DS 510B Safety in the Utilization and Modification of Research Reactors (Revision of SSG-24)

COMMENTS BY REVIEWER Reviewer: Country/Organization:			Page. Date: 07 June 2019		RESOLUTION			
Comment No.	**Country Comment No.**	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/ rejection**
1.	Australia 1	General	It is noted that both the revision to SSG-20 and the revision to SSG-24 have the same draft reference, i.e. DS510. Is this correct?					Yes, both safety guides are being revised under same DPP with number DS510A and DS510B.
2.	Finland 12	General	If the intent is to address safety-security interfaces, information security and its sub-regime computer security should be addressed at an appropriate level (with references to NSS 20). When the term physical protection (system) is used, it should be clarified, if in fact a holistic nuclear security system is meant (including information security).	Their interface of information security (including computer security) with safety is extremely significant, also regarding modifications.		Agreed and is addressed in relevant paragraphs such as 3.37 and 3.40 to replace physical protection with nuclear security Specific reference to NSS 17 Computer security at nuclear facilities is already provided paragraph 3.36 of this Safety Guide.		It has been addressed in para 3.37 and 3.40 to replace physical protection with nuclear security considering Member States comments (See response to comments France NSGC, Finland 13). Specific Reference to NSS 17 Computer security at nuclear facilities is already provided in paragraph 3.36 of this Safety Guide.

3.	Japan 1	General	In para 1.11, it states that this Safety Guide focuses mainly on research reactors of a capacity of up to a few tens of megawatts. It also states that amount of detail required in the safety analysis report is different for small reactor. However, the definition of "small" or "low power" is unclear and should be clarified. The need for water cooling may be one of the essential criteria for categorization of small research reactors. This is the same comment as DS510A, comment #1.			…. The amount of detail required for specific research reactors, critical assemblies and sub critical assemblies should be justified and documented using graded approach. Nevertheless, when using a graded approach, all items included in this Safety Guide should be addressed…..		The text is modified as per para 1.8 and 1.9 of SSR-3.
4.	USA 18	General		The terms "experimental facility" and "experimental device" are used throughout the document. Are these terms synonymous? If so, recommend using just one term for consistency.		Footnote 4 has been added.		SSR-3 has similar footnote and both terms are used.
5.	Korea 1	General Page 86 REPUBLIC OF KOREA Line 2-3	~~KINS Inc., Information Business Dept. Samho Bldg. 2nd Floor, 275-1 Yang Jae-dong SeoCho G, Seoul 137-130 Telephone: +02 589 1740 • Fax: +02 589 1746~~Korea Institute of Nuclear Safety (KINS), 62 Gwahak-ro, Yuseong-gu, Daejeon 34142 Telephone: +82 42 868 0000 • Fax: +82 42 861 1700		X			
Section 1								
6.	Germany 1 EPReSC	1.1, 9	(…) optimization of protection, limitation of radiation risks to individuals and the environment and the prevention of accidents	Consistent phrasing	X			

7.	France 1	1.1	In addition, this Safety Guide ~~supplements and elaborates~~ provides recommendations on meeting the safety requirements on utilization and modification that are established in the A.I.E.A Safety standards Series SSR-3.	As the document is a Safety guide, it should be better to be clear on the fact that recommendations, and not requirements, are provided in the guide.	X			
8.	France 2	1.7	The amount of details required for small research reactors (…) critical ~~facilities~~ assemblies and subcritical assemblies may be substantially less.	The proposed new text is more consistent with paragraph 1.3 of SSR-3.	X			
9.	Germany 1	1.7	The recommendations provided in this Safety Guide apply to the utilization of research reactors and to all modifications of research reactors. For some specific, highly complex experimental devices, additional guidance may be necessary. The amount of detail required for small research reactors (i.e. those with a capacity of less than a few tens of kilowatts)~~,~~ and critical facilities ~~and sub-critical assemblies~~ may be substantially less. Nevertheless, when using a graded approach, all items included in this Safety Guide should be addressed. Hereafter, ~~sub~~critical assemblies will be mentioned separately only if a specific recommendation is not relevant for, or is applicable only to, ~~sub~~critical facilities ~~assemblies~~. This Safety Guide does not cover experiments in prototype power reactors or experiments performed in operating or decommissioned nuclear power plants.	The hazard potential of subcritical assemblies is usually higher than for most of the research reactor (inventory several tons of fuel). For that reason, subcritical assemblies should not be explicitly listed here.		"subcritical assemblies" is replaced with "some of subcritical assemblies"		The approach of developing guidance that covers all research reactors and subcritical assemblies is the same as it was followed in development of SSR-3. The approach was also described in the DPP of the Safety Guides. The guidance unless specifically mentioned is applicable also to subcritical assemblies with use of a graded approach that commensurate with their potential risk, as described in the Guides. In

								addition, there will be also a SSG on use of graded approach.
10.	Canada 1	1.7	The amount of detail required for small research reactors ~~(i.e. those with a capacity of less than a few tens of kilowatts)~~, critical facilities and sub critical assemblies ~~may be substantially less~~ should be commensurate with the novelty, complexity and potential for harm posed by the facility. Experience has shown that the lower the hazard potential of a facility, the less the level of detail needed to support safety claims. Nevertheless, when using a graded approach, all items included in this Safety Guide should be addressed. Hereafter, subcritical assemblies will be mentioned separately only if a specific recommendation ~~is~~ might not be relevant for, or is applicable only to, subcritical assemblies.	Although the intent of this text is to more clearly articulate the use of a graded approach, the reader will automatically assume that less detail or no detail applies in their case and that it is the regulator's role to challenge this. In fact, it is the proponent's role to explain to some degree why an exclusion should be made specific to their case based on risk profile. The basis for the level of detail will always be tied to novelty, complexity and potential for harm posed by the facility. For subcritical assemblies, this guide should not pre-determine whether a guidance applies or not. It is up to the reader to make a clear argument (supported by evidence if necessary) that guidance should not be considered. In many cases, this can be done with a single sentence. For example, a subcritical nuclear assembly with a subcriticility margin very close to 1 has a significantly different risk profile from one with a margin of 0.5. And the size and use of the facility influences the risk profile as well. The Myrrha prototype project at up to 100 MWth is an example of a fast spectrum concept that is complex enough to potentially warrant a higher level of technical information in some areas. In some cases, guidance may be worth considering…in others a		"The amount of detail required for specific research reactors, critical assemblies and subcritical assemblies should be justified and documented using graded approach. Nevertheless, when using a graded approach, all items included in this Safety Guide should be addressed. Hereafter, subcritical assemblies will be mentioned separately only if a specific recommendation is not relevant for, or is applicable only to, some of subcritical assemblies."		The text of para 1.7 of this guide has been modified and made consistent with para 1.8 and 1.9 of SSR-3

				straightforward case can be made to show why the guidance does not apply.				
11.	USA 2	Para 1.9/Line 7	Organizational changes are considered modifications because these changes can affect safety.	Organizational changes are modifications, not treated as a modification.	X			
12.	Finland 10	1.11	Reword: "Modifications to systems with security aspects …"	Unclear, what systems are meant.	X			Clarified
13.	Australia 2	1.11	Leave "should" (do not write "have to")	Should is a better word to use, as this is a guide	X			
14.	France 1 NSGC	1.11	Replace: "which are not discussed" by: "Some aspects of interfaces with nuclear security are discussed in paras 3.35-3.41"		X			
15.	Germany 2	Page 12 / para 1.13 / line 9	(see ~~Ref.~~ INSAG-24 [9] for further information on this issue)	For consistency. In the rest of the document "Ref" was replaced by the title of the reference.	X			
16.	France2 NSGC	1.13	Add: Safety measures and security measures must be designed and applied in an integrated manner, and as far as possible in a complementary manner, so that security measures do not compromise safety and safety measures do not compromise security. In dealing with interfaces between nuclear safety and nuclear security, it must be borne in mind that nuclear safety and nuclear security are likewise important, and measures to be taken must be mutually acceptable in both areas. Guidance on nuclear security is issued in the IAEA Nuclear Security Series.	Generic text from SPESS C should be used in full as a minimum basis, in order to avoid forgetting important ideas (not compromising, likewise important, mutually acceptable in both areas…)	X			
17.	France 3 NSGC	1.13	Delete: "and indicates the actions that need to be taken to incorporate security elements progressively into an effective nuclear	A safety guide is not meant to do that. The word "progressively" gives an idea that it is not a priority, which is	X			

			security regime for a nuclear power programme."	counterproductive				
18.	Germany 3	1.14	Annexes I and II outline and provide information on example of a checklist for categorization of an experiment or modification, and the content of the safety analysis report for an experiment at a research reactor. Annexes-III and IV provides examples of modifications that can result in interface issue, and safety focused questions and security focused questions.	Typo	X			
19.	Australia 3	1.14 L1	This safety guide consists of eleven section …	Reflect the additional section 11 Changes to Operating Organizations	X			
20.	Pakistan, WASSC	1.14	This Safety Guide consists of eleven sections….	Correction required. In the first line of para, it is mentioned that "This Safety Guide consists of ten sections" whereas in the line 16 it is mentioned "Section 11 deals with safety related aspects of organizational changes". Furthermore, there are 11 sections mentioned in table of contents.	X			
21.	Germany 1 RASSC	1.14 line 1	This Safety Guide consists of ~~ten~~ eleven sections…		X			
22.	Germany 2 EPReSC	1.14, 20	Annexes-II and IV provide	typo	X			
Section 2								
23.	Germany 3, EPReSC	2.2, 11	(…) include provisions to ensure that utilization and modification	Consistent phrasing	X			
24.	Germany 4, EPReSC							No text provided

25.	Germany 5, EPReSC	2.7, 3	Determining the required ~~staff~~ competences and providing periodic/ recurrent training, where appropriate, to ensure that the personnel of the operating organization are competent to perform their assigned work;	'Staff' not defined in IAEA glossary To emphasize the importance of periodic refreshing and up-to-date training contents	X			
26.	Germany 4	2.12	For successful implementation of a utilization or modification project, consideration should be given to the following aspects: - (…) - Establishing appropriate operating procedures, including those for assessing and correcting non-conforming items; - Demonstrating that all safety requirements are met and the overall level of safety will not be reduced due to the utilization or modification; - Performing and documenting the required inspections and tests, including those required for commissioning an experiment or modification; (…).	It is proposed to add a new bullet point dedicated to the demonstration of safety. One important aspect is, that a utilization or modification will not jeopardize the level of safety achieved by the initial design of the research reactor.		"Addressing all relevant regulatory requirements and demonstrating that the overall level of safety will not be reduced"		Already covered in the text
27.	Germany 5	New para between 2.18 and 2.19	The project manager should be an experienced person of the operating organization with a deep understanding of • the research reactor and its experimental facilities; • the applicable regulatory framework; • latest insights in most advanced safety concepts in nuclear safety.	It is seen as very important, that the project manager is a member of the operating organization having a deep understanding of the facility. It is also necessary, that the project manager has a deep understanding of the regulatory framework and the up-to-date safety concepts in nuclear safety. These are the minimum prerequisites for the project manager to assess the impact of any utilization or modification on the licensing basis.		The operating organization should assign a person, normally a dedicated project manager with understanding of research reactor facility and applicable regulatory framework….		Para is related to responsibilities of the project manager addressed within the text instead of adding new para.

28.	Germany 6	2.19	The project manager should be responsible for determining the impact of the project on the existing safety analysis report and on the operational limits and conditions. This involves making proposals for the categorization of the modification or experiment and providing the safety documentation in order to enable the operating organization to submit the project for review and approval, as necessary, by the safety committee(s) or the regulatory body. The advice of external specialists and consultants may be sought to support the project manager in performing ~~these~~ his duties.	To avoid, that an external expert will be nominated as project manager. The objective should be, that the project manager will be supported by the external experts.	X			
Section 3								
29.	Germany 7 NUSSC	3.1	All utilization and modification projects including organizational changes should be subjected to a screening process in order to determine their implications for safety and the related safety category of the experiment or modification. The screening process should be documented and the selection of the safety category should be justified. ~~Experiments of a repetitive[7] nature that have been assessed and approved earlier, and for which no changes in the safety analysis report, operational limits and conditions or operating procedures are required, could be considered as modifications with a minor effect on safety (see para. 3.9).~~	The last sentence does not provide further guidance. If only the sample or irradiation conditions are varied, this should be considered as normal operation, in particular, if OLCs and licensing conditions will not be violated. It doesn't make sense to call this a modification.	X			
30.	Germany 6 EPReSC							No text provided
31.	Germany 7 EPReSC	3.1	All utilization and modification projects including organizational, personnel or funding changes should be subjected to a	Maybe already included in the term 'organizational', but a more detailed		Deleted "in order"		Personnel is covered in term Organizational,

			screening process ~~in order~~ to determine their implications for safety and the related safety category of the experiment or modification	explanation could clarify this				funding is covered under resource management
32.	Germany 2 RASSC	3.4 line 2	…in accordance with the SSCs classification…	Please clarify the abbreviation SSC (structures, systems and components)	X			
33.	Germany 8	3.4	For utilization projects, the relevant experimental devices should be classified in accordance with the SSCs classification system. This classification should also be used as a first step in the safety categorization of the utilization project. In developing a categorization system for Project the potential impact on main safety functions and the potential for challenging safety functions should be considered. In addition, as a minimum, the following aspects should be taken into account: - Criticality aspects; - Reactivity aspects; - In-core and out-of-core irradiation; - Experiments within or outside the biological shielding or containment; - Physical conditions and behaviour of components; - Chemical conditions and behaviour of components; - Heat generation and thermal characteristics; - Mechanical and thermal stresses and behaviour of components; The potential for a (significant) off-site dose to members of the public.	The categorization of SSC, as described in SSG-30, is mainly based on a functional approach. This should be mentioned first before addressing specific aspects. By the proposed text, the impact of a utilization project on the safety functions will be more emphasized.	X			
34.	USA 3	Para 3.4	— The potential for a (significant) dose to site personnel.	Add an additional bullet for the potential for significant dose to site personnel	X			

35.	Germany 9	3.6	The proposal for the categorization process for modification and utilization projects, including the proposed review and approval routes, should be submitted to the safety committee(s) for review and following approval by the reactor manager, the proposal should be submitted to the regulatory body for review and approval, in accordance with the regulatory requirements.	For clarification, the proposal should be send to the regulator after the approval of the internal safety committee. Therefore, it is proposed to keep the deleted text.	X			
36.	France 3	3.11	Major effects on safety : modifications or experiments that : - could affect the design function […]; - are beyond the licence conditions or beyond the existing (i.e. approved) safety analysis; - could introduce hazards that have not been previously addressed; - ~~could significantly increase the reactivity of a critical facility;~~ ~~- could significantly reduce the margin to criticality of a subcritical assembly;~~ Significant effect on safety…	The item "*are beyond the licence conditions or beyond the existing safety analysis*", which implies "*beyond the operational limits and conditions*" given the footnote, already implies the idea that a modification or an experiment that increases the reactivity of a critical assembly can be categorized as a major effect on safety modification. As for modifications or experiments that lead to the reduction of margin to criticality, they should be categorized as significant effect on safety modifications since the original safety limits are not affected.	X			
37.	Pakistan 2	3.14	An assessment of radiation exposure of site personnel expected during or as a result of the project should be prepared.	Please specify for whom (site personnel), assessment of radiation exposure need to be prepared as mentioned in para 3.23 line 1.	X			
38.	Germany 10	3.18	Modifications and experiments having a major effect on safety should be reviewed by the safety committee(s). After the review by the safety committee it should be submitted to the regulatory body for review and	Modifications with a major effect on safety are beyond the license condition as defined in para. 3.11. Consequently, a licensing procedure has to be initiated for such modifications. To ensure quality of	X			

			licensing ~~approval~~ in accordance with the same procedures as those applied for the research reactor itself.	the documents to be reviewed by the regulatory body and to avoid delays in the review process, the documents should be independently reviewed before submitting it to the regulatory body.				
39.	Germany 12	3.27	Modifications and experiments having a significant effect on safety should be reviewed by the safety committee(s) ~~and~~ before submission ~~submitted~~ to the regulatory body for review and approval in accordance with the regulatory requirements.	To clarify that the review by the safety committee should be finished before submitting the documents to the regulatory body.	X			
40.	France 4 NSGC	Before 3.35	Create a new para: "As the operator is in charge of the nuclear security on its facility, he should make sure that nuclear security is duly taken into account by the reactor manager for modifications and experiments. As part of the integrated management described in section 2, all modifications or experiments should be designed and carried out with due care to nuclear security matters. Situations when modifications or experiments can need security expertise should be clearly identified. In these cases, nuclear security experts should be part of the project, in order to avoid to compromise security, to limit negative impacts of security on the project and to look for potential synergies.	A focus should be made on leadership and management.		Added the text "The operating organization should ensure that the interface between nuclear safety and nuclear security is duly taken into account and is managed within the context of a modification. As part of the integrated management system described in section 2, all modifications or experiments should be designed and carried out with due care to nuclear security matters."		The remaining text is already addressed in para 3.39 of this safety guide.
41.	France 4	3.35-3.36	The interface between nuclear safety and nuclear security should be managed within the context of ~~throughout the different stages~~	The notion of stages of modification is not defined. There may be no need for this interface to be managed	X			The text has been modified as suggested, Annex

			~~of~~ a modification, when relevant[FN] ~~project, as some modifications could potentially result in an adverse impact on either facility safety or security if not adequately managed~~. FN: Annex III provides examples of such modifications projects. 3.36 Modifications of systems for protection of the site and installation against sabotage and unauthorized removal of fissile material and radioactive material should be carried out in accordance with the requirements of the relevant national security authorities and the guidance provided in publications in the IAEA Nuclear Security Series (see Refs [14–21]). ~~3.36.~~ Guidance on the security aspects of modifications to instrumentation and control systems and software important to safety for research reactors is provided in Ref. [14].	If a modification has negative impact on safety/security, it should not be implemented: it would be regression. Annex is not an integral part of the standard and should be quoted in a footnote Last sentence of 3.35 and §3.36 are simple reference to security series. They should be gathered				is referred in the text to avoid footnote.
42.	France 5	3.38-3.39-3.40	Consider deletion	3.38 to 3.40 provide no guidance related to the interface. They are very general or focus on security aspects without consideration of the interface			X	Paragraph provides the guidance for the interface of nuclear safety and security. Other Member States comments suggest amending those paragraphs.
43.	France 5 NSGC	3.37	Replace “on physical protection systems (or other security sensitive equipment”) by: “on any equipment, including nuclear security measures”	It is true for any equipment and clearer than “other security sensitive equipment” A nuclear security system is an “integrated set of nuclear security measures”: when we want to refer to equipment, without any idea of “integrated set”, we should use “nuclear security measures”. Otherwise, the distinction between NS measures and NS	X			

				systems is lost.				
44.	France 6 NSGC	Before 3.37	Add: "Modifications carried out on any equipment, including safety systems, should be screened and assessed for potential impacts on nuclear security. For example, they can create one-time or permanent vulnerabilities and opportunities for nuclear security threats. The results may need to be described in a separate document and be kept confidential.			Modifications carried out on any equipment, including safety structures, systems and components, and nuclear security measures should be screened and assessed for potential impacts on safety and security, and the results may need to be described in a separate document and be kept confidential		Text added in same para 3.37 with modification suggested in previous comment.
45.	France 7 NSGC	3.38	Replace section by: "It should be acknowledged that some nuclear security measures may be needed to allow access for external workers and personnel. These accesses may need prior trustworthiness checks and other measures that can need significant time to perform. The importance of these measures should not be underestimated as they aim to face insider threat, which is a major concern, in particular in nuclear research."	To make it clearer. Qualification of contractors, safety training and personnel radiation monitoring are not nuclear security measures, they should be dealt with in another section/para.	X			
46.	Finland 11	3.38	For security measures it would be better to refer to NSS publications instead of listing measures here. "To accommodate the need for external workers and personnel to access the research	Now one security measure is given and at the end a short list of safety measures (?). Neither list is exhaustive, or even comprehensive. In the NSS there is a whole guide on preventive and protective	X			Reference to NSS-8 has been added

			reactor site during modifications and experiments, adequate measures should be taken, including access control, to prevent potential nuclear safety incidents or nuclear security events that could lead to radiation exposure, contamination or radioactive release. These measures include, for example, qualification of contractors, safety training and personnel radiation monitoring. “	measures against insider threat, NSS 8. Insider threat mitigation is a programme, or set of measures, not one single measure.				
47.	USA 4	Para 3.38	3.38. To accommodate the need for external workers and personnel to access the facility ~~research reactor~~ site during modifications and experiments, adequate measures should be taken, including access control, to prevent potential nuclear safety incidents or nuclear security events that could lead to radiation exposure, contamination or radioactive release.	To be consistent with Para 3.35 which uses “facility safety and security.” The interface between safety and security applies to subcrits, research reactors, and critical assemblies unless specifically mentioned in the guidance.	X			
48.	France 8 NSGC	3.39	Replace: “The reactor manager should ensure effective communication and coordination with the security organization” by “The reactor manager should ensure that the security organization is embedded in the modification / experiment project, if needed”.	The original text gives the idea that the security organization is not part of the project.		“The reactor manager should ensure that the security organization is <u>involved in the modification project</u>.”		For clarity, added as additional sentence.
49.	France 9 NSGC	3.40	Replace: “Physical protection plan” by “Security plan”	“Security plan” is the terminology used in NSS (NSS27G for example)	X			
50.	Australia 4	3.40	Suggest revising wording to make less prescriptive. Alternatively, include this list in Annex IV rather than here in the body of	As currently written, the implication is that this is a prescriptive listing of everything an experiment or			X	It doesn’t imply that this is a prescriptive list

			the Guide.	modification should be reviewed against, in which case, what's the purpose of the rest of this Guide?				("such as" is included in lead sentence). Other Member States comments suggested adding one or two items.
51.	Finland 13	3.40	To assess potential adverse impact on facility safety and security, the proposed modification or experiment should be reviewed in conjunction with the following: — The physical layout of the facility; — The layout of security layers in the facility surrounding security targets, including access controlled points; — The configuration and purpose of structures, systems, and components important to safety and systems and equipment important to security at the facility; — Integrated management system requirements and quality procedures; — Facility operating procedures; — Physical protection plan and procedures; — The operating programme of the facility; — The safety analyses and the operational limits and conditions; — Facility licence conditions and licensing process; — Emergency and contingency plans and preparedness; — Programmes for radiation protection and waste management; — Engineering; — Maintenance;	Please add: Also possibilities to enhance the safety and security by design should be considered in conjunction with modifications Also the possibilities for enhancement should be considered.	X			

			— Work management (control and planning); — Training and qualification of personnel; — Fire protection; — Environmental protection; — Conventional health and safety (including chemical safety). Also possibilities to enhance the safety and security by design should be considered in conjunction with modifications.					
Section 4								
52.	Germany 13	4.3	In addition to the reactor operations, such as startup, steady state / pulsed operation and shutdown, other reactor conditions should be considered for their effects on the experiment or modification.	Several research reactors can be operated in pulsed mode (e.g. TRIGA). This is very specific mode of operation and should be explicitly mentioned.	X			
53.	Germany 14	4.5	Modifications aiming to continuously improve nuclear safety like ~~to~~ design features or equipment used for design extension conditions, including mobile and portable equipment should be performed in accordance with the facility modification processes, procedures and required safety assessment.	The idea of continuous improvement should be emphasized in this safety guide.	X			
54.	Canada 2	4.5	Modifications to design features or equipment used for design extension conditions, including mobile and portable equipment should be performed in accordance with ~~the~~ approved facility modification processes, procedures and required safety assessment	This is a suggestion only. Use of informal engineering change control processes is quite common in 'lower risk' facilities and this can lead to unanticipated events. The guide should stress the use of formally approved management system documents, even if the process is simple for a smaller facility.	X			

55.	Germany 11	Page 30 / para 4.6 / line 9	Additional sentence: <u>The operating organization's safety policy towards modifications should be reviewed regularly in order to allow for a continuous improvement.</u>	The support of the management system for a continuous improvement of the safety culture should be highlighted here.	X			Added in start of para 4.6.
56.	Germany 15	4.6	The operating organization's safety policy towards modifications should be based on <u>the principle of continuous improvement.</u>~~:~~ <u>For each modification adverse effects challenging</u> • ~~maintaining~~ the protection of the barriers to radioactive release; • ~~maintaining~~ the independence between the levels of the defence in depth and an adequate reliability of each level during operation, as a consequence of all modifications and related operational activities. The influence of human and organizational factors, on one, several or all barriers and levels of defence in depth, should be considered in all activities, including design related to utilization and modifications~~, to avoid adverse effects on the reliability of the barriers and levels and the independence between the levels~~.	The idea of continuous improvement should be emphasized in this safety guide. Maintaining safety is not sufficient. However, adverse impacts on the barriers or levels of defence in depth should be avoided.	X			
57.	Germany 16	4.11	~~For subcritical assemblies, any potential for criticality should be covered as a design extension condition and it should be assessed to identify additional safety features to prevent or mitigate the consequences of such event.~~ <u>For subcritical assemblies, subcriticality should be ensured for shutdown states anytime by design provisions. Care should be taken that the reactivity of the subcritical assembly and the additional reactivity induced by the external neutron source will</u>	The idea of subcritial assemblies is that the chain reaction will only be maintained in case of an external neutron source. Thus, ensuring subcriticality is the wrong requirement from a neutron physical point of view. It should be mainly based on the maximum allowable reactivity to be inserted.		For subcritical assemblies, any potential for criticality because of the reactivity worth of an experiment should be covered as a design extension condition and it should be assessed to identify whether		To ensure technical accuracy and to address the comments from Canada and USA

			not lead to uncontrollable reactivity induced accidents.			the existing safety provisions remain effective or additional safety features to prevent or mitigate the consequences of such event need to be implemented		
58.	Canada 3	4.11	~~For subcritical assemblies, any potential for criticality should be covered as a design extension condition and it should be assessed to identify additional safety features to prevent or mitigate the consequences of such event.~~ For subcritical assemblies, any experiment or modification should be assessed through safety analysis to confirm whether existing safety provisions for the facility remain effective, or additional provisions need to be implemented. As with any other modification to a facility, safety analysis should be confirmed against the as-built modification / experimental feature.	For the purposes of Section 4, this specific guidance is not clear. I suspect what the clause is trying to communicate is that the safety impacts of experiments be considered in the facility's safety analysis to determine whether additional safety provisions need to be implemented to address postulated initiating events such as criticality accidents. Whether a criticality accident is a DEC or not is determined through the systematic derivation of Postulated Initiating Events and subsequent safety analysis activities. Depending on the nature of the facility (e.g. subcritilaty margin) a criticaility event could potentially be a DBA. But for a new facility, it may be intentionally be designed to make this type of event a DEC. An experiment should not result in a substantive change to a non-conservative direction.		Text has been modified as suggested, See also response to comment Germany 16 and USA 6.		
59.	USA 6	4.11	For subcritical assemblies, any potential for criticality because of the reactivity worth of an experiment should be covered as a design	Clarify that criticality of a subcritical assembly is a result of reactivity added by an experiment.	X	See also response to previous comment.		

			extension condition and it should be assessed to identify additional safety features to prevent or mitigate the consequences of such event.					
60.	USA 7	4.14	4.12.4.14. The potential for an uncontrolled release of radioactive substances should be limited and the amounts of such material released should be minimized by measures such as the use of delay tanks, inert purge gas, filters or recirculation.	Use of a cover/purge gas to minimize release of radioactive substances.	X			
61.	Japan 2	4.15.	Whenever possible, experiments and modifications should be designed ~~to minimize the need for active safety devices (e.g.by the use of~~ considering the use of inherent safety features, passive systems and fail-safe design~~)~~.	Clarification It is important to adopt reliable systems rather than minimizing the need for active safety devices.	X			
62.	Germany 3 RASSC	4.21 line 7	… be carefully addressed*, …	Clarification: Missing explanation or reference of/to the asterisk.	X			
63.	Germany 4 RASSC	4.21 last line	… 4.6 – 4.8 …	The references to these paragraphs seem incorrect. Probably it should refer to 4.17 (?)	X			
64.	Germany 18	Page 33 / para. 4.21. / line 7	"*": Footnote/explanation is missing		X			
65.	USA 8	Para 4.21	In addition, the effect of the presence or absence of an experimental device on the power distribution in the reactor core should be carefully addressed*, as this may influence the safety margins of the research reactor.	Was the * supposed to be a pointer to a note or provide additional information somewhere else in the document?	X			

66.	Germany 19	Page 33 / para. 21 / line 15	Means to reduce the reactor power or to shut down the reactor, as discussed in paras ~~4.6 - 4.8~~ 4.8-4.10, should be analysed and ensured.	Wrong reference after revision of the guide.		Corrected		Added reference to correct paragraph
67.	Germany 17	4.25	In the design of experiments, the selection of materials should take into account material compatibility, corrosion, changing of material properties due to irradiation (e.g. creep, embrittlement, radiolytic decomposition, activation), including transmutation of material, differential thermal expansion, ageing effects and ease of decontamination, dismantling and final disposition.	Activation is a crucial point in a research reactor due to the high neutron flux density. Selecting materials which can easily activated will cause radioprotection issue during operation and maintenance, but also for later decommissioning.	X			
68.	Germany 8 EPReSC	4.26, 12	cadmium, beryllium, silver, cobalt, or boron compounds (e.g. B4C), and alloys containing these materials, should be used with extreme caution owing to their neutronic properties	Ordering	X			
69.	Pakistan 3	4.26	Chemical compounds which decompose upon irradiation and give off gases.	This may be added in section 4.26 as this type of material needs special attention while irradiation.	X			
70.	USA 5	Para 4.26	• Explosive material should be used with extreme caution and in limited quantities	Include a caution when using explosives in the design of experiments and limit the quantity used in the experiment.	X			
71.	Germany 20	New para between 4.30 and 4.31	Experiments and modifications should be designed such as, that in case of external events exceeding the design basis external events the design has a sufficient margin to avoid event sequences leading to unacceptable radiological releases.	It is important, that external events more serious than the design basis external events will not cause cliff-edge effects leading to unacceptable radiological releases, i.e. early or large releases.		Added in para 4.30.		Paragraph 4.30 context is appropriate to add the text in continuation.

72.	Canada 4	4.32	The possible vibration of experimental devices or modified components due to coolant flow should be considered. Particular consideration should be given to avoiding vibrations at resonance frequency. ~~It may not be applicable to experimental devices at some types of critical facilities and subcritical assemblies.~~	The last sentence is not necessary for this clause as the entire clause is a "should" statement. (i.e. guidance) Guidance should not be pre-determining what may be applicable or not. Although the intent of this text is to more clearly articulate the use of a graded approach, the reader will automatically assume the guidance does not apply in their case and that it is the regulator's role to challenge this. In fact, if it does not apply, it is up to the proponent to indicate that this is the case with an explanation based on the facility's specific features.	X			
Section 5								
73.	IRAN 1 EPReSC	Clause 5.6/ Lines 5 and 6	"…, ~~or~~ or operating conditions for the reactor as well as for experiments, ~~or the emergency plan and procedures~~." Or "…, ~~or~~ operating conditions or—the emergency plan and procedures. for the reactor as well as for experiments, "	It is not clear why "Or" has been omitted. "operating conditons" is the last item, then and/ or is necessary in the sentence. Also adding "or the emergency plan and procedure" in this sentence make it a little bit difficult to understand. The changes to safety systems, safety related items…or operation conditions may make it necessary to change the emergency plan and procedures. It is suggested to change the sentence.	X			
74.	Germany 21	5.6	The need for a modification or experiment can arise from different groups of persons, such as the reactor management, the regulatory body, experimenters or equipment suppliers. Modifications can be	One trigger would be the continuous improvement of safety. This aspect should be stronger emphasized. Changing demands from science and research (e.g. higher neutron flux	X			

			necessary for the continuous improvement of nuclear safety ~~involve~~ involving changes to safety systems, safety related items, operational limits and conditions, procedures, documentation, operating conditions for the reactor as well as for the emergency plan. Modifications may be also necessary to adapt the research reactor facility to changing needs from science and research, this may lead to higher neutron flux densities or modified / new experimental facilities to be installed ~~as well as for experiments, or the emergency plan and procedures~~. Whatever the reason for a modification or an experiment, the general concept should be discussed by the reactor management and the regulatory body early in the project. It may also be appropriate to include other groups, such as the safety committee(s), experimenters, equipment suppliers and independent consultants.	density, cold neutron sources, new irradiation facilities, new instruments to be installed) are separate initiators. These are primarily non-safety driven modifications.				
75.	Germany 22	Page 40 / para. 5.20. line 1	Management system criteria for design control and continuous improvement should be established and implemented, covering all aspects of the design, including inspection and testing methods, and construction.	The support of the management system for a continuous improvement of the safety culture should be highlighted here.	X			
76.	Germany EPReSC 9	FIG 1	Phases of a ~~modification or~~ utilization or modification project with a major effect on safety.	Word ordering consistent within the document	X			
77.	Pakistan 4	FIG 1/page 29	*FIG. 1. Phases of a utilization or modification project with a major effect on safety.*	For harmonization.	X			
78.	Germany EPReSC 10	5.21, 9	The experiment or modification can be carried out without significantly increasing the dose to ~~staff workers~~ site personnel and members of the public	Based on description in IAEA glossary, see above	X			

79.	Germany EPReSC 11	5.28, 12	The training programme designed to enable ~~staff~~ site personnel to cope with anticipated operational occurrences during the implementation of the project. (~~Staff~~ Site personnel-should also be informed (…)).	The term 'staff' is not defined in the IAEA glossary	X			
80.	Germany 23	Page 43 / para. 5.31. / line 1	The need for approval of the experiment, approval of the design and approval for construction of the modification or the need for formal licensing as referred to in paras. 3.18-3.19 should be considered at this stage.	Wrong reference	X			
Section 6								
81.	Germany 24	6.7	During fabrication, technical audits and quality audits should be conducted in order to verify all aspects of fabrication, such as deviations from specifications, quality control and the schedule. The regulatory body should define which inspections will be conducted at the vendors site to verify that fabrication is in compliance with applicable requirements, codes and standards. In particular, regulatory inspections during fabrication is important for those equipment which cannot be thoroughly inspected during installation.	The regulatory body should be involved.	X			
82.	Germany 12 EPReSC	6.9	The installation of the experiment or the modification should not commence until all approvals have been obtained and the relevant ~~staff~~ site personnel involved in the installation have been trained satisfactorily.	The term 'staff' is not defined in the IAEA glossary	X			

83.	Germany 13 EPReSC	6.14, 11	Emergency preparedness (1, 2)	Suggested literature: 1) Arrangements for Preparedness for a Nuclear or Radiological Emergency General Safety Guides No. GS-G-2.1 2) Preparedness and Response for a Nuclear or Radiological Emergency General Safety Requirements No. GSR Part 7		GSR Part 7 is referred		
84.	Germany 25	6.19	The safety of a modification or experiment that is to be implemented should be verified through a commissioning programme involving tests and checks, and measurements and evaluations prior to and during implementation of the modification or experiment. The requirement 73 of SSR-3 [2] is also applicable for the commissioning of a modification or experiment. The regulatory body should define appropriate witness and hold points to inspect the commissioning of the utilization / modification project.	The regulatory body should be involved in the commissioning. Based on the proposed commissioning the regulator should define which steps have to be performed under regulatory oversight.	X			
85.	Germany 14 EPReSC	6.20, 15	Provision of opportunities and time for familiarization and training of operating and maintenance personnel	Providing a sufficiently long time to adapt and train might not be included in the term ‘opportunities’	X			
86.	Germany 26	6.23	The operating organization should submit the commissioning results to the regulatory body ~~need~~ for formal approval ~~of the commissioning results~~ and permission for	If an approval of the regulatory body is necessary has to be defined in the license or within the license conditions.	X			

			operation ~~with~~ of the experiment or with the modified system ~~should be considered at this stage~~ as required in the license conditions.					
Section 7								
87.	Pakistan 5	7.5	In cases where such effects cannot be predicted with sufficient accuracy from previous experience or by analysis, a safety periodic surveillance programme should be defined for monitoring the behavior of the relevant characteristics to ensure long term operation of research reactors.	Para may be modified as suggested for perceptive point of view.		Already addressed in same para line 2-3		
Section 8								
88.	USA 1	Para 8.2	8.2. Experiments at research reactors can present significant radiological hazards for persons conducting the experiment, for operating personnel and, in some cases, for other site personnel ~~persons outside the research reactor~~ and members of the public.	The meaning of "persons outside the research reactor" is not clear. Revised to include "other site personnel."	X			
89.	Pakistan 6	8.5, 10 of Annex II and11.2	8.5 Areas in which there can be significant radiation levels during research reactor operation and ..... This comment may be implemented in other sections of the document such as section 10 of Annex II. 11.2 They should also follow the same modification categorization process in place at the research reactor.	The word research may be added to be specific about research reactor.	X			
90.	Germany 27	Page 50 / papa. 8.8. /	(…). A tabulation of the expected radiation levels or other hazards associated with the experiment should be provided, as well as a	Especially in research institutes the turnover of scientific personnel is high. Therefore, care should be taken to	X			

		line 12	list of the personnel allowed to run the experiment and of those persons associated with the experiment who can be called upon for advice if difficulties arise. This information should be regularly reviewed and updated.	provide up to date information.				
91.	Australia 5	8.9	Suggest adding a qualification "where appropriate".	Wording assumes that there are OLC for experiments, which may not necessarily be the case for all research reactors.	X			
92.	USA 9	Para 8.9	8.9. The limiting conditions for safe operation (as a part of ~~OLCs~~ operating limits and conditions covering experiments both for the reactor and for the experiment to ensure safe operation, as well as the procedures for handling and operation of the experiment), should be subject to approval by the reactor manager.	OLC is not defined in the document.	X			
93.	Germany 5 RASSC	8.9 first line	… OLCs …	Please clarify the abbreviation OLCs (operational limits and conditions)	X			
94.	Canada 5	8.15	Add a new 8.15a that reflects the following: The operating organization should establish management system processes to ensure event-free conduct of experiments within the operating envelop of the research reactor facility. Commensurate with the experiment's novelty, complexity and potential for harm, processes should implement proven nuclear	Although existing guidance establishes responsibilities, the reader needs to be aware that significant risk can exist during the conduct of experiments if the research reactor equivalent of "*conduct of operations*" does not include use of event free tools. OPEX does exist in every country of where events have occurred as a result of communication issues/errors between operators and staff conducting		Paragraph amended to make reference to section 2 of the Safety Guide		The contents are already covered in section 2 of same safety guide.

			industry practices to anticipate, prevent, control and mitigate errors that could lead to events. Examples of such tools include: • Use of approved procedures • Secondary field verifications of as-built systems to confirm consistency with the approved design • Pre-job and post job briefs between staff involved in experiments and operations • Inclusion of back-out provisions in experimental procedures Is there an IAEA document this can refer the reader to for practices?	experiments.				
95.	USA 10	8.17	The reactor manager should enforce any safety rule or any limitations to experiments, if necessary, to ensure the safe operation of both the experiment and the research reactor, as well as to ensure the safety of operating personnel and experimenters.	For document consistency.	X			
Section 9 **No Comment**								
Section 10								
96.	Germany 28	Page 54 / papa. 10.1. / line 6	and (ii) those that are at or near the reactor core and which do not utilize the radiation produced by the reactor core, but which constitute a potential hazard (e.g. a cryostat containing liquid nitrogen or cold neutron sources containing hydrogen or deuterium).	Hydrogen or deuterium is nowadays used in cold neutron sources and poses a higher hazard potential than nitrogen.	X			

97.	Germany 15 EPReSC	10.3	For the out-of-reactor-core installations that constitute a potential hazard, in addition to an analysis of ‘conventional’ safety (e.g. fire, explosion, chemical threats), analyses should be performed to identify the potential hazards and determine the safety provisions to be implemented to reduce the hazards to the extent possible	Examples might help in case that ‘conventional’ is not a fixed, well-known term	X			
Section 11								
98.	France 6	11	These articles should provide justification of the recommendations	There is no reference to any safety requirement	X			Reference Requirement 68, para 7.11 of SSR-3 is provided in para 11.2
99.	Germany 29	Page 55 / Chapter 11 New paragraph	Changes of the organizational structure should result in arrangements to learn from successes and from strengths for their organizational development and continuous improvement of nuclear safety.	The support of the management system for a continuous improvement of the safety culture should be highlighted here.		Addressed in para 11.2		Addressed in para 11.2, some text already mentioned in the same context.
100.	Japan 3	11.2.	Changes to the operating organization should be considered as modifications and should be categorized according to their safety significance. They should also follow the same modification categorization process in place at the ~~reactor~~ nuclear power plants (see Ref. [**] Appendix II). Benchmarking and analyses of the operating experience feedback concerning organizational changes in the nuclear installations and other industries should support this process.	Clarification. In DS497B “Modifications to Nuclear Power Plants” (revision of NS-G-2.3), the Appendix II is newly developed and all elements of modification process are described. It should be referred or introduced it in this document.		Additional guidance may also be found in IAEA Safety Standards Series No. NS-G-2.3, Modifications to Nuclear Power Plant [27]		Reference to NPP safety guide has been added.
101.	USA 11	11.2	11.2. Changes to the operating organization should be considered as modifications and should be categorized according to their safety significance. They should also follow the same modification categorization process		X			

			in place at the research reactor. Benchmarking and analyses of the operating experience feedback concerning organizational changes in the nuclear and other industries should support this process.					
102.	Japan 4	11.4.	An independent internal review should also be provided to demonstrate that the provisions for the management of safety, including the provision for adequate control and supervision, will not be compromised. Proposed organizational changes should be reviewed by the safety committee, before submitting to the regulatory body for review and assessment, if needed.	Not all modifications are subject to regulatory review.	X			
103.	Australia 6	11.4	Excellent section but suggest that this para be reworded to clarify that independent review is only required where there may be safety implications arising from an organizational change.	As currently worded, para implies that any organizational change requires independent review and submission to the regulatory body, which could be overly onerous for minor changes.	X			Also addressed in 11.2 with reference to Requirement 68, para 7.11 of SSR-3
104.	Germany 16 EPReSC	11.5	Special attention should be paid to the review, and revision as necessary, of a training programme for all site personnel and designated external personnel to ensure in advance that it has ~~management and staff have~~ an understanding (…)	See above	X			
105.	Canada 6	11.6 to 11.9	Add new 11.6 with wording along the following lines: Prior to implementing an organizational change plan, the organization responsible for the plan shall demonstrate capabilities to understand and address the potential nuclear safety impacts of the organizational changes.	Existing guidance is vague around a need for those instituting organization change to have sufficient competency to understand the impacts of the changes they are making. More frequently, these decision makers are far removed from the day to day operations of the facility and could be a third party organization.		Covered by the text, for example paragraph 11.2.		The comment is valid and covered by the text, for example paragraph 11.2.

106.	Australia 7	11.8	Consider adding the words “at an early stage” consistent with good practice.	It is well recognized that the involvement of the staff affected by an organizational change at an early stage in planning such a change contributes to the successful implementation of the change	X			
Annex I								
107.	Australia 8		On page 53 in the text box next to 1A, should not the last line read “Go to Part 4, Safety Categorization”? In addition, it is not clear how answering the questions 1 to 5 “yes” or “no” enable the user to differentiate between categories 1A and 1B.	This appears to be a typographic error in the original form	X			
108.	USA 12	Annex 1, Part 2, Safety Screening, Step 1a	If the proposed modification or experiment falls within the lowest safety ~~classification~~ categorization, then Safety category 4 ‘no effect on safety’ is recommended. Go to Part 4, Safety categorization.	So as not to confuse safety class of SCCs and consistency throughout the document.	X			
109.	USA 13	Annex 1, Part 2, Safety Screening, Step 1b	If the proposed modification or experiment falls within a higher safety ~~classification~~ categorization, then Safety category 3 ‘minor effect on safety’ is recommended. Go to Part 4, Safety categorization.	So as not to confuse safety class of SCCs and consistency throughout the document.	X			
110.	USA 14	Annex 1, Part 2, Safety Screening, Step 2	At least one question has been answered with “YES”. A safety evaluation (Part 3) is required to evaluate the safety implications of the project prior to assigning a safety category. Go to Part 3, Safety evaluation.	Missing “evaluation” in the step.	X			

111.	USA 15	Annex 1, Part 3, Safety evaluation	All the questions have been answered with "NO". The proposed change will have a significant effect on safety. Safety category 2 'significant effect on safety' is recommended. Go to Part 4, Safety categorization.		X			
112.	USA 16	Annex 1, Part 3, Safety evaluation	At least one question has been answered with "YES". The proposed change will have a major effect on safety. Safety category 1 'major effect on safety' is recommended. Go to Part 4, Safety categorization.	Annex 1, Part 3, Safety evaluation	X			
113.	Pakistan 7	Annex I/ Part 5 — Review and approval	Section manager?	In checklist "section manager" is mentioned. However, the same has not been described in the main text of the document. Therefore, the same may be reconsidered.	X			
114.	Germany 6 RASSC	Annex I / Part 2 / Results of the safety screening / 1A and 2		The reference to Part 4, Safety categorization, and to Part 3, Safety evaluation, is incomplete; the same in the last two boxes of Part 3	X			
115.	Germany 30	Page 61 / Annex 1 Result of the safety screening / 1	Go to Part 4, Safety categorization	Copy and paste error	X			
116.	Germany 31	Page 61/ Annex 1 Result of the safety screening / 1	Go to Part 3, Safety evaluation	Copy and paste error	X			

Annex II								
117.	United Kingdom 1	Annex II	"The following list of topics sets out the minimum requirement for the table of contents of the safety analysis report for an experiment. The topics are to be discussed using a graded approach based on the safety category of the experiment, as defined in Section 3 of this Safety Guide. The topics that are not relevant for the safety analysis report of the utilization project should be indicated with the remark 'not applicable'. Modifications to the list of topics could be necessary depending on the type and purpose of the reactor.'	Although the Annex is titled "Example of….." Para II-1 states that the following lists of topics sets out the minimum requirement for the table of contents. What needs to be provided could depend on the type and purpose of reactor.		The list of topics may be modified depending on the type and design of the research reactor.		
118.	Germany 7 RASSC	Annex II / 4.2 Radiation shielding		This passage is the same as 4.1 In-core/out-of-core irradiation. Please provide the appropriate text to "Radiation shielding".	X			Text has been added
119.	USA 17	Annex II, Section 9	9. Post-irradiation examination Description (summary) of post-irradiation examination of targets (i.e. dismantling mode, scientific measurements) and/or the irradiation facility. Specification as to whether the post-irradiation examination is scheduled to be performed at the research reactor itself or ~~at another research institute.~~ at an off-site facility.	Post-irradiation doesn't need to be performed at a research institute.	X			
120.	USA 19	Annex II, Section 10	The safety analyses need to be such as to demonstrate adequate fulfilment of the safety functions and prove that neither conduct of the experiment nor any failure	Revised to be more specific: "site personnel."	X			

			would result in unacceptable conventional hazards and/or radiological hazards to site personnel and the public, in major disturbances to the operation of the reactor and (other) experimental facilities, in damage to the reactor or experimental facilities or in reduced access to the reactor, experimental facilities or the reactor building.					
121.	USA 20	Annex II	We recommend Annex II: on "Content of the SAR for an experiment at a research reactor," to include sections on: • Inventory and records of radioactive isotopes to be generated; • Inventory and category of radioactive waste of waste to be generated from the experiment and description of pre-disposal plans for storage or disposition;	Completeness to keep records of inventories and categories of radioactive materials generates as well as radioactive waste.	X			
Annex III								
122.	Australia 9		It is not clear whether this Annex adds value or is of any real benefit to users. Based on OPAL experience, the examples given appear rather limited.					The annex provides the guidance on examples of modifications that can results in interface issues
Annex IV								
123.	Australia 10		The examples of questions to be considered on proposed modifications form a good basis for review and assessment but are they not applicable to any proposed modification?					Paragraph clear as it is, the annex is applicable to all modifications

			Stating in para IV-1 that the safety focused questions apply to proposed modifications of the physical protection system and vice versa would appear to be limiting.					(important to safety and on physical protection system)
124.	France 10 NSGC	Annex IV	Replace: “Physical protection plan” by “Security plan”		X			
Annex V								
125.	Germany 32	Page 77 / V-1 / line 1	Such reviews include an assessment of the design and operation of the reactor against current safety standards and practices in order to take into account advances in knowledge, and they have the objective of ensuring a high level <u>and a continuous improvement</u> of safety throughout the operating lifetime of the research reactor.	The support of the management system for a continuous improvement of the safety culture should be highlighted here.	X			