

Document Preparation Profile (DPP)
[Final] Version 5 dated 16 November, 2015

1. IDENTIFICATION

Document Category: Specific Safety Guide

Working ID: DS449

Proposed Title: Format and Content of the Safety Analysis Report for Nuclear Power Plants

Proposed Action: Revision of Safety Standard Series No. GS-G-4.1, IAEA, Vienna (2004)

Review Committee(s): NUSSC, RASSC, WASSC, EPreSC and NSGC

Technical Officer: Palmiro Villalibre

2. BACKGROUND

The IAEA Safety Guide GS-G-4.1 “Format and Content of the Safety Analysis Report for Nuclear Power Plants (2004)” was published to meet requirements from GS-R-1 “Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety (2000)” taking into account other requirements, mainly from NS-R-1 “Safety of Nuclear Power Plants: Design (2000)”, NS-R-2 “Safety of Nuclear Power Plants: Operation (2000)” and NS-R-3 “Site Evaluation for Nuclear Installations (2003)”.

A full set of General Safety Requirements has been developed in the last few years and is being finalized. GS-R-1 was superseded by GSR Part 1 “Governmental Legal and Regulatory Framework for Safety (2010)”. GSR Part 4 “Safety Assessment for Facilities and Activities” was published in 2009 and has been revised later. Additionally, NS-R-1 and NS-R-2 were superseded respectively by SSR-2/1, “Safety of Nuclear Power Plants: Design (2012)” and SSR-2/2 “Safety of Nuclear Power Plants: Commissioning and Operation (2011)”, which revision is being currently published, similarly as NS-R-3. The revised Safety Standards facilitate significant enhancements of Nuclear Power Plant’s safety, which should be adequately demonstrated in the Safety Analysis Report.

Among the significant changes in the IAEA Safety Standards are those incorporated in SSR-2/1, in particular the inclusion of design extension conditions in the plant design and the strengthening of the independence and effectiveness of the different levels of defence-in-depth, the robustness against extreme external hazards and the practical elimination of sequences leading to early or large radioactive releases. The importance of addressing these changes was strongly highlighted by the feedback of experience and lessons learned from the Tepco Fukushima Daiichi nuclear power plant accident.

The format and content of the Safety Analysis Report used in the majority of IAEA Member States that are currently starting or enlarging their nuclear power programme represent relevant differences versus the one presented in GS-G-4.1.

3. JUSTIFICATION FOR THE PRODUCTION OF THE DOCUMENT

GS-G-4.1 was developed to provide guidance in fulfilling requirements mainly from GS-R-1, taking into account Specific Safety Requirements from NS-R-1, NS-R-2 and NS-R-3 (2003). The General Safety Requirements and those of SSR-2/1, SSR-2/2 and NS-R-3 established and/or revised after publishing GS-G-4.1 represent relevant changes with respect to those of GS-R-1, NS-R-1, NS-R-2 and NS-R-3 (2003). Additionally, the safety documentation currently prepared for new nuclear power plants incorporate approaches and safety enhancements that are not covered in GS-G-4.1. Consequently it is necessary to revise the Safety Guide GS-G-4.1 for making it consistent with the existing framework of IAEA Safety Standards and for taking into account feedback from current practices in IAEA Member States.

4. OBJECTIVE AND SCOPE

The main objective of the revised Safety Guide is to provide recommendations and guidance for preparing a Safety Analysis Report for Nuclear Power Plants in compliance with the current IAEA Safety Standards. The revision will take into account applicable Safety Requirements and Safety Guides published regarding the different aspects covered by the Safety Analysis Report to ensure consistency.

Reference will be made to applicability of the revised Safety Guide for the development of a Safety Analysis Report for different types of nuclear fuel cycle facilities, based on GSR Part 4.

The revised Safety Guide is intended for use by designers, operators, technical support organizations and regulators primarily in connection with authorization (licensing) of the nuclear power plants of new construction and, as far as reasonable, also for the safety re-evaluation of existing nuclear power plants. Applicable feedback of lessons learned from the Tepco Fukushima Daiichi nuclear power plant accident is to be taken into account.

The main changes to be included in the revised Safety Guide are:

- In general, the terminology of the Safety Guide needs to be revised and made consistent with the plant states described in SSR-2/1 Rev. 1 (in publication).
- The structure of the revised Safety Guide will take into account feedback from current practices used by IAEA Member States in the preparation of Safety Analysis Reports.
- To provide guidance for the adequate demonstration of compliance with recently enhanced IAEA Safety Requirements in the Safety Analysis Report, including specifically those from GSR Part 4 Rev.1, SSR-2/1 Rev. 1, SSR-2/2 Rev. 1 and NS-R-3 Rev. 1 (all them in publication).
- To provide guidance regarding the use of up-to-date safety analysis tools and approaches for demonstrating safety.
- To provide guidance on how to revise and to keep the Safety Analysis Report updated to reflect the current state and the licensing basis of the plant. This includes cases of major plant changes, such as the replacement of steam generators and the thermal power uprates.

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

The new version of the Safety Guide will be directly related with all the General Safety Requirements established, as revised. Regarding Specific Safety Requirements, it will be mainly related to SSR-2/1 Rev. 1, SSR-2/2 Rev. 1 and NS-R-3 Rev. 1 (all in publication).

Interfaces with other Safety Guides and Security Guides will also be considered. Among the long list of them the following, as revised, can be highlighted:

- GS-G-1.2 “Review and Assessment of Nuclear Facilities by the Regulatory Body (2002)”
- GS-G-1.3 “Regulatory Inspection of Nuclear Facilities and Enforcement by the Regulatory Body (2002)”
- GS-G-1.4 “Documentation for Use in Regulating Nuclear Facilities (2002)”
- SSG-12 “Licensing Process for Nuclear Installations (2010)”
- GS-G-1.5 “Regulatory Control of Radiation Sources (2004)”
- NS-G-1.5 “External Events Excluding Earthquakes in the Design of Nuclear Power Plants (2003)”
- NS-G-1.6 “Seismic Design and Qualification for Nuclear Power Plants (2003)”
- NS-G-1.7 “Protection against Internal Fires and Explosions in the Design of Nuclear Power Plants (2004)”
- NS-G-1.11 “Protection against Internal Hazards other than Fires and Explosions in the Design of Nuclear Power Plants (2004)”
- NS-G-2.3 “Modifications to Nuclear Power Plants (2001)”
- NS-G-2.4 “The Operating Organization for Nuclear Power Plants (2001)”
- NS-G-2.12 “Ageing Management for Nuclear Power Plants (2009)”
- SSG-18 “Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (2011)”
- GSG-1 “Classification of Radioactive Waste (2009)”
- SSG-30 “Safety Classification of Structures, Systems and Components in Nuclear Power Plants (2014)”
- NSS-4 “Engineering Safety Aspects of the Protection of Nuclear Power Plants against Sabotage (2007)”
- NSS-13 “Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5, 2011)”
- NSS-16 “Identification of Vital Areas at Nuclear Facilities (2012)”
- NSS-17 “Computer security at Nuclear Facilities (2011)”
- NSS-23-G “Security of Nuclear Information. Implementing Guide. (2015)”

Other Safety Guides that will be taken into account include those dealing with the following areas:

- Site evaluation;
- Description of different types of plant systems;
- Civil and structured engineering (mechanical, electrical and Instrumentation and Control);
- Defence-in-depth;
- Management of safety;
- Emergency preparedness;
- Radioactive waste management, decommissioning and remediation;

- Environmental aspects;
- Accident analysis (including all plant states considered in design);
- Deterministic and probabilistic safety analyses.

6. OVERVIEW

The structure of the planned revision of the Safety Guide will include the following main contents (given for illustration):

INTRODUCTION

GENERAL CONSIDERATIONS

CONTENT OF THE SAFETY ANALYSIS REPORT (SAR)

1. Introduction and general considerations
2. Site characteristics
3. Design of structures, systems and components
4. Reactor
5. Reactor coolant and connected systems
6. Engineered safety features
7. Instrumentation and control
8. Electric power
9. Auxiliary systems and civil structures
10. Steam and power conversion systems
11. Radioactive waste management
12. Radiation protection
13. Conduct of operations
14. Plant commissioning
15. Safety analysis
16. Operational limits and conditions
17. Management systems
18. Human factors engineering
19. Emergency preparedness
20. Environmental aspects
21. Decommissioning and end of life aspects

REVIEW AND UPDATING OF THE SAR

Annex 1. Safety Analysis Report development in the course of the Nuclear Power Plant project evolution;

Annex 2. Description of plant design systems;

REFERENCES

CONTRIBUTORS TO DRAFTING AND REVIEW

7. PRODUCTION SCHEDULE: Provisional schedule for preparation of the document:

STEP 1: Preparing a DPP	DONE
STEP 2: Approval of DPP by the Coordination Committee	March 2015
STEP 3: Approval of DPP by the relevant review Committees	July 2015
STEP 4: Approval of DPP by the CSS	November 2015
STEP 5: Preparing the draft	July 2016
STEP 6: Approval of draft by the Coordination Committee	September 2016
STEP 7: Approval by the relevant review Committees for submission to Member States for comments	4Q 2016
STEP 8: Soliciting comments by Member States	2Q 2017
STEP 9: Addressing comments by Member States	3Q 2017
STEP 10: Approval of the revised draft by the Coordination Committee. Review in NS-SSCS	4Q 2017
STEP 11: Approval by the relevant review Committees	1Q 2018
STEP 12: Endorsement by the CSS	2Q 2018
STEP 13: Establishment by the Publications Committee	3Q 2018
STEP 14: Target publication date	4Q 2018

8. RESOURCES

It is envisaged that the development of the document will entail the organization of three consultancy meetings and one Technical Meeting for the production of the draft and two further consultancy meetings for addressing comments from NUSSC, RASSC, WASSC, NSGC and CSS.