remaining lifetime of the plant. This would usually be done periodically so as to reflect any feedback of operating experience, plant modifications and improvements, new regulatory requirements or changes to the licensing basis. (GS-G-4.1 §2.6). Since the SAR is part of the overall justification of plant safety, it should reflect the current state and the licensing basis of the plant and should be kept up to date accordingly. (GS-G-4.1 §4.3).*

#### **4.2. Safety issue: Periodic safety review**

**DA-135:** The licensee shall have the prime responsibility for performing the periodic safety reviews<sup>9</sup>.

*Related IAEA safety standards:*

*The primary responsibility for conducting a PSR and reporting its findings lies with the owner/operator of the plant. The regulator has the responsibility of specifying or approving the requirements for a PSR... (DS 307, paras 5.1 and 5.2).*

*The PSR requirements should be... and agreed upon with the regulatory body before start of the review. (DS 307, para 3.7).*

**DA-136:** The review shall confirm the compliance of the decommissioning activities and states with its licensing requirements and any deviations shall be resolved

*Related IAEA safety standards:*

*It shall be determined by means of the PSR to what extent the existing safety analysis report remains valid (NS-R-2, para 10.3).*

**DA-137:** The review shall identify and evaluate the safety significance of deviations from applicable current safety standards and best practices.

*Related IAEA safety standards:*

*The procedure... should identify any differences between the safety status of a nuclear power plant and current safety standards and practices (DS 307, para 7.1).*

**DA-138:** All reasonably practicable improvement measures shall be taken by the licensee as a result of the review.

*Related IAEA safety standards:*

*The procedure does not require that a nuclear power plant meet all current standards, however, reasonably practicable improvements should be made towards meeting them (DS 307, para 7.1)*

**DA-139:** The scope of the review shall be clearly defined and justified

*Related IAEA safety standards:*

*The scope of a PSR includes all nuclear safety aspects of a nuclear power plant (DS 307, para 3.1).*

*It is recommended that the scope should include, as a minimum, the safety factors: Plant, Safety analysis, Performance and feedback of experience, Management, Environment and Global assessment (DS 307, para 6.2)*

**DA-140:** The scope shall be as comprehensive as reasonably practical.

*Related IAEA safety standards:*

*The scope of a PSR includes all nuclear safety aspects of a nuclear power plant (DS 307, para 3.1).*

*It is recommended that the scope should include, as a minimum, the safety factors: Plant, Safety analysis, Performance and feedback of experience, Management, Environment and Global assessment (DS 307, para 6.2)*

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<sup>9</sup> See DB-41, DB-42

**DA-141:** The review shall use an up to date systematic and documented methodology.

*Related IAEA safety standards:*

*Each safety factor is reviewed using current methods...There is a need to record the results of the review in a systematic and auditable manner. Probabilistic safety assessment ... is a useful contributor to a PSR (DS 307, paras 3.3, 3.6 and 6.5)*

**DA-142:** Each area shall be reviewed and the findings compared to the licensing requirements as well as to current safety standards and practices. Conclusions shall be drawn with regard to reasonable and practical improvement measures taking into account interactions and overlaps between the different safety issues.

*Related IAEA safety standards:*

*Each safety factor is reviewed ...the findings are compared to current safety standards and practices. Reasonable and practical corrective actions are determined and an implementation plan is agreed with account taken of the interactions and overlaps between safety factors ... (DS 307, para 3.3).*

**DA-143:** If studies made for other purposes are utilised in the periodic safety review, their contribution to the review shall be explained. These studies shall be available and appropriate references given.

*Related IAEA safety standards:*

*The results of relevant studies, and of routine and special safety reviews, should be utilised in the PSR to minimise duplication of effort. Appropriate references should be made and an explanation on the use of these references provided (DS 307, para 3.8).*

## ***Subpart B (Decommissioning Specific SRLs)***

### **1. Safety area: Safety management**

#### ***1.1. Safety issue: Responsibilities***

**DB-01:** A licensee<sup>10</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:*

*WS-R-2 requirements n°3-2*

#### ***1.2. Safety issue: Licensee's safety policy***

No specific reference level

#### ***1.3. Safety issue: Licensee's operating organization***

No specific reference level

**DB-02:** The adequacy of the organisational structure, for safe and reliable decommissioning of the facility, and for ensuring an appropriate response in emergencies, shall be assessed on a regular basis, more frequent than the periodic safety reviews, and in particular, if there is a major change in the plant state or hazard (e.g. end of power operation of NPP, removal of fuel elements, entry to care-and-maintenance period, etc).

*Related IAEA safety standards:*

*WS-G-2.1&4 guidance n° 5.3, 7.2, 7.3*

#### ***1.4. Safety issue: Quality management***

No specific reference level

#### ***1.5. Safety issue: Record keeping***

**DB-03:** Accurate and relevant records and knowledge shall be retained of the operating phase of the facility in order to facilitate safe and efficient decommissioning.

*Related IAEA safety standards*

*WS-G-2.1&4 guidance n°4.4*

**DB-04:** Essential information required for decommissioning purposes at the end of the operational lifetime of the facility shall be identified, consolidated and adequately preserved.

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<sup>10</sup> Covers the possible change of licensee

*Related IAEA safety standards:*

*WS-G-2.1&4 guidance n°4.4, 4.6, 4.7*

**DB-05:** The licensee shall maintain an appropriate record system during the decommissioning phases, in particular to ensure that the radioactive material contained in the facility at the end of the operational phase is accounted for, and to facilitate remaining decommissioning.

*Related IAEA safety standards:*

*WS-G-2.1&4 guidance n°7.30*

## **2. Safety area: Decommissioning strategy and planning**

### **2.1. Safety issue: Facilitating decommissioning during design, construction and operational phase**

**DB-06:** Account shall be taken 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 in the safety documentation of the facility.

**DB-07:** The licensee shall undertake a baseline survey, including radiological conditions of the site before construction, for comparison with the proposed end-state after decommissioning.

*Related IAEA safety standards:*

*WS-G-2.1&4 guidance n°4.4 and 4.7*

### **2.2. Safety issue: Site decommissioning strategy**

**DB-08:** The licensee shall establish a decommissioning strategy for each of its sites or groups of sites.<sup>11</sup>

**DB-09:** A report on the development of the strategy shall be produced and include a description of the possible options and timescales for decommissioning. The factors to be considered should include safety and radiation protection aspects, interdependencies of different facilities on a site, possible burdens on future generations, and possible loss of knowledge and expertise. The report should explain the reasons for the preferred option, and options involving deferred decommissioning shall be rigorously justified.

**DB-10:** The strategy shall be consistent with existing related national strategies, e.g. on decommissioning or radioactive waste management and disposal.

**DB-11:** An initial decommissioning strategy report (see DB-09) shall be developed in the planning phase of a new site.

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<sup>11</sup> If several facilities are located at the same site with different licenses as an alternative to a site specific strategy it shall be ensured that in each facility specific initial decommissioning plan any interactions and interdependencies between the facilities are taken into account.

**DB-12:** The licensee shall propose an end-state in its decommissioning strategy, which is consistent with the national policy.

**DB-13:** The decommissioning strategy shall be reviewed by the licensee regularly and shall be updated as required. In particular, the decommissioning strategy shall be updated when planning a new facility on the site.

*Related IAEA safety standards:*

*WS-R-2 requirements n°3.13, 6.2-4 and WS-G-2.1&4 guidance n°4.1, 4.2, 4.6, 6.8, 6.9*

### **2.3. Safety issue: Facility decommissioning plan during design, construction and operational phases**

**DB-14:** In accordance with the decommissioning strategy, the licensee shall establish and maintain facility decommissioning plans, the details of which are commensurate with the type and status of the facility (graded approach).

*Related IAEA safety standards:*

*WS-G-2.1 Para 5.6*

**DB-15:** The initial decommissioning plan shall be established in the design phase of the facility.

**DB-16:** 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 updates of the decommissioning plan shall reflect, in particular, changes in the facility or regulatory requirements, and advances in technology.

*Related IAEA safety standards:*

*WS-R-2 requirements n°3.13, 6.2, 6.4 and WS-G-2.1&4 guidance n°4.1, 4.2, 4.5*

**DB-17:** The decommissioning plan shall be supported by an appropriate safety analysis for the decommissioning activities.

**DB-18:** The decommissioning plan shall identify existing facilities and equipment that will be used during decommissioning to ensure that the equipment is available when needed. The decommissioning plan shall also identify necessary changes to the existing safety systems which were used during operation and the need for replacement or new plants to carry out decommissioning operations.

*Related IAEA safety standards:*

*WS-G-2.1&4 guidance n°5.7, 5.14*

### **2.4. Safety issue: Decommissioning plan at shutdown**

**DB-19 :** When it has been decided to shut down a nuclear facility, the licensee shall inform the regulatory body.

**DB-20** : Towards the end of the operational phase of the facility, and before final shutdown, the licensee shall prepare an updated decommissioning plan based on an adequate safety analysis. In the case of an unexpected final shutdown, this plan shall be prepared as soon as reasonably practical.

**2.5. Safety issue: Decommissioning plan update during decommissioning operations**

**DB-21** : 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, progress with the decommissioning work, deviations from the scheduled program, changes in the facility or regulatory requirements, advances in technology and, finally, the needs of the decommissioning operation.

*Related IAEA safety standards:*

*WS-R-2 requirements n°6.2 and 6.4*

**2.6. Safety issue: Regulatory policy and permitting strategy**

Unlike the other safety reference levels this chapter addresses mainly the regulatory authorities responsible for the control of decommissioning activities.

**DB-22:** The established regulatory framework shall contain provisions to ensure that there is clear and unequivocal allocation of responsibility for safety during decommissioning. The continuity of responsibility for safety shall be ensured through regulatory control.

*Related IAEA safety standards:*

*WS-R-2 requirements n°3-2*

**DB-23:** The post-operational phase of a nuclear facility, starting with the final shutdown and extending over the entire decommissioning process, shall be regulated by a license, which may be the same legal document as for the operating phase, or a specific license for decommissioning, or a sequence of licenses, according to the national legal framework.

*Related IAEA safety standards:*

*WS-R-2 requirements n°3-2 and 3-4*

**DB-24:** Depending on the licensing regime, a regulatory permission may be required to start major decommissioning operations (i.e. operations outside the operational phase safety case). This shall be based on the updated decommissioning plan for final shutdown and the initial safety case for decommissioning.

**DB-25:** Depending on the licensing regime, some safety-significant decommissioning operations may be subject to regulatory permissions. These shall be based on detailed safety analyses provided by the licensee<sup>12</sup>.

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<sup>12</sup> Unlike DB-24 takes account of developments of the ongoing decommissioning operation, thus broadening the decision basis.

**DB-26:** Depending on the licensing regime, specific information on the progress of the decommissioning work against the plan shall be provided by the licensee.

*Related IAEA safety standards:*

*WS-R-2 requirements n°6.5, 6.6 – 3.13*

### **3. Safety area: Design**

**DB-27:** SSCs may be declassified / downgraded as they lose their importance to safety in the course of decommissioning activities. This must be justified by an update of the safety case which was the basis for classification of the respective component/system.

**DB-28:** OLCs shall be kept updated and reviewed in the light of experience, developments in science and technology, and every time modifications in the facility or in the safety case warrant it, and changed if necessary.

*Related IAEA safety standards:*

*The OLCs shall be reviewed over the operating life of the plant in the light of experience, developments in technology and safety, and changes in the plant, and shall be modified if this is required by the regulatory body or if it is considered appropriate by the operating organization and approved by the regulatory body. (NS-R-2. Para 5.7)*

*Periodic review of OLCs should be undertaken to ensure that they remain applicable for their intended purpose [...]. (NS G 2.2 Para 3.15)*

### **4. Safety area: Operation**

#### **4.1. Safety issue: On-site emergency preparedness**

**DB-29:** During decommissioning, the licensee shall review and modify as necessary the existing emergency plan, so that it stays appropriate for current and future states of the facility.

#### **4.2. Safety issue: Waste management**

**DB-30:** The licensee shall develop and implement processes to categorise and manage the particularly large quantities and different types of radioactive waste and 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:*

*WS-G-2.1&4 guidance n°2.20*

**DB-31:** The licensee shall develop and implement processes to segregate radioactive waste from non-radioactive waste in accordance with the requirements set by the national legal framework and with the national waste management strategy.

*Related IAEA safety standards:*

**DB-32:** The licensee shall keep accurate record of the waste and other material generated by the decommissioning operations stored on the site.

**DB-33:** The licensee shall keep accurate record, for a timeframe defined in the national regulations or in the license, of the waste and other material generated by the decommissioning operations that has left the site.

(Note: in the case where waste has been sent to interim storage, the licensee keeps responsibility as the waste owner)

#### **4.3. Safety issue: *On-site and off-site monitoring***

**DB-34:** 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:*

*WS-G-2.1&4 guidance n°7.14-17*

#### **4.4. Safety issue: *Operational experience feedback***

Generic safety reference levels formulated in chapter 3.2 of subpart A cover all generic aspects. However, due to the uniqueness of some decommissioning projects, specific emphasis needs to be placed on the communication of operation feedback and event analysis to the regulatory body and other licensees and as well on the evaluation of all information gathered vice versa. Licensees are encouraged to take part in multilateral information exchange programmes, which are promoted by international organisations such as IAEA, NEA, WANO and others.

**DB-35:** The licensee shall maintain liaison as appropriate with the organisations (manufacturer, research organisation, designer) involved in design and construction of decommissioning equipment, with the aims of feeding back information on their operating experience to facilitate the decommissioning.

#### **4.5. Safety issue: *Operation/plant modification***

No specific reference level

#### **4.6. Safety issue: *Ageing management, maintenance***

Generic safety reference levels formulated in chapters 3.4 and 3.5 of subpart A cover all generic aspects. In the course of decommissioning projects possibly long timeframes associated with the decommissioning strategy and plan must be taken into account as well as sometimes changes of facility state as key operations of the decommissioning plan are carried out.

**DB-36:** The licensee shall apply, review and modify as necessary its maintenance and testing program, considering the rapid changes of the facility during decommissioning.

#### **4.7. Safety issue: Control of work activities**

**DB-37:** No decommissioning operation may be undertaken without a prior assessment of its impact on safety.

**DB-38:** The licensee shall set up a system to ensure that work control procedures are amended as the state of the plant changes.

*Related IAEA safety standards:*

*WS-G-2.1 guidance n°7.3*

**DB-39:** No decommissioning operation that may have an impact on safety shall be undertaken without appropriate written work procedures.

#### **4.8. Safety issue: Care-and-maintenance periods**

**DB-40:** The facility shall be made passively safe so far as it is reasonably practical before entering a care-and-maintenance phase.

**DB-41:** Before the start of care-and-maintenance periods, the licensee shall develop an adequate care-and-maintenance program to ensure safety, by its implementation, and enable future decommissioning.

## **5. Safety area: Safety verification**

### **5.1. Safety issue: Contents and updating of the safety case**

**DB-42:** The initial safety case for decommissioning shall be produced by the licensee with the updated decommissioning plan for final shutdown.

**DB-43:** The safety case for decommissioning shall include, in particular, aspects such as : rapid changes in facility state, radiological characterisation plan of the facility, management of large quantities of radioactive material, conventional and nuclear safety issues from demolition and dismantling and also the unusual working environment.

Radiological hazards that are of particular importance in the case of decommissioning 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.

Significant non-radiological hazards that are of particular importance in the case of decommissioning include: lifting and handling of heavy loads, use of hazardous materials for decontamination, stability of decontaminated structures, demolition.

*Related IAEA safety standards:*

*WS-R-2 requirements n°6.10, 7.2, 7.5, 6.14*

**DB-44:** The safety case for decommissioning shall cover planned new installations, facilities and systems that are necessary according to the decommissioning plan.

**DB-45:** To support the safety case for decommissioning, the licensee shall examine records<sup>13</sup> 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:*

*WS-G-2.1&4 guidance n°6.1-4*

**DB-46:** To support the safety case for decommissioning, the licensee shall conduct surveys of the facility for comparison with recorded design information.

**DB-47:** The licensee shall consolidate the safety case at major states in the decommissioning program. This consolidation has the goal to produce a revised, integrated and consistent safety case including all necessary amendments.

**DB-48:** The licensee shall maintain an up-to-date safety case that corresponds to the actual state of the facility in the decommissioning process, based on the latest consolidated safety case.

## **5.2. Safety issue: Periodic safety review**

**DB-49:** A periodic safety review shall be carried out at least every ten years. If the latest consolidated case has been produced in accordance with the general principles of periodic safety review, then the ten year period starts from the date of that case.

**DB-50:** As a minimum the following areas shall be covered by the review:

- assessment of the monitoring and surveillance data, and of the operating experience to determine the actual condition of systems, structures and components
- updated radioactive inventory
- current safety analyses and their use
- organisational arrangements
- radiation protection arrangements
- safety performance and the effectiveness of safety and quality management
- staffing and qualification of staff
- emergency preparedness
- radiological impact on the public and on the environment
- waste storage conditions
- ageing of the safety significant structures, systems and components
- advances in science and technology
- changes in the environment of the facility, including external natural and man-made hazards
- changes in regulations
- feedback from past decommissioning operations

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<sup>13</sup> Experience show that records are not generally adequate to provide a sound basis for the safety case and that confirmatory surveys and measurements have to be conducted to verify the basic information on facility state.

- feedback from similar facilities

### **5.3. Safety issue: License termination conditions**

**DB-51:** At the completion of decommissioning, the licensee shall not be relieved of further responsibility for the facility or site unless the regulatory body has agreed.

*Related IAEA safety standards:*

*WS-R-2 requirements n°3.18*

**DB-52:** Before a site can be released and the licensee relieved of further responsibility, a survey shall be performed to demonstrate that the end point conditions, as established by the regulatory body, have been met.

*Related IAEA safety standards:*

*WS-R-2 requirements n°6.11*

**DB-53:** In the case where the site cannot be released for unrestricted use, the licensee shall provide a safety case including a long term impact assessment, an appropriate surveillance regime and any proposed land use restrictions.

**DB-54:** A license can be terminated if a facility or site can be released:

- for unrestricted use, or
- for restricted use if appropriate institutional control is maintained ensuring protection of human health and the environment (e.g. new nuclear license, state-managed land-use control system...).

*Related IAEA safety standards:*

*WS-R-2 requirements n°6.12*

### **5.4. Safety issue: Final decommissioning report**

**DB-55:** Before the license is terminated, a final decommissioning report, including any necessary final confirmation survey, shall be prepared and retained with other records, as appropriate.

*Related IAEA safety standards:*

*WS-R-2 requirements n°6.13*

**DB-56:** The final decommissioning report and other records shall be kept for a specified period of time according to the national requirements.

*Related IAEA safety standards:*

*WS-G-2.1&4, guidance n°8.1*