TITLE: DS 510A, Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report

COMMENTS BY REVIEWER					RESOLUTION			
			Date: 06/04/2020					
Comment No.	Reviewer	Para/ Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/ rejection
General								
1.	Finland 1	General	Radiation Protection safety guide GSG-7 is not referenced in the document. However, radiation protection has a significant role in the operation of research reactors. IAEA should consider and justify the approach adopted in DS510 (as well in DS509). The approach is different from that adopted in operational safety guides of the NPPs (DS497) where all operational radiation protection issues as presented in GSG-7.			X Radiation Protection safety guide GSG-7 referenced in the document		We agree that radiation protection has a significant role in the operation of research reactors. Appropriate reference is made to the revision of NS-G-4.6 (DS509F) which provides specific guidance on radiation protection for research reactors - in addition to operational aspects, it also covers design aspects for RP & RWM in research reactors which are not covered in

								GSG-7 and SSG-40. The revision by amendment of the set of research reactors Safety Guides is different from the approach taken for NPP guides, in accordance with the approved DPP. There is no overlap between the safety guides GSG-7 and DS509F
2.	Germany NUSSC 1	General	Ensure that notation for cited references is the same within entire document	Currently notations of different art have been used, e.g.: 1) Doc-No [x] (see Para 2.19: NS-G-4.6 [18]) 2) Ref. [x] (see Para 2.28 Ref. [28]) 3) Doc-Title [x] (see Para 2.5: IAEA Safety Standards Series No. SSG-12, Licensing Process for Nuclear Installations [19])	X			All reference will be checked and cited as per IAEA style before publication.

				Please unify				
3.	Russia 1	Add NSS-17 - Computer Security at Nuclear Facilities	Add NSS-17 - Computer Security at Nuclear Facilities	Guidance mentioned should be considered	X			
Section 1								
4.	Brazil 21	1.1/3-4	This Safety Guide provides recommendations on safety ~~analysis~~ assessment and preparation of safety analysis report for research reactors. ...	Compatibility with the title of this Safety Guide and terminology and technical concepts of IAEA Safety Glossary.	X			
5.	Finland 2	1.1	IAEA should present in detail how GSR Part 4 has been used as a reference to this safety guide. One general reference is not adequate.			X Statement included in 2.28 referring to Req 8. References to specific requirements in GSR Part 4 Rev. 1 have been added to 2.1, 2.24, 3.8, and 3.29.		
6.	Germany RASSC 1	1.1/3	… This Safety Guide provides recommendations on safety ~~analysis~~ assessment and preparation of safety	To be consistent with the title.	X			

			analysis report for research reactors….					
7.	Germany NUSSC 2	1.1	Requirements for the safety of research reactors, with particular emphasis on their design and operation, are established in IAEA Safety Standards Series No. SSR-3, Safety of Research Reactors [1]. This Safety Guide provides recommendations on safety analysis and preparation of safety analysis report for research reactors. ~~This Safety Guide was developed in parallel with several other Safety Guides on the safety of research reactors, as follows:~~ ~~• IAEA Safety Standards Series No. DS510B, Safety in the Utilization and Modification of Research Reactors [2];~~ ~~• IAEA Safety Standards Series No. DS509A, Commissioning of Research Reactors [3];~~ ~~• IAEA Safety Standards Series No. DS509B, Maintenance, Periodic Testing and Inspection of Research Reactors [4];~~ ~~• IAEA Safety Standards Series No. DS509C, Core Management and Fuel Handling for Research Reactors [5];~~ ~~• IAEA Safety Standards Series No. DS509D, Operational Limits and Conditions and Operating Procedures for Research Reactors [6];~~ ~~• IAEA Safety Standards Series No. DS509E, The Operating Organization and the Recruitment, Training and Qualification of Personnel for Research Reactors [7];~~	This information is omissible and does not provide either useful guidance or important information with respect to the safety assessment for research reactors and the preparation of the safety analysis report. Alternatively, before publication the draft numbers DSXXX should be replaced by the corresponding SSG-xx numbers.		X		Standardized text for all research reactor safety guides. Before publication the draft numbers DSXXX will be replaced by the corresponding SSG-xx numbers.

			~~• IAEA Safety Standards Series No. DS509F, Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors [8];~~ ~~• IAEA Safety Standards Series No. DS509G, Ageing Management for Research Reactors [9];~~ ~~• IAEA Safety Standards Series No. DS509H, Instrumentation and Control Systems and Software Important to Safety for Research Reactors [10].~~ ~~• IAEA Safety Standards Series No. DS511, Use of a Graded Approach in the Application of the Safety Requirements for Research Reactors [11].~~					
8.	Germany NUSSC 3	1.5	The recommendations provided in this Safety Guide are intended for operating organizations of research reactors; it can also be used by designers performing a safety assessment for a research reactor. Furthermore, this guide provides useful guidance for regulatory bodies performing a review and assessment of submitted safety analysis reports as an important document within authorization process.	SSG-20 provides also usefull guidance for review and assessment performed by the regulatory body. The safety analysis report to be reviewed and assessed by the regulatory body is in important document exchanged between applicant / licence holder and regulatory body.	X			
9.	Korea 1	1.6 / Line 7	… and ~~SSG-41~~ GS-G-4.1, Format and	Editorial error.	X			

			Content of the Safety Analysis Report for …	SSG-41 does not match with the Reference [15].				
10.	Korea 2	1.9 / Line 2	…, such as operational limits and conditions[2], …	Editorial error. There is no footnote 2.	X			The footnote has been reinserted
11.	Brazil 1	1.9/3	and utilization and modification; more detailed recommendations on these ~~other~~ aspects of research reactor operation are provided in other Safety Guides [2-11].	Apparently, the word "other" is not applicable in this phrase.	X			
12.	Japan	1.9 / 2 (Bottom of page 2)	This publication covers aspects of research reactor operation that are normally included in the safety analysis report, such as operational limits and conditions[2], commissioning, operating procedures, and utilization and modification; more detailed recommendations on these other aspects of research reactor operation are provided in other Safety Guides [2-11]. [2 -------. (Please add a description on footnote No.2.)]	Missing a description on footnote No.2.	X			
13.	Germany RASSC 2	1.9/2	This publication covers aspects of research reactor operation that are normally included in the safety analysis report, such as operational limits and conditions[2], …	Footnote content is missing (should be consistent with previous version of SSG-20).	X			

			[2] The terms 'safety specifications', 'technical specifications (tech. specs) for safe operation' and 'general operating rules' are used by operating organizations and by regulatory bodies for nuclear reactors in some States instead of the term 'operational limits and conditions'. These expressions usually cover safety limits, safety system settings, limiting conditions for safe operation, surveillance requirements and administrative requirements.					
14.	Brazil 22	1.9/2 missing footnote no. 2 of page 2	On page 2, add the footnote 2 for operational limits and conditions, cited in para 1.9 line 2: 1.9. This publication covers aspects of research reactor operation that are normally included in the safety analysis report, such as operational limits and conditions[2], commissioning, operating procedures, and utilization and modification;	The footnote 2 for operational limits and conditions, cited in para 1.9 line 2, is missing on page 2.	X			
15.	USA 1	1.9	Text includes a footnote 2, but there is no footnote provided	Typo	X			
16.	India 1	2/1.9	Footnote No. 2 is missing	Editorial	X			
17.	Germany RASSC 3	1.11/4	This Safety Guide provides recommendations relating to utilization (i.e. for experiments and experimental facilities[3]) only with regard to safety analyses for the safety analysis report for the reactor. Detailed recommendations on safety analyses for experiments at research reactors and experimental facilities[3] are provided in	Footnote should appear where the term "experimental facilities" is mentioned first.	X			

			DS510B [2].					
18.	Korea 3	1.12 / Line 1	Recommendations on nuclear security are not provided in this Safety Guide. However, …	Editorial error. There is no punctuation mark (.) at the end of sentence.	X			
19.	Brazil 23	1.12/1	1.12. Recommendations on nuclear security are not provided in this Safety Guide. However, ...	Correct typographical error (missing a point after safety Guide).	X			
20.	Brazil 24	1.14/1	1.14 ~~Annexes~~ Annex I outlines the application of a basic approach to performing the safety analysis for a ...	Correct grammar error.	X			
21.	Brazil 2	1.14/1	~~Annexes~~ Annex I outlines	It is not Annexes I. There is only one Annex I, mentioned on the singular.	X			
Section 2								
22.	Germany NUSSC 4	2.1 Line 3	(…) Prior to the ~~operation stage~~ construction phase, the main safety assessment activities support the preparation of the safety analysis report and supporting documents and their submission for review by the regulatory body. (…)	Safety analysis are already expected in the so called PSAR, which is expected when applying for the construction license. Already at this stage compliance with all regulatory requirements and the future safe operation of the research reactor	X			

				has to be demonstrated. In the way 2.1 is formulated now, it would be in contradiction with paras. 2.23, 2.24, 2.29 and 2.30.				
23.	Brazil 3	2.1/1	for a research reactor ~~can~~ should be extensive	Because it is extensive in most cases, apparently, "should be" is a more adequate verb and verb tense.			X	The use of the word "should" in this context would make this statement a recommendation, which is not appropriate here. The text is introducing the subject of safety assessment.
24.	Germany RASSC 4	2.7/last line	… stage (see para. 2.6 in SSG-12 [19]) ~~para. 2.6~~).	For consistency with similar references in the document.	X			
25.	India 2	6/2.7	The operating organization is required to submit a demonstration of nuclear safety, including an adequate safety analysis, at each stage of the authorization process, which should be reviewed and assessed by the regulatory body before the next stage is authorized. Operating Organization, before each stage of the authorization process, should revise the safety analysis report based on the feedbacks from	It is mentioned that the operating organization should submit safety analysis report at each stage of the authorization process. There is some ambiguity in the sentence	X			

			pervious stages. In some States, consideration has been given to the adoption of a 'pre-licensing' process. The pre-licensing process contributes to fostering the mutual understanding of licensees, vendors and the regulatory body on the design concept, safety concepts as well as safety expectations and requirements to be fulfilled. Such an approach may help to minimize the duplication of effort at different stages of the authorization process and it may allow for some stages to be conducted in parallel. It also provides for a clear division of responsibilities, at different stages, between the regulatory body, the vendor and the operating organization; gives the public opportunities for early participation; and ensures that the most important safety issues are dealt with properly at the pre-licensing stage (see SSG-12, para. 2.6).	as to whether it refers to multiple safety analysis reports. However if safety analysis report if needed to be submitted before each stage, the should be updated based on feedback from the previous stage.				
26.	Germany NUSSC 5	2.13 (b)	… Perform a review and assessment of the operating organization's technical submissions. This review and assessment should proceed from an overall survey of the reactor to an in-depth review and assessment of the design of individual structures, systems and components, and their performance in ~~normal operation, anticipated operational occurrences~~ operational	To ensure compliance with the defined plant states terminology in the IAEA Safety Glossary: • operational states: NO and AOO • accident conditons:	X			

			states and accident conditions. …	DBA and DEC. Alternatively replace "and accident conditions" by ", design basis accidents and design extension conditions."				
27.	Brazil 4	2.14/9	by inspections of the programmes and facilities (e.g. design and review programmes or management system requirements and their implementation)	The example between parentheses better explains which kind of programmes. (OBS: This is a text taken from the correspondent item 2.13 on SSG-20).		X "...by inspection of the operating organization' s facilities and management system."		"Management system" is more inclusive terminology as it includes all aspects of how the operating organization conducts work, including any 'programmes'
28.	Brazil 5	2.17/3	Examples include maximum allowable doses to the public ~~or~~ and the prevention of fuel failure	The two examples are independent, and the preposition "and" is more adequate than "or" for the verb "to include".	X			
29.	France 1	2.18	In accordance with para 6.68 of SSR-3 [1], conditions that could lead to an early radioactive release or large radioactive releases are required to be practically eliminated~~, and so~~ ~~a~~Acceptance criteria for design extension conditions with core	To be in accordance with SSR-3 : article 6.68 of SSR-3 does not include "so" (practical elimination and	X			

			melting should be defined in a way that ensures mitigation of radiological consequences, as far as reasonably practicable	mitigation of DEC are two different concept)				
30.	Korea 4	2.19 / Lines 4~5	- Dose limits and design target doses (see NS-G-4.6 [~~18~~]) for public exposure; - Dose limits and design target doses (see NS-G-4.6 [~~18~~]) for occupational exposure;	Editorial error.	X			
31.	Brazil 6	2.20/2-3	or a subcritical assembly, the non-applicability of the specific acceptance criteria should be justified and documented.	Apparently, the text is referring to the not applicable criteria.		X "...or a subcritical assembly, the decision should be justified..."		"nonapplicability" could not be used however the modified text addresses the objective of the comment.
32.	Brazil 7	2.34/3	power ascension and full/fixed power tests".	The expression "full" or "fixed" is important to differentiate one kind of test from another.			X	The terminology in 2.34 is consistent with that used to describe commissioning in Requirement 73 of SSR-3
33.	Brazil 8	2.44/6	including review by the reactor safety committee	The word "reactor" is important because it indicates that the committee is part of operating organization.			X	The term "safety committee" is defined in the IAEA safety glossary 2018 and used consistently in Requirement 6 of SSR-3

34.	Korea 5	2.28 / Line 8	…) and in SSG-12 [~~10~~19] and requirements on …	Editorial error.	X			
35.	Brazil 25	2.28/4-8	... The requirements for the initial site evaluation and site selection, the general criteria for site evaluation and the external events that should be considered for site evaluation are provided in section 5 of SR3 [1]. Additional recommendations on siting and site evaluation are provided in the Appendix to this Safety Guide (see Chapter 3: Site characteristics) and in SSG-12 [10], and requirements on site evaluation are established in IAEA ...	Clarify that Appendix cited in this paragraph is not from SSR-3.	X			
36.	Brazil 26	2.29/8	Consideration should also be given to nuclear security, including physical protection [29, 30], ...	Correct typographical error (eliminate a blank between [29, 30] and a comma).	X			
37.	Korea 6	2.31 / Line 7	… Additional recommendations on the authorization process for this stage are provided in SSG-12 [~~10~~19].	Editorial error.	X			
38.	Korea 7	2.49 / Line 4	… Further recommendations on decommissioning are provided in SSG-47~~s~~ [16] and …	Editorial error.	X			
39.	India 3	11/ 2.27	The operating organization should provide sufficient information commensurate with the type, complexity and hazards associated with the research reactor to	As a technical document, it is needed to state that For a research reactor	X			

			demonstrate to the regulatory body that the proposed site is suitable for the type and design of the proposed research reactor. Difficulties that will need to be resolved during the subsequent stages of the authorization process should be identified. Information on the site itself, and preliminary information on the research reactor and its interaction with the site and the surrounding environment, should be provided. In addition, a preliminary statement on the potential radiological impacts on site personnel, on the population in the surrounding area and on the environment should be provided. ~~If required in the State, a~~ A radiological environmental impact assessment should be performed as a part of the authorization process; see GSG-10 [26].	radiological environmental impact assessment should be part of the authorization process. In any case, whether to follow IAEA document is prerogative of member state, so need not be explicitly stated again.				
40.	Germany RASSC 5	2.28 and 2.31	… and in SSG-12 ~~[10]~~ [19] …	Wrong reference for SSG-12.	X			
41.	India 4	12/ 2.31	Those aspects of the design that should be submitted to the regulatory body for review and assessment before the design is finalized should be identified in agreement with the regulatory body ~~so that activities can proceed while the reactor is under construction~~. The information should be updated and resubmitted to the regulatory body as the detailed design ~~and the construction~~ of the reactor proceed. In some cases,	The paragraph currently implies that detailed design of the plant and construction go hand in hand. Due issues of irreversibility (arising out of	X			

			revised versions of documents will be sufficient; in other cases, technical supplements may be appropriate. Additional recommendations on the authorization process for this stage are provided in SSG-12 [10].	detailed design/review), and contractual issues w.r.t changes during construction, concurrent detailed design and construction should not be encouraged.				
42.	Germany NUSSC 6	2.43	The final version of the safety analysis report should be prepared ~~safety analysis report should be updated~~ for the application for the authorization for operation. The results from the commissioning programme should be included in the application and assessed by the regulatory body to demonstrate that the design requirements have been met. 2.44 (new paragraph) Systematic periodic safety reviews of the research reactor are required to be performed throughout its lifetime (see para. 4.25 of SSR-3 [1]). Such periodic reviews of the safety of the research reactor include periodic safety reviews required by the regulatory body (see paras 7.121 and 7.122 of SSR-3 [1]) and self-assessments performed by the operating organization. Such reviews should address important issues such as the cumulative effects of ageing of the research reactor. The nature of such reviews and the interval between	This paragraph mixes two different important issues and is not transparent. Please split into two recommendations: 1. Final safety analysis report for authorisation (para 2.43) Periodic safety reviews (para 2.44, new one)		X 2.43. Safety analysis report should be updated…. 2.44 (new para)		Original text is more generalized and is retained.

			reviews should reflect the risks that the research reactor presents. For such reviews, a comparison of the existing safety analysis report with operating experience should be made, including operating experience from accidents and information on radiation protection, modifications, experiments and other aspects of operation. If required as a result of a periodic safety review, the operating organization should submit to the regulatory body a request for an amendment of the licence, which should include a revised safety analysis report, as appropriate.					
Section 3								
43.	Brazil 27	3.2/after line 21	Include a new line: — To aid the development and establishment of the decommissioning plan.	For completeness. According to SSR-3, the safety analysis report is also required to provide information on the design provisions and operating procedures relating to decommissioning, which are the basis for preparing the decommissioning plan.	X			

44.	Netherland 1	3.4	… The safety analysis report is required to include the safety analyses of accident sequences and to describe the safety features incorporated into the design as well as safety features for design extension conditions to prevent accidents or to mitigate their consequences through the design as well as operating procedures and emergency procedures. ...	Explicit reference to DEC to improve clarity		X ……as well as <u>additional</u> safety features for design extension conditions….		For clarity.
45.	Germany NUSSC 7	3.14	The type of research reactor, its site and its characteristics (design, power and utilization) might influence the extent of the information to be presented in the safety analysis report. Accident scenarios for research reactors with higher power levels or with a significant inventory of radioactive material <u>should</u> ~~will usually~~ require more details to be provided about the site and about the safety features to protect against any significant release of radioactive material to the environment and to mitigate the consequences of such releases if they occur.	Para 3.14 should contain a recommendation.	X			
46.	Germany NUSSC 8	3.18	The consideration of <u>incident</u> ~~accident~~ conditions should determine the design of the research reactor and the design limits for the safety systems and for most structures, systems and components necessary for the operation of the research reactor. The <u>incident</u> ~~accident~~ conditions should also be considered in the operating instructions and procedures for operating personnel.	Safety analysis report may not be restricted only to the accident conditions. It should take into account also incidents, which are at the lower defense-in-depth			X	Consistent with glossary

			In addition, the potential radiological consequences of incident ~~accident~~ conditions for workers, the public and the environment is typically more severe than the radiological consequences of operation. For this reason, an important part of the effort in the peer review and verification by the operating organization should be directed to the safety analysis of incident ~~accident~~ conditions.	level in order to prevent the accidents. Compare with original version of SSG-20 (it says about fault conditions).				
47.	Brazil 9	3.8/4	and is ~~in addition~~ apart from the reviews	The expression "apart from" is more suitable.		X "...on behalf of the operating organization ~~and is in addition~~ as a separate activity to the reviews carried out within the design organization"		
48.	Brazil 10	3.18/5-6	typically, more severe than the radiological consequences of normal operation.	The word "normal" is important to differentiate from "accident".	X			
49.	Brazil 28	3.20/6-7	... The use of systematic techniques, such as hazard and operability (HAZOP) studies or failure modes	For completeness. There are many	X			

			and effects analysis (FMEA), among others, could facilitate the selection process.	other systematic techniques which can be used for that purpose.				
50.	Brazil 11	3.21/4	The list of selected postulated initiating events is taken with few minor modifications from appendix I of SSR-3 [1].	When comparing the two lists, there are two or three small differences.		X Instead of adding the qualifying text, the list has been adjusted to make it identical to SSR-3		
51.	France NSGC 1	In (5) and (6), "Nuclear security events" are mentioned as potential initiating events, while the concepts of "security event" and of "initiating event" are not aligned. Nuclear security events generally	SSR-3 (2016) concepts have been updated from "Security related incidents" to "nuclear security events". But it creates some problems: - Malicious acts can potentially cause any initiating event defined in (1), (2), (3), (4), (5), (6), (8) and some of (7). It is therefore not clear why placing them in (6) and (7). - Most "security events" are not "initiating events", the aim of nuclear security is to make sure of it. - Furthermore, introducing "security events" in the list of "initiating events" can let people think that safety approaches can	Delete "Nuclear security events" in (5) and (6) and insert in 3.21: "The actual list will depend on the type of reactor, actual design and potential hazards associated with the research reactor. **Depending on national regulation and interface arrangements**		"The actual list will depend on the type of reactor, actual design and potential hazards associated with the research reactor". Footnote is added **"Depending on national regulation and interface arrangements with nuclear security, the**		Deleting nuclear security events from (5) and (6) will introduce inconsistencies in the guide. The list is taken from SSR-3 where security related incidents are covered as special internal events. Para 3.22 serves as an introduction to the full list of PIEs and it not appropriate to introduce detailed text on nuclear

		happen before and cause the "initiating events"	be applied to these events, when they are irrelevant most of the time: any new safety measure is only a (often minor) complication to a malicious act, very rarely an effective barrier. Moreover, safety methods are not adapted to security context. For example, safety method based on probability of crash used for assessing plane crash risk doesn't apply to intended plane crashes. These events should be taken in consideration when security analysis shows a need for close coordination with safety, for example, when security measures are considered to need complementary safety measures. Depending on the regulations, this coordination can be covered by the safety plan, the security plan or both.	**with nuclear security, it may be complemented by relevant nuclear security events. Methods may need to be adapted to security context (e.g. probabilistic assessment of accidental plane crash risk does not apply to intended plane crashes).** The list of selected postulated initiating events is taken from appendix I of SSR-3"		**list may be complemented by relevant nuclear security events.**		security events here
52.	Germany NUSSC 9	3.21	Typical examples of postulated initiating events leading to event sequences categorized as anticipated operational occurrences, design basis accidents or design extension conditions include those given below, sorted by types of sequence. (…)	Postulated initiating events (PIE) can lead to different plant states depending on the event progression, assumed failures	X			

				or event frequency. Thus, AOO and DEC should be mentioned, too. For example, a loss of off-site power may be an AOO (for a short period of time) or a DBA (longer period of time). This would also increase consistency with para 3.23, 3.27 and 3.30.				
53.	Germany NUSSC 10	3.21 Line 4	…. The list of selected postulated initiating events is based on ~~taken from~~ appendix I of SSR-3 [1]:	The list of postulated initiating events varies from the one in appendix I of SSR-3, (especially point (7)). Please verify and make an appropriate modification. Attached one of the possible modifications. Other solution would be to copy exactly the list from the		X list has been adjusted to make it identical to SSR-3		

				appendix.				
54.	India 5	Page 24, Section 3.21 item 7	**Suggestion:** The external event may include following point: epidemic	To take care of potential loss of manpower due to large number of workers falling ill.			X	List is taken from SSR-3
55.	France 2	3.21 4.1 A.16.1 A.16.11 A.16.16 I-3 I-12	Replace "human error" or "human errors" by "malfunction due to organizational or human causes" in: 3.21 (8) page 24 4.1 page 30 A.16.1 page 74 A.16.11 (h) page 77 A.16.11 (f) page 78 I-3 page 98 I-12 line 1 page 101	Human error should not be considered as the initiating event. Most of the time, human error is a consequence of organizational malfunctions and not the root cause of visible failures.		X		Except 3.21, A16.11 as list is taken from SSR-3
56.	Netherland 3	DEVELOPMENT OF THE SAFETY ANALYSIS 3.16 to 3.36	*This chapter contains (at the end) a specific part dealing with design extension conditions. We think the clarity of this chapter could be increased by reorganising it; we suggest to have an introductory part clearly mentioning that both design and design extension conditions should be considered (moving 3.27?), and further deal consequently with first the design part and then DEC (now the last part). Considerations now included in par 3.26-3.31 (deterministic and probabilistic techniques etc.) could be moved to the end and expanded to cover also DEC.*	Improve clarity	X			The section has been revised to improves clarity, to better show the logical flow in the development of the safety analysis, and for consistency with similar guidance for NPPs in DS449
57.	Netherland 4	3.17 and 3.18	*Information in 3.17 and 3.18 largely overlap.* *We suggest to combine them*	Editorial change to improve clarity		X		The section has been revised (see resolution to comment 3 above). Para 3.18 has been

								revised. We believe this helps to improve clarity
58.	Netherland 5	3.7 and 3.8	*We suggest to explicitly mention that the team of experts performing the independent verification can be part of the same operational organization, or, as alternative, external reviewers working "under responsibility"...* *If external reviewers are involved, additional guidance should be given on what is meant by "under responsibility". What are the expectations for being able to bear or carry out the responsibility for a review that is carried out by an external consultant or what minimum competence is still needed in house.*	Improve clarity. The independent review maybe difficult to organize within the operating organization, specifically the small ones.		X Para 3.7 has been updated, "...This verification should be conducted either by the operating organization or by another qualified organization on its behalf (see paras 4.64, 4.66 and 4.67 of GSR Part 4 (Rev. 1) [13]). Irrespective of the process followed for the development and verification of the safety analysis, the operating organization remains responsible for the content, comprehensive		To improve clarity Para 3.7 has been updated to provide guidance on the subject, in accordance with similar guidance for NPPs in DS449.

						ness and quality of the safety analysis (see Requirement 2 in SSR-3 [1]).		
Section 4								
59.	Netherland 2	4.1	… This safety analysis should be complete and should cover all the postulated initiating events (including those related to design extension conditions) as agreed with the regulatory body, and one of the initial tasks of the review and assessment is to confirm its completeness. …	Explicit reference to DEC to improve clarity			X	Any PIEs for DBA may lead to DEC.PIEs are grouped by types.
60.	Brazil 29	4.1/4-6	... Paragraphs 3.149 to 3.209 of IAEA Safety Standards Series No. GSG-13, Functions and Processes of the Regulatory Body for Safety [34] provide recommendations for the regulatory body on meeting these requirements.	Correct grammar error.	X			
61.	Netherland 6	PROGRAMME FOR REVIEW AND ASSESSMENT 4.7 – 4.10	*We suggest to include also for the commissioning fase documentation related to experiments (and not only in par 4.11, dealing with regular operation).*	Explicitly cover experiments also in the commissioning fase.		X 4.11 modified to read, "Detailed recommendations on utilization and		Covered by SSG-24 referenced in para 4.11

						modification projects, including commissioning of experiments and modifications, are provided in SSG-24 [2]"		
62.	France 3	4.6	Delete (e): ~~"The design features of the nuclear security system (including physical protection and information security) that are important to safety"~~	According to 1.12, Recommendations on nuclear security are not provided in this Safety Guide" and "Guidance on sensitive information and information, security is provided in IAEA Nuclear Security Series No. 23-G, Security of Nuclear Information".		X Detailed recommendations on nuclear security are not provided in this Safety Guide……		Para 1.12 is modified.
63.	France 4	4.8	Delete (l): "~~The security plan~~"	According to 1.12, Recommendations on nuclear security are not provided in this Safety Guide" and "Guidance on sensitive information and information, security is provided in IAEA Nuclear Security Series No. 23-G, Security of Nuclear Information".		X		Same as above resolution to France comment 3.
Chapter 2								

64.	India 6	Page 35, Appendix Section A.2.1	This chapter of the safety analysis report should identify and describe the safety objectives and the engineering design requirements of the structures, systems and components ~~and other equipment~~ important to safety~~.~~	Since the 'structures, systems and components' is a general term encompassing all of the elements (items) of a facility or activity that contribute to protection and safety the redundant words 'and other equipment may be removed.	X			
65.	France 5	A.2.3	… (l) Assessment of organizational and human factors and dependent failures; …	Talking about only "human factors" is too restricted	X			
66.	Germany NUSSC 11	A 2.3 New point	… (s) fire protection	Please add fire protection. In A2.3 solely the *Safety objectives and general design requirements* are listed. A2.11 goes deeper into consideration of internal fire protection, but the fire protection is part of the Safety objectives and needed to be	X			

				reflected here as such.				
67.	Brazil 30	A.2.3/after item (r)	Include a new line: (s) Provisions for decommissioning in the design of research reactors and their experimental facilities.	For completeness. According to Requirement 33 “Design for Decommissioning” of SSR-3 (para 6. 92), in the design of the research reactor and its experimental facilities and in any modifications of them, consideration shall be given to facilitation of decommissioning.	X			
68.	Brazil 31	A.2.4/2	... are established in section 6 of SSR-3 [1] (see Requirements 42–66) and address the following:	Correct typographical error in citation of Requirements 42– 66.	X			
69.	Brazil 32	A.2.4 (15)(e)	(e) Facilities and equipment for measuring radioactive surface contamination, and doses to and contamination of personnel;	For completeness, in order to include	X			

				laboratories for analysis of radioactive material and other facilities for support the measurement of doses and contamination of personnel.				
70.	India 7	Page 36, Appendix Section A.2.3	A statement of the overall safety objectives should be included. This should be followed by a brief description of the underlying safety objectives and general design requirements that are important to safety ~~the design~~. Safety objectives are set out in section 2 of SSR-3 [1], and general design requirements are established in section 6 (see Requirements 16–41) of SSR-3 [1].	'... general design requirements that are important to the design' may be reworded to address safety.	X			
71.	Brazil 12	A.2.4/(23)/ (a)/1	Provisions to ~~enhance~~ ensure safety in waste management	"To ensure" seems a more suitable verb.	X			
Chapter 3								
72.	India 8	43/A3.2	Information should be provided in sufficient detail to permit an independent evaluation and to support the analysis and conclusions of Chapter 16 of the safety analysis report, to demonstrate that the research reactor can be safely operated at the proposed site. For some research reactors with low hazard potential, critical assemblies	To be in line with para. 3.7 which calls for independent assessment	X			

			and subcritical assemblies, the amount of detail provided in this chapter can be substantially reduced. In addition, most of the details described below relating to geology and seismology, meteorology, hydrology and oceanography, radiological impact, adequacy of the site for emergency response actions might not be required for some subcritical assemblies.					
73.	India 9	Page 43, Appendix Section A.3.4	The location of the research reactor site should be specified and an area map should be provided that indicates: (a) The location of the research reactor, the site area and the boundaries of the site area; (b) Location and orientation of principal buildings and equipment; (c) Location of any nearby industrial, commercial or military facilities, and any institutional, recreational or residential structures; (d) Nearby highways, roadways, airports, waterways, pipelines and railway lines; ~~(e) Boundaries of the site area, i.e. the area controlled by the operating organization;~~	It is already covered in point (a).	X			

			(f) Boundaries for establishing release limits for effluents.					
74.	Germany NUSSC 12	A3.14	Natural phenomena to be considered in the safety analysis report should ~~may~~ include, where appropriate: — Flooding; — Surges, seiches and wave action, including effects of ice ridges; — Seismically induced phenomena such as tsunamis and dam failures.	A3.14 should contain a recommendation.	X			
75.	India 10	45/A3.18	Information should be included that, in combination with details of radioactive discharges and of radionuclide behavior and transfers presented in other chapters of the safety analysis report, will permit an assessment of doses to the surrounding population, and of any contamination of flora and fauna and food chains under all plant states.	Radiological impact during normal operation, DBA and DEC conditions are to be calculated. The related inputs (as needed for chapter 12 and 16) should be available in this section.		X Under all facility states		For consistency.
Chapter 5								
76.	Brazil 13	A.5.11/3	including materials, redundancy and diversity aspects, anticipated performance characteristics (such as drive speed and actuation and insertion times), ~~and~~ fail-safe features, etc.	Apparently, the old text for the same item on SSG-20 (with "etc") is better, because this list is not exhaustive.	X			
Chapter 6								
77.	Brazil 14	A.6.2/4	the materials ~~of~~ that the components	Apparently,	X			

			are made of	there is a grammatical mistake in this sentence (see also item A.6.9, where similar sentence is properly written).				
78.	India 11	53 and 54	**Suggestion:** The following aspects may be addressed in sub-sections concerning primary coolant and moderator systems: Concentration of neutron poisons like boron/gadolinium, if any, in the primary coolant/coolant, including their effect on reactivity and the system for monitoring them.	Chemistry reactivity coefficient			X	Covered by the text in para A6.4
79.	India 12	Page 54, Appendix Section A.6.7	The materials of construction ~~the~~ of components ~~are made of~~ should be specified; the effects of irradiation and corrosion should be addressed. Ageing effects should also be addressed.	Editorial		X The materials that the components …..		For clarity
80.	Germany NUSSC 13	A6.8 Line 7	…. The procedures for inspection and testing of the emergency core cooling system should be described ~~mentioned~~.	The emergency core cooling system is crucial for safety of the facility. It is not sufficient to mentions the procedures to its inspection and testing. These should be	X			

				discussed in an appropriate deepness in order to ensure the functionality of the system in an emergency situation				
81.	Brazil 15	A.6.12/1-2	The design and operation of the coolant make-up system should be described ~~here~~ in this section, or reference should be made ~~here~~ in this section if it is described in Chapter 10	Apparently, it is better stated (see paragraph A.5.10)	X			
82.	India 13	Page No -55-, Item A7.3 (a)	Component reliability, system interdependence, redundancy, diversity, ~~of~~ fail-safe characteristics and physical separation of redundant systems;	Editorial correction	X			
83.	India 14	Page No -56, Item A8.5, Line No -3	The adequacy of the protection system to shut down the reactor in a safe manner (e.g. by providing redundancy) and to bring the research reactor into a safe condition should be described. It should be demonstrated that the protection system will perform its function on demand, especially in cases of common cause failures and common mode failures, as well as with single failures. It should also be shown that protection system instrumentation is fail safe in nature.	Fail safe behavior of protection system is an important design consideration.	X			
84.	India 15	Page 56, Appendix Section A.8.5	The adequacy of the protection system to shut down the reactor in a safe manner (e.g. by providing redundancy and diversity) and to	May be added to ensure/improve safety.	X			

			bring the research reactor into a safe condition should be described.					
85.	India 16	Appendix : Content of a Safety Analysis Report	**Suggestion:** A chapter on Human Factor Engineering may be included in Safety Analysis Report	IAEA SSG-51 on HFE is applicable to NPPs, whereas HFE is requirement to all Nuclear Installations. It may be adequate, if reference of SSG-51 is included in this document for this purpose		X SSG-51 is referenced.		Human factors is already covered in the text of the guide. It is more appropriate to keep the currently recommended structure of the safety analysis report as per approved DPP. Changes in the format may cause more challenges for Member States.
86.	India 17	Appendix : Content of a Safety Analysis Report Chapter 9: Electric Power	**Suggestion:** Following text may be added in Chapter 9: Electric Power : Grounding and Lightning Protection: This section should provide description of the grounding and lightning protection (both internal and external protection) system, including the components associated with the various grounding subsystems	To include protection aspects of electrical systems.	X			
Chapter 10								
87.	Brazil 33	A10.9/5	... include the parameters defining the load that, if dropped, would cause the greatest damage: the area of ...	Correct grammar error (replace a semicolon	X			

				with a colon).				
Chapter 12								
88.	Germany RASSC 6	A.12.1 (a)	The radiation protection programme (see Requirement 84 of SSR-3 [1]), including the radiation protection policies and objectives of the operating organization;	Please add the reference to SSR-3.	X			
89.	Brazil 34	A.12.1(d)/1	(d) The ~~waste management programme and~~ waste management systems;	The waste management programme is not discussed in this Safety Guide.			X	Waste management is discussed in relevant paras (i.e. A12.29 to A12.35).
90.	Brazil 35	A.12.19/1-3	For radiation sources that are shielded or contained, information should be provided on the form, location, geometry, isotopic content and activity and date of measurement. For liquid and airborne radioactive material, information should be provided on the form, location, isotopic content and activity concentrations and date of measurement or estimation.	The date of measurement of activity of radiation sources or radioactive material is an important parameter for derivation of source terms of the Chapter 16: Safety Analysis of the safety analysis report.	X			
Chapter 13								
91.	Brazil 36	A.13.1/8	... recommendations on these topics are provided in NS-G-4.2 [4], NS-G-4.4 [6] and NS-G-4.5 [7].	Correct typographical error (missing a bracket at the end of paragraph).	X			

92.	Brazil 37	A.13.12(a)	(a) Screening of structures, systems and components for ageing management review;	Correct typographical error (missing a semicolon at the end of line).	X			
93.	France 6	A.13.1	… Consideration of organizational and human factors should also be addressed along with the information provided on staffing, training and qualification of personnel, operating procedures, and maintenance, periodic testing and inspection programme. …	Talking about only "human factors" is too restricted	X			
94.	France 7	A.13.10	Delete: "~~Nuclear security, including physical protection and information security (see paras A.13.13 and A.13.14)~~"	According to 1.12, Recommendations on nuclear security are not provided in this Safety Guide" and "Guidance on sensitive information and information, security is provided in IAEA Nuclear Security Series No. 23-G, Security of Nuclear Information".			X	Same as resolution to France comment 3.
95.	Brazil 38	A.16.2(5)	(5) Analysis of design extension conditions (paras A.16.47–A.16.52); (6) (6) Summary — a summary of significant results and conclusions regarding acceptability (paras A.16.53–A.16.55).	Correct typographical error (include the item (5) and correct the citation of Summary from A.16.47–	X			

				A.16.48) to A.16.53–A.16.55).				
96.	Brazil 16	A.16.3/5	but the level of detail of Annex I is not necessary ~~here~~ in this section.	Apparently, it stated (see A.5.10) is better paragraph	X			
97.	Brazil 17	A.16.6/3	they should be summarized ~~here~~ in this section to assist in the review and assessment of the safety analysis.	Apparently, it stated (see A.5.10) is better paragraph	X			
98.	Brazil 18	A.16.20/7	and computer codes ~~or lists~~ used	The word "lists" or the expression "computer lists" should be clarified in this context.	X			
99.	Brazil 19	A.16.22/10	~~Nuclear heating~~;	This term should be clarified or deleted.	X			
100.	Brazil 20	A.16.30/ (d)/1	and plate-out (deposition of daughter products of a radioisotope onto the surface of another material) factor of radionuclides in water and on surfaces.	Apparently "plate-out" is not a well-known term on the nuclear industry, so it should be defined.	X			

101.	France 8	A.16.15	Replace "human error" by "organizational or human causes"	"Human error" is too restricted. The sentence should include organizational aspects.	X			
102.	France 9	A.16.16	**Evaluation of individual events** … A16.16. The step by step sequence of events, from event initiation to the final stabilized condition, should be described. The following should be provided for each event sequence: … (h) Justification for event sequences that are considered 'practically eliminated' and justification, that they are physically impossible or that they are, with a high level of confidence, ~~that they are physically impossible or~~ extremely unlikely to arise. It should be noticed that this part is not an evaluation of the consequences of the event.	Practically eliminated events are not evaluated by nature because they are practically eliminated + Modification to be in accordance with SSR-3	X			
103.	France 10	A.16.50	This section should also provide identification of the most severe parameters resulting from core melt sequences, and should demonstrate the following: … - That the possibility of conditions arising that could lead to an early radioactive release or large radioactive release is practically eliminated. Nevertheless, a good practice would be to implement a dedicated section for practically eliminated event sequences.	It should be enhanced that practical elimination approach is a specific approach considering that the consequences of the corresponding event are not evaluated and that it should be justified that these events can be considered as extremely unlikely to occur with a high level of confidence	X			
104.	Brazil 39	After para A.16.46	Analysis of design extension conditions	Correct typographical	X			

				error (this title is in bold because it is a new sequence of paras related to "Analysis of design extension conditions" and not to "Evaluation of individual events" (page 77).				
Chapter 18								
105.	Brazil 40	After para A.18.2	Include a new paragraph: A.18.3. The management system should establish a safety committee (or advisory group) to advise the operating organization on the safety assessment of design, commissioning and operational issues, as well as all relevant aspects of the safety of the reactor and the safety of its utilization.	In order to meet the Requirement 6: Safety committee of SSR-3 "A safety committee (or an advisory group) that is independent from the reactor manager shall be established to advise the operating organization on all the	X			

				safety aspects of the research reactor".				
Annex I								
106.	France 11	I-11	"(a) Qualitative and quantitative frequency or probability arguments justifying the exclusion or practical elimination of event sequences ~~that are practically eliminated~~;"	Exclusion and practical elimination are two different approaches	X			
107.	Brazil 41	I–18	Number of para I–18 is repeated in page 103.	Correct typographical error (correct number of para from I–18 to I–19, and the following).	X			
108.	India 18	105	**Suggestion:** A new line may be added in II-1 on the following: -Chemistry coefficient of reactivity (in moderator /coolant)	Presence of boron in moderator or light water in small amount in heavy water moderator, affects core reactivity.			X	The list is not exhaustive.
109.	Netherland 7	Annex I - APPROACH TO AND METHODS OF SAFETY ANALYSIS	… ~~Deterministic and p~~ Probabilistic methods may be used ~~in a~~ complementary ~~way~~ to deterministic methods to evaluate which accident sequences are of a higher likelihood; they will also be useful for evaluating relative rankings of risks, and hence for determining countermeasures….	Editorial correction	X			