Document Preparation Profile (DPP)
Version 03 dated 7 July 2016

1. IDENTIFICATION

Document Category: **Safety Guides**

Working ID: **DS497**

Proposed Title: **Nuclear Power Plants Operation**

Proposed Action: **Revision of eight closely interrelated Safety Guides as a set of publications:**

- **NS-G-2.2: Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants (2000);**
- **NS-G-2.3: Modifications to Nuclear Power Plants (2001);**
- **NS-G-2.4: The Operating Organization for Nuclear Power Plants (2001);**
- **NS-G-2.5: Core Management and Fuel Handling for Nuclear Power Plants (2002);**
- **NS-G-2.6: Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants (2002);**
- **NS-G-2.7: Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants (2002);**
- **NS-G-2.8: Recruitment, Qualification and Training of Personnel for Nuclear Power Plants (2002);**
- **NS-G-2.14: Conduct of Operations at Nuclear Power Plants (2008).**

Review Committee(s): **NUSSC, RASSC, TRANSSC, WASSC, NSGC, EPReSC**

Technical Officer(s): **Vesselina RANGUELOVA**

Other Operational Safety Section (OSS) staff members (TBD)

2. BACKGROUND

The IAEA safety standards in the domain of NPP operational safety include the Specific Safety Requirements publication *Safety of Nuclear Power Plants: Commissioning and Operation* (IAEA Safety Standards Series No. SSR-2/2, Rev 1, Vienna, 2016) and a number of Safety Guides. Most of these guides were published in the period 2000–2002 and represent the international consensus on operational safety which existed at that time. These standards have been extensively used as a basis for the NPP operational safety assessments conducted during the IAEA OSART missions and were used by many Member States as reference when establishing national regulations. In accordance with the IAEA's approach of reviewing and revising, if necessary, its safety standards every ten years, the IAEA conducted a TM in November 2015 to review the need for revision of the 8 Safety Guides in NPP operational safety domain, as indicated above. The current DPP has been developed based on the conclusions from this TM (see attachment).

The rest of the IAEA safety guides in the NPP Operational domain have been recently issued, are under revision or will be revised with an individual DPP due to substantial modifications needed to the original texts.

3. JUSTIFICATION FOR THE PRODUCTION OF THE DOCUMENT

Most of the eight Guides subject to this DPP are outdated and therefore would benefit from amendments to take into consideration:

- Post-Fukushima Vienna Declaration on Nuclear Safety;
- Long Term Structure of the IAEA Safety Standards;
- Feedback from the users of IAEA Safety Standards;
- Revisions implemented in the other safety standards and, in particular, the IAEA Safety Requirements SSR-2/2 Rev. 1(2016);
- Experience gained with OSART missions and the 2015 revision of the IAEA OSART Guidelines and Working Notes Outlines;
- Recent changes in the NPP operational practices;
- Potential use of these documents for new types of reactor technologies (e.g. Small Modular Reactors and Non-Water Cooled Reactors);
- Lessons from the Fukushima Daiichi accident and other events in the nuclear industry.

Amendments of the relevant Safety Guides are needed in the following areas:

1. There are several requirements in SSR- 2/2 Rev 1 which are not yet adequately addressed in the Safety Guides – this will include Req.9 Monitoring and review of safety performance; Req. 10 Control of plant configuration; Req. 13 Equipment qualification; Req. 17 Consideration of objectives of nuclear security in safety programmes; Requirement 28 Material conditions and housekeeping (as concerns foreign material exclusion (FME)); Requirement 32 Outage management.

2. There are a lot of references in the Safety Guides to the quality assurance programme (Quality Assurance Code and appropriate Safety Guides, Safety Series No. 50-C/SG-Q). All these references should be rechecked and either removed or replaced by the relevant provisions of the integrated management system presented in the relevant IAEA Safety Standards publications (GSR Part 2 (ex GS-R-3), GS-G-3.1. GS-G-3.5). In general, References have to be updated in all Safety Guides.

3. Some statements in the Safety Guides (NS-G-2.1, NS-G-2.2, NS-G-2.4, NS-G-2.5, etc.), despite that they are expressed as “should” statements are obvious requirements. Some of them are already introduced as such in the new Requirements publication No.SSR-2/2 Rev. 1. In such a form they do not bear any value added in the Safety Guides. Such statements should be carefully rechecked and either removed from the Safety Guides (as no value added) or modified to make them useful recommendations, supporting appropriate requirements.

4. There are many references in the current version of Safety Guides to the Regulator’s intervention into operations. It should be taken into consideration that the requirements for regulator’s involvement in operations activities have been formulated in the IAEA Safety Standards publications GSR Parts 1 – 4. The recommendations on how to meet these requirements are provided in the appropriate safety guides GS-G-1.2 to 1.4. All references to the involvement of regulators in the operational activities (commissioning, maintenance, operation, modification, etc.) currently available in the operational safety guides should be revised and deleted, if appropriate.

5. There are some other operation related cross-cutting issues (related to implementation of Defence-in-Depth (DiD) in operations, safety culture, use of PSA applications, records and reports, etc.) which are inadequately or inconsistently represented in the current IAEA Safety Standards and they should be consistently addressed in all eight Safety Guides.

6. The guides have to be updated to better reflect the recent changes introduced in the operational practices in the nuclear industry.

4. OBJECTIVE

The objective of this DPP is to propose a two step approach for the revision of the IAEA Safety Standards in the NPP operational safety domain. This revision will aim at improving the safety guides in the domain of NPP operational safety by implementing modifications as indicated in chapter 5 below. The guides are to be used by NPP, utilities, regulatory authorities and other governmental organizations staff members, as appropriate.

Step A:

- Revision (under the current DPP)by amendment of Guides NS- G- 2.2; 2.3; 2.4; 2.5; 2.6; 2.7;2.8;2.14; Due to the fact that these Safety Guides are closely interrelated it is necessary to ensure consistency and avoid repetitions and therefore to revise them in a single process. This is achieved by creating only one DPP to revise this set of publications: all the guides will be revised simultaneously or at least so that the schedules of the revision of guides overlap considerably. A specific, effective coordination mechanism between all the different groups that will work on the revision of the guides will be established.

- Full revision of NS-G-2.1 to cover all hazards in NPP operation; e.g. New guide in line with SSR-2/2 Requirement and recommendations of Vienna Declaration on Nuclear Safety.(DPP for DSxxx is being prepared)

- New guide on “Monitoring and review of safety performance in Operation of NPP” in line with SSR-2/2 Requirements 8&9 and recommendations of Vienna Declaration on Nuclear Safety (DPP for DSyyy is being prepared).

Step B:

- The structure of all IAEA Safety Guides on operational safety of NPPs should be re-defined to better reflect the organization in which they are used. Once all Safety Guides have been updated it will be important to publish them in a form of one integrated set of guides, having the same publication number with different volumes, thus keeping the structure of the NPP Operational guides intact and consistent with the IAEA SSR-2/2 Rev. 1 and following the intention of the Long Term Structure of the IAEA Safety Standards to reduce the number of the safety standards, combine some guides on NPP Operational Safety and eliminate unnecessary duplication.

- At this stage opportunity will be used to link the NPP operation safety standards to the standards which will be developed under GSR Part 2 and thus avoid inconsistency on issues related to integrated management systems, systemic approach to safety and safety culture.

5. SCOPE

Step A

For all Safety Guides, as appropriate, the following cross cutting issues will be addressed consistently:

- Application of Defence-in-Depth concept to NPP operation

- Influence of Human and Organisational Factors (HOF) on human performance , Systemic approach to safety; Safety Culture
- Consistency between the IAEA Safety Guides on operational safety of NPPs and Safety Guides on management systems
- Lessons from the Fukushima Daiichi accident and recent operational events
- Risk-informed approaches to support operational safety of NPPs, including under low power and shutdown conditions.
- Nuclear safety/nuclear security interface
- Safety for outages, including management of risk
- Organizational changes, outsourcing and downsizing aspects, load following regimes and other new operational practices
- Specific safety considerations relevant for multi-unit nuclear power plant site
- Quality assurance , Records and reports, References
- Consistency between the IAEA Safety Guides on operational safety of NPPs and relevant guides developed under the lead of WASSC, RASSC, EPReSC, NSGC

In addition[1], for each Guide the following subjects will be addressed to provide adequate guidance for the implementation of different SSR-2/2 Requirements: :

- NS-G-2.2: Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants (2000):
    - Requirement 6 – The OLCs should be expanded to cover also design extension conditions (including Equipment used for accident management and severe accident management, permanently installed and mobile). The OLCs should be expanded also to include criteria for Steam Generator tube leakage monitoring that allows for early detection and trending of leakage.
    - Requirement 26 – To consider Operating Procedures for all plant states and make the Guide consistent with the revision of NS-G-2.15 (DS 483). Operator aids should be considered under section 8.
    - Requirement 33 – To include preparation for decommissioning

- NS-G-2.3: Modifications to Nuclear Power Plants (2001);
    - Requirement 11 – To include guidance on Management of modifications for organizational changes, temporary modifications and modifications to computer based systems
    - Requirement 10 - To adequately address configuration control with respect to redundancy, diversity, and common cause events.
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[1] See also the annex to this document.

- To provide more guidance on risk-informed approaches for modifications to assess impact of safety of individual modifications and compare different alternatives, and to assess cumulative effects of modifications
- To provide more guidance on avoiding common cause failures, especially human induced
- To provide guidance on testing after a modification. After completion of the modification tests, the correct alignment of the system and its components should be independently verified considering incident and emergency situations in the analysis of the correct alignment.

- NS-G-2.4: The Operating Organization for Nuclear Power Plants (2001);

  - Requirement 1 (3.2) and Requirement 2 – To revise the guidance on Responsibilities and Integrated Management Systems in a consistent manner with GSR Part 2
  - Requirement 5– To revise commitment to periodic safety review
  - Requirement 10 – To address configuration control
  - Requirement 17 – To address safety and security interfaces in a consistent manner with NST041
  - Requirement 23 - To replace industrial safety terminology with non-radiation-related safety terminology.
  - Requirement 32 – To address outage management
  - To provide guidance on the activities, responsibilities and functions of appropriate safety committees
  - To provide guidance on responsibilities of Operating Organization to establish the proper accident management programme
  - To make reference to the GSR Part 7 on guidance on responsibility of operating organization for provision of clear and understandable safety related information to the public during and after a nuclear or radiological emergency
  - To provide guidance on responsibilities and functions of Operating organization for the lifetime extension of operating power plants.

- NS-G-2.5: Core Management and Fuel Handling for Nuclear Power Plants (2002);

  - Requirement 30 – To revise/ expand the guidance on core management and fuel handling
  - To address lessons from the Fukushima Daiichi accident on storage of spent fuel: monitoring, qualified instrumentation, make-up, emergency operating procedures, severe accident management guideline, design extension conditions, multi-unit, explosive gas management, To extend to safety aspects, not only RP
  - To include more guidance on avoiding common cause failures, especially human induced
  - To add guidance on detection of foreign materials.
  - To consider complementing the list of expected safety equipment available before starting handling of spent fuel (such as radiation protection, load measurement, overload protection, calibration, …); To consider a list of human resources including backup needed for the action with respect to competences.
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  - To ensure consistency with the revision of NS-G-1.12 (DS 488) under revision

- NS-G-2.6: Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants (2002);

- Requirement 13 – To address adequately Equipment Qualification in relation to activities needed during operation, including realistic performance targets under DEC conditions
- To consider whether Chapter 6 is covered by the revision of NS-G-2.11 (DS479)
- Requirement 28 – To cover also foreign material exclusion
- Requirement 32 – To cover outage management
- Requirement 33 – To cover also preparation for decommissioning
- To address Maintenance backlog control
- To address Systematic use of Human Performance Tools
- To address maintenance, surveillance and in-service inspection for severe accident management associated equipment, including permanently installed and mobile. Ensure for appropriate backup of the system unavailable due to maintenance or surveillance if necessary.
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- To provide more guidance on risk-informed approaches for both maintenance and inspection (heading 10, to be extended to all inspections, not only in-service inspection).
- To provide better specification of the expected content of the surveillance programme. Consider reducing title to "maintenance and surveillance" (as surveillance includes testing and inspections) and check whether the Safety Guide covers all necessary inspections
- To improve the guidance on trending analyses, including amongst others choosing right parameters, on-line surveillance, diagnostics, acceptance criteria etc.
- To improve the guidance on functional tests (acceptance criteria, pre-conditioning, overlaps, …) and ensure consistency on this subject with NS-G-2.3
- To cover the control of special tests and non-routine activities)
- To improve guidance on predictive maintenance
- To improve guidance on assessment of the cumulative effects on safety of differed maintenance, including demonstration that the cumulative effects of deficiencies on non-safety related systems, does not impact functions important to safety
- To ensure consistency of guidance on surveillance with NS-G-2.2.

• NS-G-2.7: Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants (2002);

- Requirement 20 – To revise/expand the guidance on radiation protection
- Requirement 21 – To revise/expand the guidance on radioactive waste management
- To ensure consistency with the latest revision of GSR Part 3 Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards.
- To ensure consistency with the latest revision of GSR Part 5 Predisposal Management of Radioactive Waste.
- To ensure consistency with the IAEA Safety Guides supporting GSR Part 3 and GSR part 5, eg. revision of WS-G-2.3(DS442); revision of WS-G- 2.5 (DS 448), etc.
- To ensure consistency with SSR-5 and GSR Part 6.

• NS-G-2.8: Recruitment, Qualification and Training of Personnel for Nuclear Power Plants (2002);

- Requirement 18 – To include training of the external personnel involved in EPR; training of maintenance staff, basic nuclear training for general NPP staff; training in relation with management of severe accidents in a consistent manner with the revision of NS-G-2.15 (DS 483); outage management related training;
- To include more guidance on training concerning explicitly security/safety interactions in a consistent manner with NST041

- To revise and amend guidance on Control Room operators and field operators training to reflect current NPP practices, including adequate use of simulators
- To revise guidance on "Authorisation" to reflect current NPP practices
- To provide guidance regarding maintaining of nuclear competence, including knowledge transfer between generations and considering factors such as increased staff fluctuation, loss of young staff and motivation problems for special situation of plants facing shutdown within the next few years.

• NS-G-2.14: Conduct of Operations at Nuclear Power Plants (2008)

- To ensure consistency with the structure of SSR-2/2
- Requirement 8 – To address Performance of Safety Related activities
- Requirement 13- To address Equipment Qualification, including realistic performance targets under DEC conditions
- Requirement 17- To revise Safety /Security Interface in a consistent manner with NST041
- Requirement 23- To ensure consistency on use of Non-Radiation-Related Safety terminology
- Requirement 33 – To include Preparation for Decommissioning
- To address extension of the guide to include guidance on conduct of operation during emergencies
- To amend the guidance on control of reactivity related operations
- To include guidance on avoiding human induced common cause failures
- To include guidance on "load following" operational regimes

Step B:

During the second stage all the safety guides in the domain of NPP Operational Safety will be considered, the common elements of these guides will be consolidated, and a proposal for grouping the operational safety subjects in accordance with the IAEA SSR-2/2 Rev. 1 structure will be prepared. At this stage some guides might be combined and the whole set will be issued as an integrated set of guides on NPP Operations with the same publication number in several volumes, as proposed for example below. The restructuring of the safety guides in the domain of NPP operation, however will have to take into account the IAEA Long Term Structure for safety standards and interrelation amongst all guides with impact of safe NPP operation as to avoid any duplication or inconsistency with the related current safety standards. The Safety Standards Committees opinion will be sought before proceeding with Step. B and amendments will be implemented, as appropriate.

Volumes / titles	Guides to be considered
Vol.01: OPERATING ORGANIZATION AND OPERATIONAL SAFETY MANAGEMENT	1.1 Introduction 1.2 Responsibilities of the operating organization (R 3.1–3.3) **NS-G-2.4 The Operating Organization for Nuclear Power Plants** 1.3 Management system (R3.4–3.7) **NS-G-2.4 The Operating Organization for Nuclear Power Plants** 1.4 Structure and functions of the operating organization (3.8–3.9) **NS-G-2.4 The**

		Operating Organization for Nuclear Power Plants
	1.5	Staffing of the operating organization (R3.10–3.13) **NS-G-2.4 The Operating Organization for Nuclear Power Plants (from NS-G-2.8)**
	1.6	Safety policy (R4.1–4.5) **NS-G-2.4 The Operating Organization for Nuclear Power Plants**
	1.7	Operational limits and conditions (R4.6–4.15) **NS-G-2.2 Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants**
	1.8	Qualification and training of personnel (R4.16–4.24) **NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants**
	1.9	Performance of safety related activities (R4.25–4.32) **New safety guide (DPP for DSyyy)**
	1.10	Monitoring and review of safety performance (R4.33–4.37) **New safety guide (DPP for DSyyy)**
	1.11	Control of plant configuration (R4.38) **NS-G-2.3 Modifications to Nuclear Power Plants**
	1.12	Management of modifications (R4.39–4.43) **NS-G-2.3 Modifications to Nuclear Power Plants**
	1.13	Periodic safety review (R4.44–4.47) **SSG-25 Periodic Safety Review for Nuclear Power Plants**
	1.14	Equipment qualification (R4.48–4.49) **NS-G-2.4 The Operating Organization for Nuclear Power Plants**
	1.15	Ageing management (R4.50–4.51) **NS-G-2.12 Ageing Management for Nuclear Power Plants (under revision DS485)**
	1.16	Records and reports (R4.52) **NS-G-2.4 The Operating Organization for Nuclear Power Plants +all relevant SGs**
	1.17	Programme for long term operation (R4.53–4.54) **NS-G-2.12 Ageing Management for Nuclear Power Plants (under revision DS485)**
	1.18	Consideration of objectives of nuclear security in safety programmes (R5.1) **NS-G-2.4 The Operating Organization for Nuclear Power Plants**
	1.19	Emergency preparedness (R5.2–5.7)
	1.20	Accident management programme (R5.8–5.9) **NS-G-2.15 Severe Accident Management Programmes for Nuclear Power Plants (under revision DS483)**
	1.21	Radiation protection (R5.10–5.16) **NS-G-2.7 Radiation Protection and Radioactive Waste Management in the Operation of Nuclear**

	Power Plants 1.22 Management of radioactive waste (R5.17–5.20) **NS-G-2.7 Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants** 1.23 Fire safety (R5.21–5.25) **NS-G-2.1 Fire Safety in the Operation of Nuclear Power Plants (DPP for DSxxx)** 1.24 Non-radiation-related safety (R5.26) 1.25 Feedback of operating experience (R5.27–5.33) **NS-G-2.11 A System for the Feedback of Experience from Events in Nuclear Installations (under revision DS479)**
Vol.02: PLANT COMMISSIONING	2.1 Introduction 2.2 Commissioning programme (R6.1–6.15) **SSG-28 Commissioning for Nuclear Power Plants**
Vol.03: PLANT OPERATIONS AND MAINTENANCE	3.1 Introduction 3.2 Operating procedures (R7.1–7.6) **NS-G-2.2 Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants** 3.3 Operation control rooms and control equipment (R7.7–7.9) **NS-G-2.14 Conduct of Operations at Nuclear Power Plants** 3.4 Material conditions and housekeeping (R7.10–7.12) **NS-G-2.6 Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants** 3.5 Chemistry programme (R7.13–7.17) **SSG-13 Chemistry Programme for Water Cooled Nuclear Power Plants** 3.6 Core management and fuel handling (R7.18–7.29) **NS-G-2.5 Core Management and Fuel Handling for Nuclear Power Plants** 3.7 Maintenance, testing, surveillance and inspection programmes (R8.1–8.17) **NS-G-2.6 Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants** 3.8 Outage management (R8.18–8.24) **NS-G-2.6 Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, NS-G-2.14 Conduct of Operations at Nuclear Power Plant** 3.9 Preparation for decommissioning (R9.1–9.6) **NS-G-2.4 The Operating Organization for Nuclear Power Plants**

6. PLACE IN THE OVERALL STRUCTURE OF THE RELEVANT SERIES AND INTERFACES WITH EXISTING AND/OR PLANNED PUBLICATIONS

This Specific Safety Guide falls within the thematic area of nuclear safety and will interface with the following IAEA Safety Standards and other publications (this is not, and cannot be, regarded as an exclusive or exhaustive list):

- GSR Part 2 Leadership and Management for Safety (to be published before finalization of this safety guide revision)
- GSR Part 3 Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards.
- GSR Part 4 (Rev.1) Safety Assessment for Facilities and Activities.
- GSR Part 5 Predisposal Management of Radioactive Waste.
- GSR Part 6 Decommissioning of Facilities
- GSR Part 7 Preparedness and Response for a Nuclear or Radiological Emergency.
- SSR-2/1 (Rev.1) Safety of Nuclear Power Plants: Design.
- SSR-2/2 (Rev.1) Safety of Nuclear Power Plants: Commissioning and Operation.
- NS-G-2.11: A System for the Feedback of Experience from Events in Nuclear Installations (2006) DS479
- NS-G-2.12: Ageing management for Nuclear Power Plants (2009) DS485
- NS-G-2.13: Evaluation of Seismic Safety for Existing Nuclear Installations (2009)
- NS-G-2.15: Severe Accident Management Programmes for Nuclear Power Plants (2009) DS 483
- SSG-13: Chemistry Programme for Water Cooled Nuclear Power Plants (2011)
- SSG-25: Periodic Safety Review for Nuclear Power Plants (2013)
- SSG-28: Commissioning for Nuclear Power Plants (2014)
- Revision of GS-G-1.1; GS- G-1.5 (DS 472)
- Revision of GS-G-1.2; GS-G-1.3 GS- G-1.4; SSG-12(DS 473)
- Revision of WS-G-2.3 (DS442); Revision of WS-G-2.5 (DS 448)
- NST041 Preventive and protective measures against insider threats

As applicable, it will be necessary to coordinate with the development and revision of other relevant IAEA Safety Standards in cooperation with IAEA Regulatory Activities Section, Safety Assessment Section, Incident and Emergency Centre, Division of Nuclear Security and Division of Radiation, Transport and Waste Safety..

7. OVERVIEW

The envisaged document is to be split in 3 volumes in order to reflect the Contents of SSR-2/2 Rev. 1

1. MANAGEMENT OF THE OPERATING ORGANIZATION AND OPERATIONAL SAFETY PROGRAMMES

    1.1 Introduction
    1.2 Responsibilities of the operating organization (R 3.1–3.3)
    1.3 Management system (R3.4–3.7)
    1.4 Structure and functions of the operating organization (3.8–3.9)

1.5 Staffing of the operating organization (R3.10–3.13
1.6 Safety policy (R4.1–4.5)
1.7 Operational limits and conditions (R4.6–4.15)
1.8 Qualification and training of personnel (R4.16–4.24)
1.9 Performance of safety related activities (R4.25–4.32)
1.10 Monitoring and review of safety performance (R4.33–4.37)
1.11 Control of plant configuration (R4.38)
1.12 Management of modifications (R4.39–4.43)
1.13 Periodic safety review (R4.44–4.47)
1.14 Equipment qualification (R4.48–4.49)
1.15 Ageing management (R4.50–4.51)
1.16 Records and reports (R4.52)
1.17 Programme for long term operation (R4.53–4.54)
1.18 Consideration of objectives of nuclear security in safety programmes (R5.1)
1.19 Emergency preparedness (R5.2–5.7)
1.20 Accident management programme (R5.8–5.9)
1.21 Radiation protection (R5.10–5.16) **s**
1.22 Management of radioactive waste (R5.17–5.20)
1.23 Fire safety (R5.21–5.25)
1.24 Non-radiation-related safety (R5.26)
1.25 Feedback of operating experience (R5.27–5.33)

2. PLANT COMMISSIONING

2.1 Introduction

2.2 Commissioning programme (R6.1–6.15)

3. PLANT OPERATIONS AND MAINTENANCE

3.1 Introduction

3.2 Operating procedures (R7.1–7.6)
3.3 Operation control rooms and control equipment (R7.7–7.9)
3.4 Material conditions and housekeeping (R7.10–7.12)
3.5 Chemistry programme (R7.13–7.17)
3.6 Core management and fuel handling (R7.18–7.29)
3.7 Maintenance, testing, surveillance and inspection programmes (R8.1–8.17)
3.8 Outage management (R8.18–8.24)
3.9 Preparation and transitioning into decommissioning (R9.1–9.6)
3.10 Preparation for radioactive waste (RW) predisposal and spent fuel (SF) managements(R9.1–9.6).

8. PRODUCTION SCHEDULE: Provisional schedule for preparation of the document, outlining realistic expected dates for each step:

STEP 1: Preparing a DPP	DONE
STEP 2: Approval of DPP by the Coordination Committee	Q2 2016
STEP 3: Approval of DPP by the relevant review Committees	Q2 2016

STEP 4: Approval of DPP by the CSS	Q4 2016
STEP 5: Preparing the draft Indicate as to whether a TM is expected to be organized for the preparation of the draft	Q1, Q2 & Q3 2017
STEP 6: Approval of draft by the Coordination Committee	Q4 2017
STEP 7: Approval by the relevant review Committees for submission to Member States for comments Consultation with all SSC on possible restructuring of the safety guides and preparing of one guide or publication of 8 guides	Q1 2018
STEP 8: Soliciting comments by Member States	Q2 2018
STEP 9: Addressing comments by Member States	Q4 2018
STEP 10: Approval of the revised draft by the Coordination Committee Review in NS-SSCS	Q1 2019
STEP 11: Approval by the relevant review Committees	Q2 2019
STEP 12: Endorsement by the CSS	Q4 2019
STEP 13: Establishment by the Publications Committee	Q1 2020
STEP 14: Target publication date	Q4 2020

9. RESOURCES

Staff: 50 staff weeks

Consultants: 30 consultant weeks

10. ATTACHEMENT

Assessment of the IAEA Safety Standards on Operational Safety of Nuclear Power Plants
Technical Meeting to Review the IAEA Safety Guides on NPP Operational Safety
IAEA&EC JRC, 16-20 November 2015
Brussels, Belgium

1. Introduction

The objective of the Technical Meeting, held in Brussels 16-20 November, was to provide a forum for sharing the experience gained from the implementation of the IAEA Safety Standards on nuclear power plant (NPP) operational safety, as well as for ascertaining the opinions of IAEA Member States on the revisions needed to those standards in order to take the following aspects into consideration
-lessons learned from operating experience
-the latest revision of the Specific Requirements publication Safety of Nuclear Power Plants: Commissioning and Operation (IAEA Safety Standards Series No. SSR-2/2)
-relevant lessons learned from the Fukushima Daiichi accident.

2. Presentations

During the first day of the TM altogether 17 presentations were made by the participants. A major part of the presentations covered national approaches in developing regulations and guides but included also some comments concerning IAEA Safety Guides, for example what is missing in the existing Safety Guides on operational safety of NPPs. Also comments on the SSR-2/2 were made in some of these presentations.
One group of the presentations covered specific issues related to Safety Guides on operational safety of NPPs like risk informed approaches, performance indicators and inspection programmes and development of Periodic Safety Reviews.
One presentation dealt with the effectiveness of the revision process of IAEA Safety Standards. The conclusion of the presentation was that “revision by one DPP is effective”.
One group of presentations covered specific reviews of IAEA Safety Guides on operational safety of NPPs. One review covered configuration control, another WENRA Safety Reference Levels.
The last presentation of the day covered an overall review of the nine Safety Guides on operational safety of NPPs which are planned to be revised as a package. Many of these safety guides are closely related to other safety guides in the area of NPP operational safety or to safety guides in the area of management systems. The review covered the connections to these other guides. Based on the review detailed proposals and three recommendations for “in block” revision of the specified IAEA Safety Guides in the field of NPP operational safety were developed.
Some specific issues were discussed in the presentations. The need for common understanding of terms was emphasized in many presentations (for example plant states, systemic approach to safety, policy/programme/process, etc.). The Defence in Depth concept was discussed in some presentations (DiD for design, fire safety, and operational safety). The need for additional guidance on LTO was mentioned as more plants are going to LTO. It was noted that more guidance is also needed for the safety/security-interface. Severe accident conditions were discussed, especially qualification of equipment for these conditions and guidance for using mobile equipment. Development of IT tools for configuration management was mentioned as well as the application of IAEA NPP requirements to SMRs.

3. Working groups

In the end of the first day three working groups were established from the participants of the TM and the following four tasks were given to the groups:

1. Assess whether all the relevant Requirements of the SSR-2/2 are addressed adequately, not adequately or not addressed at all in the IAEA Safety Guides the group is reviewing
    - A table should be prepared indicating the relations between the Requirements and Safety Guides and the result of the assessment (adequately, not adequately, not at all)
2. Assess the structure of the IAEA Safety Guides on NPP operational safety
    - Should some guides be divided or combined?
    - Should some parts of the guides be transferred into other guides?
    - Are any new guides needed?
3. Review the three Safety Guides from different angles
    - Fukushima-lessons
    - Level of detail
    - Need of quantitative recommendations
    - Operating experience
    - Experience from using the guides
    - Out-of-date?
    - Cross-cutting issues?
    - Safety/security interface
    - Any other views
4. Present views on the way to perform the parallel revision of the nine IAEA Safety Guides

The nine Safety Guides on operational safety of NPPs which are going to be revised as a package were divided between the three groups in the following way:

Group 1:
NS-G-2.1: Fire Safety in the Operation of Nuclear Power Plants (2000)
NS-G-2.4: The Operating Organization for Nuclear Power Plants (2001)
NS-G-2.8: Recruitment, Qualification and Training of Personnel for Nuclear Power Plants (2002)

Group 2:
NS-G-2.2: Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants (2000)
NS-G-2.6: Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants (2002)
NS-G-2.14: Conduct of Operations at Nuclear Power Plants (2008)

Group 3
NS-G-2.3: Modifications to Nuclear Power Plants (2001)
NS-G-2.5: Core Management and Fuel Handling for Nuclear Power Plants (2002)
NS-G-2.7: Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants (2002)

The chairs of working groups gave an interim report of the activities of their respective groups and a final report on the afternoon of 19 November.

Concerning **Tasks 1 and 3**, the groups were able to establish links between the Requirements of SSR-2/2 and the relevant Safety Guides. The maps created in this way are useful in the revision process of Safety Guides on NPP operational safety. IAEA is developing an IT tool which also creates these links but the schedule and

availability to different types of users is not clear. The connections are needed to be able to establish a logical structure of Safety Guides and to avoid unnecessary overlap between them.
The task was also useful for the groups as it triggered several comments on different Safety Guides. The reports of the three groups include altogether about 120 detailed comments on the Safety Guides. These include many of the comments made in the presentations on the first day of the TM but include also additional comments.

Concerning **Task 2** which deals with the structure of safety guides on operational safety of NPPs a summary of the proposals of the groups with some comments is presented below:

Group 1:
- NS-G-2.4: minimize overlap with other guides, add responsibilities and organizational aspects (Comment: Ch.3 includes responsibilities)
- Create a new NS-G on LTO (Comment: will be included in NS-G-2.12)
- "Fire safety has separate guidance for design and operation, which is not a common approach for the IAEA documentation. The IAEA should consider whether it is convenient to keep them separated or combined."
- NS-G-2.1does not consider combination of internal and external hazard

Group 2:
- NS-G-2.2: Split in OLC and Procedures
    - Merge in one central document for procedures with NS-G-2.15 (Comment: NS-G-2.15 is being revised as a separate process)
- NS-G-2.6/NS-G-2.14: Merge outage sections in one guide, consider transition from operation to decommissioning in the scope
- NS-G-2.6: FME missing, guidance for MA backlog, systematic use of Human Performance Tools as a comprehensive package, MSI of non-permanent or SAM-associated equipment
- Consider to consolidate the structure of SS on internal and external hazards

Group 3:
- Radiation protection programme and waste management programme should be in separate safety guides
- NS-G-2.3: More guidance on organizational changes, paragraphs on modifications to computer based systems to be more developed (safety/security), guidance on quantification of risk to be provided or referred to, modifications of mobile equipment

Concerning **Task 4** dealing with the preparation process of Safety Guides the groups presented the following views:

Group 1:
- Minimize the time by clearly defining a common review process to ensure consistency
- The ideal would be to review them in parallel (if not possible establish a proper sequence)

Group 2:
- Revision by one DPP is effective/define groups
- Two phases: 1) All common tasks, 2) Dedicated tasks

Group 3:

- Three options: 1)Maintain current system, 2)Prepare 9 DPPs, team leaders meet to harmonize DPPs, 3)SGs should be divided into groups, after completion of milestones group representatives should have common meetings
- Regardless of option: 1)Experts may need to participate in more than one group, 2)Important cross-cutting issues shall be reviewed for all the guides to ensure consistency

4. Plenary session

The chair of the meeting summarized the results of the working groups and made proposals for consensus views in the plenary session on 20 November. These proposals were discussed in depth and the conclusions of the discussion are presented below.

4.1 Structure

As a background information concerning the structure of the IAEA Safety Guides on operational safety of NPPs the IAEA Long Term Plan for the structure was presented first. It was noted that the revision of three Safety Guides on the area of operational safety of NPPs has already been started, namely NS-G-2.11 A System for the Feedback of Experience from Events in Nuclear Installations (2006), NS-G-2.12 Ageing management for Nuclear Power Plants (2009) and NS-G-2.15 Severe Accident Management Programmes for Nuclear Power Plants (2009). The NS-G-2.12 will include issues related to LTO.

Concerning the structure, the consensus view of the TM was that the NS-G-2.4 should be kept as the basic Safety Guide for operational safety of NPPs and organizational issues should be added in the guide as the groups proposed. Unnecessary overlap with other guides should be avoided but due to the nature of the guide, it cannot be avoided totally (and should not be avoided). The NS-G-2.14 should be kept as the basic guide for direct activities of operations. Unnecessary overlap should be avoided. OLCs should be included in NS-G-2.14 since they establish the most basic requirements for operations (presently in NS-G-2.2). Recommendations dealing with Operating Procedures should be merged into one single safety guide (NS-G-2.2).

The consensus view was that the scope of the NS-G-2.1 should be widened to include at least all internal hazards and even all internal and external hazards should be considered as concerns the scope of the new guide. It was mentioned that the importance of fires should be emphasized also in the new guide.

The consensus view was that the NS-G-2.3 and NS-G-2.6 should be kept as separate guides (in the IAEA Long Term Plan they are proposed to be combined).

The dividing of NS-G-2.7 into two parts dealing separately with radiation protection and waste management should be discussed later, for example in connection with drafting the DPP for the new guide.

All the detailed proposals of the working groups concerning the structure of the guides, especially moving some parts of the guides to other guides should be considered during the preparation process of the new guides.

4.2 Preparation process

For the revision of the nine Safety Guides which were reviewed in the TM (Appendix 3), the structure of the IAEA Safety Guides on operational safety of NPPs needs to be defined first. As these Safety Guides are closely interrelated, they should be revised in a single process (one DPP). For the practical work, the guides should be divided in two or

three groups with respective working groups. All the guides should be revised simultaneously or at least so that the schedules of the different groups of guides overlap considerably. A specific, effective coordination mechanism is needed between different working groups and should be established by the IAEA.
If two groups are established, the guides NS-G-2.2, NS-G-2.3, NS-G-2.4, NS-G-2.6 and NS-G-2.14 could belong to one group and the remaining four guides to the other group.
Goals and milestones need to be defined for the preparation process of the new safety guides on operational safety of NPPs as a package.
Good coordination is also required between the preparation of Safety Guides on operational safety of NPPs and the Safety Guides related to the design (for example internal hazards).
All the detailed technical comments of the working groups and comments made in the presentations should be considered during the preparation process of the new guides.

4.3 Other Issues

In the plenary session some other issues were also discussed. One of the issues which was discussed in depth concerns including regulatory activities in the Safety Guides on operational safety. The consensus view was they should be included in the other set of Safety Guides dealing especially with regulatory activities (Safety Guides under GSR Part 1).
The safety/security- interface was also discussed. It was noted that some recommendations are presented in the existing Safety Guides NS-G-2.4 and NS-G-2.14 but these recommendations should be revised. Guidance concerning escape routes and balancing between safety and security in this respect is presently missing in the Safety Guides on operational safety of NPPs.
It was noted that risk-informed operational strategies should be included in several Safety Guides on operational safety of NPPs.
It was noted that it would be important to create a user friendly and clear connection between the Requirements and the corresponding recommendations of the relevant Safety Guides. This would facilitate avoiding redundancies and minimizing inconsistencies.
The terms used in the Safety Guides should be clear and consistent. For the revision process all the necessary definitions from Requirements and Safety Guides published after 2007 need to be made available (The Safety Glossary was published 2007). All references of the Safety Guides need to be updated.
As several comments were presented in the TM also concerning the SSR-2/2 and as similar comments have been presented also in connection with some IAEA services, it was proposed to update also the SSR-2/2 simultaneously with updating the nine Safety Guides.

11. ANNEX

Assessment of the IAEA Safety Standards on Operational Safety of Nuclear Power Plants
Main parts of the Safety Guides to be affected by the revision

- NS-G-2.2: Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants (2000):

  - Development of operational limits and conditions (3.8–3.16)
  - Safety Limits (4.1–4.5)
  - Surveillance Requirements (7.1–7.5)
  - Particular aspects of emergency procedures (8.8–8.18)
  - Development of Operating Procedures (9.1–9.7)
  - Compliance with operational limits and conditions and operating procedures (10.1–10.7)

- NS-G-2.3: Modifications to Nuclear Power Plants (2001);

  - Types of modifications (4.1–4.2)
  - Categorization of modifications by safety significance (4.3–4.7)
  - Safety assessment (4.8–4.12) 1
  - Review of proposed modifications (4.13–4.14)
  - Design considerations (4.15–4.18)
  - Modifications to the operational limits and conditions (4.19–4.21)
  - Modifications to the operating procedures (4.22–4.23)
  - Modifications to computer based systems (4.24–4.26)
  - Interactions between modifications (4.27–4.29)
  - Organizational changes (5.1–5.5)
  - Modifications to programmes for operation management (5.6–5.7)....
  - Modifications to safety assessment tools and processes (5.8–5.9)
  - Temporary modifications (6.1-6.9)
  - Administrative control (7.1–7.3)
  - Specific safety considerations (7.4–7.7)
  - Testing and commissioning (7.8–7.13)
  - Operation (7.14–7.20)
  - Quality Assurance (9.1)
  - Training (10.1-10.2)

- NS-G-2.4: The Operating Organization for Nuclear Power Plants (2001);

  - Structure of the operating organization (2.9–2.19)
  - Responsibilities of the operating organization (3.2–3.9)
  - Responsibilities of the plant management (3.10–3.18)
  - Interface with external supporting organizations (4.5–4.10)
  - Interface with the public (4.11–4.14)
  - Safety management system (5.1–5.5)
  - Monitoring and review of safety performance (5.17–5.22)
  - Plant operation management programmes (6.1-6.81)
  - Supporting functions (7.1-7.25)

- NS-G-2.5: Core Management and Fuel Handling for Nuclear Power Plants (2002);

  - Core monitoring programme (2.16–2.23)

- Ensuring fuel integrity (2.24–2.42)
- Refuelling programme (2.43–2.52)
- Surveillance relating to core management and fuel handling (2.53)
- Loading fuel and core components into the reactor (4.4–4.10)
- Unloading fuel and core components (4.11–4.16)
- Precautions for loading and unloading fuel and core components (4.17–4.20)
- Handling of irradiated fuel (5.2–5.9)
- Storage of irradiated fuel (5.10–5.20).

- NS-G-2.6: Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants (2002);

  - Interrelationship between maintenance, surveillance and in-service inspection (2.16–2.17)
  - The operating organization (3.1–3.3)
  - Contractors (3.6–3.9)
  - Other bodies, including designers and manufacturers (3.10–3.11)
  - Interface control (3.12)
  - Planning and safety management (4.17–4.24)
  - Administrative procedures (4.25–4.28)
  - Quality assurance (4.29)
  - Training and qualification of personnel (4.30–4.38)
  - Procedures (5.1–5.13)
  - Work control (5.14–5.19)
  - Outage management (5.20–5.22)
  - Evaluation of results and corrective actions (6.5–6.10
  - Feedback of experience (6.11–6.14)
  - Structures, systems and components for abnormal
  - operating conditions (7.1)
  - Risk assessment of plant status under shutdown
  - conditions (7.2–7.5)
  - Plant ageing (7.6–7.8
  - Plants designed to earlier standards (7.9
  - Computer applications important to safety (7.10–7.14)
  - Surveillance of the integrity of barriers (9.10–9.14)
  - Surveillance of safety systems (9.15–9.17)
  - Surveillance of other items (9.18)
  - Frequency and extent of surveillance (9.19–9.30
  - Surveillance methods (9.31–9.37)
  - Functional tests (9.38–9.44)

- NS-G-2.7: Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants (2002);

  - Programmes and organizational aspects (2.34–2.44)
  - Quality assurance (2.45–2.46)
  - Incidents and emergencies (2.47–2.50)
  - Work planning and work permits (3.39–3.47)
  - Protective clothing and protective equipment (3.48–3.55)
  - Facilities, shielding and equipment (3.56–3.60)
  - Health surveillance (3.61–3.66)
  - Processing of radioactive waste (4.24–4.40)

- Training (5.1-5.11)
- Radiation surveys, instrument calibration and radiation work permits (6.7–6.9)

- NS-G-2.8: Recruitment, Qualification and Training of Personnel for Nuclear Power Plants (2002);

  - Qualification requirements (3.1–3.13)
  - Educational background (3.14–3.24)
  - Requirements for experience (3.25–3.39)
  - Qualification of external personnel (3.40–3.42)
  - Training for emergencies (4.32–4.43)
  - Training programmes for managersand supervisory personnel (5.11–5.15)
  - Training programmes for operations personnel (5.16–5.21)
  - Training programmes for maintenance personnel (5.22–5.26)
  - Training programmes for other technical personnel (5.27–5.30)
  - Training programmes for the trainers (5.31–5.34)
  - Review and modification of training programmes (5.35–5.44)
  - Training facilities and materials (6.1-6.7)

- NS-G-2.14: Conduct of Operations at Nuclear Power Plants (2008)

  - Operating policy (2.6–2.9)
  - Human resources and qualification of personnel (2.10–2.15)
  - Performance objectives and standards (2.16–2.21)
  - Interfaces with other plant groups (2.22–2.29)
  - Availability and use of operating procedures (4.21–4.26)
  - Pre-job briefings (4.27–4.28)
  - Conduct in the control room (4.29–4.33)
  - Shift rounds (4.34–4.42)
  - Communications (4.43–4.48)
  - Temporary modifications (5.37–5.43)
  - Operator aids and supporting tools (6.15–6.19)
  - Housekeeping and material conditions (6.20–6.26)
  - Work control procedures (7.1–7.9)
  - Work planning and scheduling (7.10–7.14)
  - Control of special tests and non-routine activities (7.15–7.17)
  - Control of outages (7.18–7.20)
  - Routines for isolation of equipment (7.21–7.32)
  - Industrial safety (7.33–7.37)