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1. IDENTIFICATION

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Proposed Title: Safety Assessment for Facilities and Activities

Proposed Action: Revision of IAEA Safety Standards Series No. GSR Part 4 (Rev. 1),
Safety Assessment for Facilities and Activities (2016)

Review Committee(s) or Group: NUSSC, EPreSC, RASSC, WASSC, NSGC, TRANSSC

Technical Officer: Shahen POGHOSYAN (NSNI/SAS), Tania VENEAU (NSNI/SAS),
Ronald PACHECO (NSRW/RIT)

2. BACKGROUND

IAEA Safety Standards Series No. GSR Part 4 (Rev. 1), Safety Assessment for Facilities and Activities, (2016) establishes requirements for the safety assessment of facilities and activities. The initial version, GSR Part 4, was published in 2012; the requirements were then revised in 2016 to incorporate the lessons learned from the Fukushima Daiichi nuclear power plant (NPP) accident and available feedback from operational experience. Since the publication of GSR Part 4 (Rev. 1), there have been significant developments in the area of innovative technologies used in various facilities and activities, including small modular reactors (SMRs), non-water-cooled reactors, transportable NPPs and cogeneration concepts as well as in context of medical, industrial and research facilities and activities.

In addition, GSR Part 4 (Rev. 1) serves as reference in relevant IAEA review services, such as Technical Safety Review (TSR), Integrated Regulatory Review Service (IRRS), Integrated Safety Assessment of Research Reactors (INSARR) and Safety Evaluation of Fuel Cycle Facilities During Operation (SEDO), and Occupational Radiation Protection Appraisal Service (ORPAS). This has allowed the IAEA to accumulate feedback on GSR Part 4 (Rev. 1) and identify specific areas for further enhancement.

The feedback analysis is provided in the Annex.

3. JUSTIFICATION FOR THE PRODUCTION OF THE DOCUMENT

GSR Part 4 (Rev. 1) set high level requirements that apply to all of facilities and activities. Feedback from Member States (see Annex) on the use GSR Part 4 (Rev. 1) confirms the need for revision of GSR Part 4 (Rev. 1), with particular attention to the following aspects:

- **Application of requirements for facilities and activities other than NPPs.** Feedback from different interested parties in Member States, together with experience gained from applying the requirements, has shown that some provisions may be challenging to implement and may not be fully applicable across the broad spectrum of facilities and activities, limiting their practical use

in these contexts. Therefore, there is a need for the forthcoming revision to improve the applicability to facilities and activities other than NPPs while maintaining their applicability to the NPPs. In particular, further elaboration of requirements is expected in the following areas to enhance their future application: graded approach in the context of safety assessment, assessment of defence in depth, independent verification, consideration of safety interfaces with security and safeguards, roles of interested parties in the context of safety assessment.

- **Use of terminology in GSR Part 4 (Rev.1).** While GSR Part 4 (Rev. 1) uses terminology that is common to NPPs, there are differences with the terminology used in both General and Specific Safety Requirements for other facilities and activities. For example, different terminology is used in: GSR Part 5 for predisposal management of radioactive waste and SSR 5 for disposal of radioactive waste; SSR-3 for research reactors; SSR-4 for fuel cycle facilities; SSR-6 for transport; and in the Specific Safety Guides for radiation facilities and activities (e.g. SSG-57, 58, 59). The terminology used in the context of safety assessment and safety analysis needs enhancement, harmonization and further elaborated, given its application across all facilities and activities, its use in the relevant Safety Standards that reference GSR Part 4 (Rev. 1), as well as with the IAEA Nuclear Safety and Security Glossary.
- **Application of requirements to facilities and activities with the use of new types of technologies with limited operating experience and large uncertainties:** Emerging technologies may incorporate novel design features for which there is little or no operating experience. In such cases, significant uncertainties exist, and established knowledge, data, codes, standards, and proven practices may be limited. Additional considerations may therefore be needed in the application of safety assessment requirements to ensure that safety is adequately demonstrated despite these uncertainties.

The above factors support the need for a full review of all the requirements in GSR Part 4 (Rev. 1) with account taken of the current level of knowledge to ensure the continued relevance and applicability of the safety requirements for safety assessment of all facilities and activities.

The revision of GSR Part 4 (Rev. 1), hereinafter called GSR Part 4 (Rev. 2), is expected to enhance the clarity, applicability, and usability of the safety requirements for regulatory bodies, design organizations, operating organizations and technical support organizations.

4. OBJECTIVE

The objective of the revised requirements in GSR Part 4 (Rev. 2) will be to strengthen the applicability of requirements to ensure safety assessment for facilities and activities.

In general, GSR Part 4 (Rev. 2) will aim to provide a consistent and coherent basis, especially via harmonised terminology, for safety assessment across all facilities and activities. Implementation of the requirements established in GSR Part 4 (Rev. 2) will ensure that safety assessment considers all relevant aspects and that a consistent framework is applied across the facilities and activities.

GSR Part 4 (Rev. 2) will be intended for use by organizations involved in all stages of facility lifetime, including associated activities, as well as be used by regulatory bodies in the review of the safety assessment for the authorization process of any of the stages of facility lifetime.

5. SCOPE

The requirements of GSR Part 4 (Rev.1), which are derived from the IAEA Fundamental Safety Principles, relate to any human activity that may cause people to be exposed to radiation risks arising from facilities and activities, as follows:

‘Facilities’ include:

- (a) Nuclear power plants¹;
- (b) Research reactors (including critical assemblies and subcritical assemblies)
- (c) Enrichment facilities and fuel fabrication facilities;
- (d) Conversion facilities used to generate UF₆;
- (e) Storage and reprocessing plants for irradiated fuel;
- (f) Facilities for radioactive waste management where radioactive waste is treated, conditioned, stored or disposed of;
- (g) Any other places where radioactive materials are produced, processed, used, handled or stored;
- (h) Irradiation facilities for medical, industrial, research and other purposes, and any places where radiation generators are installed;
- (i) Facilities where the mining and processing of radioactive ores (such as ores of uranium and thorium) are carried out;
- (j) Fusion facilities.

‘Activities’ include:

- (a) The production, use, import and export of radiation sources for industrial, research, medical and other purposes;
- (b) The transport of radioactive material;
- (c) The decommissioning and dismantling of facilities and the closure of disposal facilities for radioactive waste;
- (d) The close-out of facilities where the mining and processing of radioactive ore was carried out;
- (e) Activities for radioactive waste management such as the discharge of effluents;
- (f) The remediation of sites affected by residual radioactive material from past activities.

The requirements for security are out of scope, however the interface between safety and security are to be addressed in the new revision.

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

The Safety Requirements will interface with at least the following IAEA Safety Standards Series and other publications (the list is not intended to be final or exhaustive):

- 1) SF-1 – Fundamental Safety Principles (2006);
- 2) GSR Part 1 (Rev. 1) – Governmental, Legal and Regulatory Framework for Safety (2016);
- 3) GSR Part 2 – Leadership and Management for Safety (2016), under revision as DS565;
- 4) GSR Part 3 – Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards (2014);
- 5) GSR Part 5 – Predisposal Management of Radioactive Waste (2009), under revision as DS548;

¹ In line with the description provided in section 5 of the DPP for DS562 (SSR-2/1(Rev. 2))

- 6) GSR Part 6 –Decommissioning of. Facilities (2014);
- 7) GSR Part 7 – Preparedness and Response for a Nuclear or Radiological Emergency (2015), under revision as DS558;
- 8) SSR-1 – Site Evaluation in Nuclear Installations (2019), under revision as DS557;
- 9) SSR-2/1 (Rev. 1) – Safety of Nuclear Power Plants: Design (2016), under revision as DS562;
- 10) SSR-2/2 (Rev. 1) – Safety of Nuclear Power Plants: Commissioning and Operation (2016), under revision as DS532;
- 11) SSR-3 – Safety of Research Reactors (2016);
- 12) SSR-4 – Safety of Nuclear Fuel Cycle Facilities (2017);
- 13) SSR-5 – Disposal of Radioactive Waste (2011);
- 14) SSR-6 (Rev. 2) – Regulations for the Safe Transport of Radioactive Material (2025);
- 15) SSG-2 (Rev. 1) – Deterministic Safety Analysis for Nuclear Power Plants (2019);
- 16) SSG-3 (Rev. 1) – Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants (2024);
- 17) SSG-4 (Rev. 1) – Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants (2025);
- 18) SSG-25 – Periodic Safety Review for Nuclear Power Plants (2013), under revision as DS535;
- 19) SSG-88 – Design Extension Conditions and the Concept of Practical Elimination in the Design of Nuclear Power Plants (2024);
- 20) SSG-61 – Format and Content of the Safety Analysis Report for Nuclear Power Plants (2021);
- 21) DS537 Safety demonstration of innovative technology in power reactor designs (in preparation);
- 22) SSG-20 (Rev. 1) – Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report (2022);
- 23) SSG-22 (Rev. 1) - Use of a Graded Approach in the Application of the Safety Requirements for Research Reactors (2023);
- 24) SSG-89 - Evaluation of Seismic Safety for Nuclear Installations (2024)
- 25) SSG-5 (Rev. 1) – Safety of Conversion Facilities and Uranium Enrichment Facilities (2023);
- 26) SSG-6 (Rev. 1) – Safety of Uranium Fuel Fabrication Facilities (2023);
- 27) SSG-7 (Rev. 1) – Safety of Uranium and Plutonium Mixed Oxide Fuel Fabrication Facilities (2023);
- 28) SSG-42 (Rev. 1) – Safety of Nuclear Fuel Reprocessing Facilities (2025);
- 29) SSG-43 (Rev. 1) – Safety of Nuclear Fuel Cycle Research and Development Facilities (2025);
- 30) SSG-27 (Rev. 1) – Criticality Safety in the Handling of Fissile Facilities (2022)
- 31) GSG-3 – The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste (2013) ongoing revision as DS553;
- 32) GSG-10 – Prospective Radiological Environmental Impact Assessment for Facilities and Activities (2018)
- 33) SSG-23 – The Safety Case and Safety Assessment for the Disposal of Radioactive Waste (2012);

- 34) WS-G-5.2 – Safety Assessment for the Decommissioning of Facilities Using Radioactive material (2008), under revision as DS555;
- 35) SSG-57 – Radiation Safety in Well Logging (2020)
- 36) SSG-58 – Radiation Safety in the use of Nuclear Gauges (2020)
- 37) SSG 59 – Radiation Safety of Accelerator Based Radioisotope Production Facilities (2020)
- 38) SSG-94 - Ageing Management and Maintenance of Packages for the Transport of Radioactive Material (2026)
- 39) NSS-20 – Objective and Essential Elements of a State’s Nuclear Security Regime (2013), under revision as NST072;
- 40) NSS-13- Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5) (2011), under revision as NST073;
- 41) NSS-14 Nuclear Security Recommendations on Radioactive Material and Associated Facilities (2011), under revision as NST074;
- 42) Draft Technical Report on the management of the interfaces between nuclear and radiation safety and nuclear security, in preparation.

The scope of safety assessment is broad and intersects with all safety aspects of facilities and activities. Consequently, the concepts and requirements of GSR Part 4 (Rev. 1) are referenced in and provided with specificity for application across numerous IAEA Safety Standards and other publications.

Given the wide scope of applicability of the safety requirements on safety assessment for facilities and activities and the interfaces with other IAEA Safety Standards listed above, revision of the various parts of GSR Part 4 (Rev. 1) will be coordinated, as relevant, within NSNI, within NSRW, and with NSNS, NS/IEC and the safeguards team dealing with ‘safeguards by design’ (SGCP POC).

7. OVERVIEW

GSR Part 4 (Rev. 2) will retain the overall structure and table of contents of the current GSR Part 4 (Rev. 1) as follows:

1. INTRODUCTION
2. BASIS FOR REQUIRING A SAFETY ASSESSMENT
3. GRADED APPROACH TO SAFETY ASSESSMENT
4. SAFETY ASSESSMENT
5. MANAGEMENT, USE AND MAINTENANCE OF THE SAFETY ASSESSMENT
6. APPENDICES (if needed)
7. REFERENCES
8. ANNEXES (if needed)
9. CONTRIBUTORS TO DRAFTING AND REVIEW

8. PRODUCTION SCHEDULE

STEP 1: Preparation of the DPP	Q2 2026
STEP 2: Approval of DPP by the Coordination Committee	Q3 2026
STEP 3: Approval of DPP by the relevant review Committees	Q4 2026
STEP 4: Approval of DPP by the CSS	Q2 2027
STEP 5: Preparing the draft	Q3 2028

STEP 6: Approval of draft by the Coordination Committee	Q4 2028
STEP 7: Approval by the relevant review Committees for submission to Member States for comments	Q2 2029
STEP 8: Soliciting comments by Member States	Q4 2029
STEP 9: Addressing comments by Member States	Q4 2029
STEP 10: Approval of the revised draft by the Coordination Committee Review in NSOC-SGDS (Technical Editorial review)	Q1 2030
STEP 11: Approval by the relevant review Committees	Q2 2030
STEP 12: - Submission to the CSS - Submission in parallel and approval by the Publications Committee - MTCD Editing - Endorsement of the edited version by the CSS	Q4 2030
STEP 13: Establishment by the Publications Committee and/or Board of Governors (for SF and SR only))	Q1 2031
STEP 14: Target publication date	Q2 2031

9. RESOURCES

It is estimated that the full revision of the Safety Requirements would involve approximately 300 weeks of effort by experts. This is based upon assuming 8 one-week consultancy meetings, involving no more than 20 experts and an average of one week of work per expert between meetings. It will also include 40 days of home-based assignments for external experts to support the revision.

Agency resources involved are estimated at 50 weeks of effort by the Technical Officers and 30 additional weeks of other IAEA staff.

ANNEX – Feedback Analysis Report

The proposal to revise GSR Part 4 (Rev. 1) is based on inputs from multiple sources, including:

- i. Requests and encouragement from Member States provided in recent resolutions of the IAEA General Conference;
- ii. Feedback from the application of GSR Part 4 (Rev. 1) to a wide range of facilities and activities and during IAEA peer review missions;

Two Consultancy Meetings were held on 9-11 December 2025 (EVT2403499) and on 11-12 March 2026 (EVT2506221) to discuss the development of the draft DPP for the revision of GSR Part 4 (Rev. 1). Participants shared their experience in safety assessment, including past and ongoing projects, based on both proven and innovative technologies. Discussions covered:

- Application of requirements for all facilities and activities.
- General framework of safety assessment and terminology consistency.
- Use of the graded approach in safety assessment.
- Demonstration of the implementation of defence in depth in safety assessment.
- Expectations and suggestions regarding the potential revision of GSR Part 4 (Rev. 1).

This feedback analysis report reflects the key discussions and relevant issues raised by the experts during those meetings.

1. Feedback from IAEA Member States through the GC resolutions

Recent IAEA General Conference resolutions have highlighted several important gaps and priorities related to safety assessment, with specific focus on advanced reactors, including micro-reactors, SMRs and transportable NPPs (TNPPs).

The IAEA General Conference has acknowledged that, while the existing Safety Standards provide a strong foundation, they may not fully address the novel design features of advanced reactors and may therefore need further revision in order to be fully applicable.

General Conference resolutions have called for greater harmonization of safety requirements and regulatory cooperation to avoid duplication and facilitate international deployment. This includes developing common expectations for safety cases, pre-licensing design reviews, and mutual recognition of regulatory assessments which can be addressed by updated IAEA Safety Standards on design safety, safety assessment and regulation.

The 67th, 68th and 69th IAEA General Conferences (2023–2025) reaffirmed the importance of updating the Safety Standards to reflect emerging technologies.

2. Feedback from the application of GSR Part 4 (Rev. 1)

GSR Part 4 (Rev. 1) applies to all facilities and activities, encompassing applications with widely varying radiological risk profiles, including those with significant radiological consequences. Applying GSR Part 4 (Rev.1) requirements to all facilities (e.g. power reactors, research reactors, fuel cycle facilities, industrial, medical, research facilities and activities) requires the application of a graded approach.

The discussions held during the consultancy meetings in December 2025 and in March 2026 showed that

the application of GSR Part 4 (Rev. 1) to facilities and activities other than NPPs entails certain challenges. During the above mentioned consultancy meetings it was concluded that the formulation in of Requirement 1 of GSR Part 4 (Rev. 1) related to graded approach needs more elaboration. In addition, issues with terminology were emphasized during these meetings, with comments that some terms are unclear or inconsistent (e.g. safety case, review, assessment, verification). Also, some of the terms used relate specifically to NPPs and might not be understood in the same way by interested parties in other facilities or activities.

The summary below presents feedback from the application of GSR Part 4 (Rev. 1) to a broad range of facilities and activities:

- **Applicability of the requirements to all facilities and activities.** Feedback from the application of GSR Part 4 (Rev. 1) for different facilities and activities in Member States and from IAEA peer review missions indicate the need for further elaboration of some of the existing requirements of GSR Part 4 (Rev. 1). In particular, the clarification of requirements in the following areas will enhance their future application:
 - **Application of requirements for facilities and activities other than NPPs.** Feedback from different stakeholders in Member States, together with experience gained from applying the requirements, has shown that some provisions are difficult to implement and are not always fully applicable across the broad spectrum of facilities and activities, limiting their practical use in these contexts. Therefore, there is a need for the forthcoming revision to improve the applicability for facilities and activities other than NPPs while maintaining their applicability to the NPPs.
 - **Graded approach in the context of safety assessment.** Feedback from the review of the application of GSR Part 4 (Rev. 1) by IAEA peer review missions indicates the need for further elaboration of this requirement.
 - **Assessment of defence in depth.** Further elaboration are needed on what is expected to be done in safety assessment regarding the adequate implementation of defence in depth (Requirement 13) for all facilities and activities.
 - **Independent verification.** The feedback analysis showed that the notion of independent verification of the safety assessment as written is tailored to nuclear installations, but its application to other facilities and activities following a graded approach would benefit from additional elaboration. This also applies to the verification by regulatory bodies. The relationship between the independent verification process and regulatory review will also be clarified.
 - **Interested parties in the context of safety assessment.** While the roles and responsibilities of interested parties are generally well established for nuclear installations, their identification and involvement in the safety assessment process are less clearly defined for facilities and activities other than nuclear installations. Further clarification of the roles, responsibilities and interfaces of relevant interested parties would support a more consistent interpretation and application of the safety requirements.
 - **Early regulatory feedback.** Vendor or operating organization of facilities and activities would benefit from early regulatory feedback on safety assessment overarching expectations (specifically for unproven technologies). Early interaction would be beneficial in this respect and therefore will be considered to be emphasized during the revision of GSR Part 4 (Rev. 1).
 - **Consideration of safety interfaces with security and safeguards.** For various nuclear

facilities, the IAEA Safety Standards and IAEA nuclear security guidance emphasize that the implementation of safety measures, security measures, and safeguards-related arrangements should be coordinated in such a way as to ensure that they do not adversely affect or compromise one another. Accordingly, the safety assessment has to address these interfaces from a safety perspective, so that the compliance with the relevant design requirements is demonstrated in safety assessment. This important principle is not explicitly reflected in GSR Part 4 (Rev. 1) and should therefore be incorporated into GSR Part 4 (Rev. 2).

- **Use of terminology in GSR Part 4 (Rev.1).** The terminology used in the context of safety assessment and safety analysis needs enhancement and further clarification, given its application across a wide range of facilities and activities and its use in the relevant Safety Standards that reference GSR Part 4 (Rev. 1). In particular, greater clarity and consistency are needed in the use of terms related to:
 - concepts of safety assessment, safety analyses and safety case
 - relationship between safety assessment and environmental radiological impact assessment
 - deterministic and probabilistic safety approaches (e.g. methods and analyses),
 - the entities performing, verifying, or reviewing the safety assessment (operating organization, regulatory bodies, technical support organizations and other public authorities),
 - the elements that should be considered within the scope of safety assessment versus those that fall outside its scope (e.g. as illustrated in Figure 1 of GSR Part 4 (Rev. 1))
 - radiological consequences of potential exposures due to accidents compared to radiation exposures occurring during normal operations.

Additional efforts are needed to ensure consistency in the terminology used across Safety Standards applicable to different types of facilities and activities, including SSR-3, SSR-4, GSR Part 3 and associated specific safety guides, GSR Part 5, SSR-5, as well as with the IAEA Nuclear Safety and Security Glossary.

- **Application of requirements to facilities and activities with the use of new technologies with limited operational maturity, high complexity and uncertainties arising from lack of operating experience:** In recent years, Member States have been considering diverse types of technologies to establish or to enlarge their nuclear power programmes. Those technologies might incorporate unproven design features, and imply different radiological source term, different neutron spectrums, different coolants and moderators, different fuel types, which require use of novel simulation codes and validation experiments for safety assessment. Also, an important design features considered by recent reactor designs (e.g. non water cooled reactors, small modular reactors) are modularity² and modularization³, different power outputs and transportable NPPs, including use of nuclear reactors for propulsion (such as in nuclear merchant ships). The safety assessment of such technologies should also explicitly address their backend implications throughout the facility lifetime, which may introduce unique challenges for safety assessment (e.g. considerations related to radioactive waste management, spent fuel management,

² Modularity is understood as the possibility for the subsequent placing of small modular reactor (SMR) modules (i.e. reactor modules) close to each other in one NPP (cf. TECDOC-2010).

³ Modularization is the possibility to assemble several SSCs of the NPP in the manufacturing factory, thereby facilitating subsequent transport / relocation of such assembled modules to the site and the construction of the reactor module on site (cf. TECDOC-2010).

decommissioning strategies, waste generation characteristics, activated materials, disposal requirements for large activated components, centralized waste management approaches, and return-to-vendor fuel arrangements). Such technologies could also be applied in industry, medicine or research facilities and activities. While these innovations offer significant potential benefits, their use also presents challenges relative to the limited knowledge, insufficient operating experience, and absence of established codes and standards. These factors need additional elaborations in the context of requirements underlying robust and sound safety assessments.

- **Fusion facilities.** Looking ahead to the coming years, fusion is projected to advance from experimental devices to prototype designs and commercial-scale deployments. It is important that fusion facilities are explicitly listed in the scope of the GSR Part 4 (Rev.2) as part of the revision recognizing the difference with other types of facilities.

Moreover, during the last decade, GSR Part 4 (Rev. 1) has been applied extensively in conjunction with other IAEA Safety Standards for various facilities and activities in IAEA peer review missions. Given the broad scope of GSR Part 4 (Rev. 1) it has been applied throughout a variety of peer review services offered by the IAEA⁴. Those peer review missions have generated numerous comments and findings related to the requirements of GSR Part 4 (Rev. 1). These findings have covered a wide range of areas, including matters specifically relevant to nuclear installations, as well as activities such as radioactive waste and spent fuel management, decommissioning and environmental remediation, regulatory oversight and siting. Many of the observations correspond to aspects identified above.

Those factors support the need for a full review of all the requirements in GSR Part 4 (Rev. 1) with account taken of the current level of knowledge to ensure the continued relevance and applicability of the safety requirements for safety assessment of a wide range of facilities and activities.

The list provided above reflects the main conclusions from the feedback analysis. It should be noted that GSR Part 4 (Rev. 1) is a Safety Requirements publication, and therefore only the high level requirements related aspects will be addressed during the revision. The detailed elaboration of some of the aspects identified above may be more appropriately addressed in supporting guidance.

⁴ - Disused Sealed Radioactive Sources Technical Centres Peer Review Service (DSRS-TeC);
- Integrated Research Reactor Utilization Review (IRRUR);
- Integrated Safety Assessment of Research Reactors (INSARR);
- Integrated Regulatory Review Service (IRRS);
- Operational Safety Review Team (OSART);
- Safety Evaluation of Fuel Cycle Facilities During Operation (SEDO);
- Site and External Events Design Review Service (SEED);
- Technical Safety Review (TSR).