TITLE: Safety of Research Reactors (DS476)

COMMENTS BY REVIEWER Reviewer: Country/Organization: Japan/Ministry of Foreign Affairs			Page of Date:	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./reject.
1.	Requirement 5/3	"~~complimentary~~ complementary probabilistic analysis..."	Wording.	✓			

TITLE: Safety of Research Reactors (DS476)

COMMENTS BY REVIEWER Reviewer: Country/Organization: Japan/NRA			Page of Date:	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./reject.
1.	1.4/4	commissioning, operation~~,~~ including utilization and modification, and planning for decommissioning.	Adding word to make the description consistent with para. 3.4.	✓			
2.	1.6/2	commissioning, operation including utilization and modification, and planning for decommissioning of research reactors,	The same reason as the comment No1.	✓			
3.	1.9/2	a specific research reactor, critical or subcritical assembly,	Critical assemblies should be considered.	✓			
4.	3.2/11	commissioning, operation~~,~~ including utilization and modification, and planning for decommissioning.	The same reason as the comment No1.		✓ Operation including utilization and modification		The general safety requirements apply to planning as well as to decommissioning.
5.	3.4/2	up to ~~and including the decommissioning of the nuclear facility~~ release from regulatory control.	Amendment to make the description consistent with the bullets (a)-(g) in the same para. The authorization process includes release from regulatory control.	✓			
6.	Requirement 2/4	commissioning, operation~~,~~ including utilization~~,~~ and modification, and decommissioning.	The same reason as the comment No1.			✓	Retained for clarity, per footnote 10.
7.	4.1	Insert this para. after Requirement 4.	The contents of para. 4.1 define the			✓	Para. 4.1 includes

COMMENTS BY REVIEWER Reviewer: Country/Organization: Japan/NRA			Page of Date:	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./reject.
			duties of senior management in integrated management system, therefore this para. should be moved to the place where the associate requirements of OAR (overarching requirement) 4 "Integrated Management System" are described.				responsibility for management and safety for a research reactor and is consistent with the overarching requirements given in Req. 2.
8.	Requirement 5/3	complimentary probabilistic analysis with consideration for a graded approach as appropriate and validated by independent verification	This requirement is to be applied in accordance with the potential hazards associated with the research reactor by means of a graded approach.			✓	It is agreed that the requirement is to be applied in accordance with the potential hazards as specified in the current text; adding with consideration of a graded approach would introduce redundancy.
9.	6.45/4	This applies also to ~~movable~~ non-permanent equipment	Amendment to make the terminology consistent with the one used in SSR-2/1 (Rev. 1).	✓			
10.	Requirement.33 and 6.92	Delete.	Deletion of duplicated contents. Req.33 overlaps with Req.15. Similarly, para.6.92 overlaps with para.6.27.			✓	Although both Reqs. address decommissioning of a RR, Req. 15 covers features for radioactive waste management while Req. 33 addresses experimental

COMMENTS BY REVIEWER Reviewer: Country/Organization: Japan/NRA			Page of Date:	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./reject.
							facilities in particular. Some minor overlap is unavoidable.
11.	6.93	Insert this para. after para.8.2	Para. 8.2 seems to be the appropriate place for this para. to be mentioned.			✓	It is important to specify this as a Design requirement in Chapter 6, so that the information is retained for decommissioning.
12.	Requirement 59/4	concentrations of radioactive discharges ~~releases~~ as low as reasonably achievable	Amendment to make the terminology consistent with the one used in IAEA SAFETY GLOSSARY (2007 EDITION), that is, planned and controlled release of (usually gaseous or liquid) radioactive material to the environment. All other related paragraphs have to be carefully checked.(e.g. 6.201/2, 7.58 (i), 7.116/2, 7.117)			✓	The text on radioactive releases is consistent with SSR-2/1 Rev1.
13.	6.202/1-2	Means shall be provided in the design for the handling, processing~~,~~ and storage~~, removal from the site and disposal~~ of radioactive waste.	Means for removal and disposal of radioactive waste are not provided in the design.			✓	Means for removal such as overhead cranes and shielded containers are provided in the design if required.
14.	Footnote 39(p.70)	[39] The reactor manager does not necessarily need to hold a licence to operate the reactor, but needs to have passed through a training programme (see para. 7.~~31~~30).	Typo.	✓			

COMMENTS BY REVIEWER Reviewer: Country/Organization: Japan/NRA			Page of Date:	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./reject.
15.	Footnote 43(p.81)	[43] Emergency procedures are developed as an element of a separate emergency arrangements (see paras 7.~~90~~89–7.~~94~~93) and in accordance with Ref. [10].	Typo.	✓			
16.	7.99/8	(d) All personnel who will be involved in making a proposed modification or in conducting the proposed utilization are suitably trained, qualified and experienced ~~for the~~;	Editorial.	✓			
17.	7.115/7	Records shall be maintained for the characterization, ~~waste generation and waste~~ classification, ~~as well as for the~~ processing, transport, storage~~,~~ and disposal of radioactive waste.	Amendment to make the wording consistent with the sentence in same paragraph which says, "The programme for the management of radioactive waste shall include the characterization, classification, processing (i.e. pretreatment, treatment, and conditioning), transport, storage and disposal of radioactive waste.")		✓ Records shall be maintained for waste generation and waste classification.		To simplify the paragraph and also to address comments from GER re para. 7.119
18.	Requirement 89/2	The operating organization for a research reactor facility shall prepare a decommissioning plan including financial programme and shall maintain it…	This document well addresses the aspects of radioactive waste management. However, requirement on financing of decommissioning provided in GSR Part6 is not addressed in this document. Financing is also essential for decommissioning of research reactors.			✓	As per Ref. [9] of 8.1, the decommissioning plan is to be prepared and updated in accordance with GSR Part 6 which covers financing.
19.	8.2/1	The plan shall be submitted for review and approval by ~~the safety committee and~~ the regulatory body as appropriate before decommissioning activities are commenced.	According to GSR Part 6, it is only an independent regulatory body to have responsibility approving the decommissioning plan.		✓ Reviewed by the safety committee and approved by the regulatory body…		For a RR it is appropriate to have the plan reviewed by the safety committee.

COMMENTS BY REVIEWER Country/Organization: FRANCE Date: pages				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	General comment:	The main aspects of research reactors are eclipsed or not enough underlined or highlighted (besides the document is not synthetic, not easy readable): • in the context of a complete revision of the NS-R-4, it would have been useful if the new document could really focus on the **safety specificities of research reactors (mainly requirements related to the graded approach and to experimental devices and interactions between them and the reactor)** considering of course that all general safety requirements defined by the AIEA are applicable to research reactors (NS-R63, GSR Part 3, GSR Part 4…). For example, experimental devices are more clearly mentioned in "scope" and other chapter of the DPP • It appears that there are too many general requirements that are non-specific to research reactors but also applicable to others nuclear facilities. At least, specificities of research reactors should be clearly identified.					The document focus on the safety specifics of research reactors and requirements related to the graded approach. Experimental devices are fully covered.

2.	2.12	The independent effectiveness of the different levels of defence is a ~~necessary~~ essential element of defence in depth.	To be consistent with the SSR-2/1 and with the requirement n°10 of DS476.			✓	The text is consistent with SF-1; 'necessary' is consistent with SSR-2/1 Rev 1, para. 2.13.
3.	5.4	*(e) capability for an ultimate heat sink at the site*	It is proposed to add an item (e) to the para. 5.4 as it was in the previous version of NSR-4.			✓	As appropriate is retained because it may not be required in critical and subcritical assemblies and in some small reactors.
4.	5.5	If the evaluation of the site and the operations area for these six factors, including their foreseeable evolution, indicates that deficiencies of the site or the operations area cannot be compensated for by means of design features, site protection measures or administrative procedures, the site shall be deemed unsuitable.	There are 6 factors		✓ Six aspects		Changed to six aspects. Factors changed to aspects to be consistent with 5.4 and other MS comments

5.	6.171	Interconnections between reactor instrumentation and systems to control experimental devices shall in general be prohibited. Exceptions shall only be permitted, if specific parameters of experimental devices are mandatory for the safe operation of the reactor	This paragraph needs to be clarified since interconnections between reactor protection system and control systems related to experimental devices might be necessary to ensure safety of the reactor and the experimental devices.		✓ ..instrumentation and control systems… …permitted if interconnections to control specific…		Clarification added. The exception clause covers situations where interconnections are necessary for the safety of the reactor.
6.	6.187	Proposed deletion	This requirement seems to be related to the feedback from the accident at the Fukushima Dai-chi accident. It may be more appropriated to deal with this topic in an integrated manner (and not only to focus on one safety item).			✓	The text is in accordance with the approved DPP and consistent with SSR-2/1 Rev1. Para. 6.40a.
7.	6.190	Reliable electrical power supplies for essential safety functions shall be available in normal operational states, in accident conditions and in design extension conditions.	Electrical power supplies might be useful in DEC.			✓	"Accident Conditions" include "Design Extension Conditions". See definitions on page 108

8.	Req.57	Equipment shall be provided at a research reactor facility to ensure that there is adequate radiation monitoring in operational states, in accident conditions and in design extension conditions.	Radiation monitoring might be useful in DEC			✓	See above resolution to comment 7.
9.	6.193	Stationary dose rate meters to indicate the general radiation levels at suitable locations of the facility in anticipated operation occurrences, in accident conditions and in design extension conditions	Radiation monitoring might be useful in DEC			✓	See above resolution to comment 7.
10.	6.193	Stationary equipment and laboratories for determining in a timely manner the concentrations of selected radionuclides in fluid process systems and in gas and liquid samples taken from the research reactors facility or the environment in operational states, in accident conditions and in design extension conditions.	Radiation monitoring might be useful in DEC			✓	See above resolution to comment 7.

TITLE: Draft DS476

COMMENTS BY REVIEWER Reviewer: Page 1 of 4 Country/Organization: Poland Date: 2015-03-16				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	2.8/6	2.8. (…) Such measures and arrangements include: engineered safety features; safety features for design extension conditions[6] – where necessary, and in case of existing reactors – applied to the extent practicable; (…).	It should be made clear that safety features for design extension conditions are required where necessary (due to specific design and safety related characteristics of the research reactor itself and/or its associated installations – in particular in context of para. 2.8), and in case of existing research – to the extent practicable. This is in concord with provisions in para. 1.6 that "The safety requirements			✓	It is agreed that the requirements, including provisions for DEC, are to be applied to existing reactors to the extent practicable, as stated in 1.6. The additional text suggested here would be repetitive and would make this paragraph cumbersome.

			established in this publication are also to be applied to existing research reactors to the extent practicable.", and para. 2.14 "(4) if necessary, event sequences that may lead to design extension conditions".				
2.	4.2/1	4.2. Whenever a change of stage is to be initiated by the operating organization, it shall submit a detailed demonstration, which shall include an adequate safety analysis, for review and assessment by the regulatory body before the project is authorized to progress to the next stage.	The wording "a change of stage" is unclear, what does it mean exactly – any modification to the reactor or its associated facilities? Please modify this wording accordingly to ensure the clearness.		✓ Change of stage in the lifetime of a research reactor…		This refers to the stages in the lifetime of a research reactor from the beginning of the project, through to the decommissioning stage, per Req. 2.
3.	4.11/4	4.11. The integrated management system shall identify and include the following requirements: (a) The statutory and regulatory requirements of the State; (b) The requirements established by the relevant IAEA safety	The requirements established by the IAEA safety standards are not mandatory in the Member States unless adopted by their legislation.		✓ …that have been adopted by the State.		Further clarification.

		standards that have been adopted in the national legislation; (c) Any requirements formally agreed with interested parties.					
4.	4.23/3-4	4.23. (…) Probabilistic safety analysis may be used as a complementary tool for detecting the potential weakness and improving the research reactor design ~~safety assessment~~.	The primary aim of the PSA is to identify any weak points in the system design to ensure implementation adequate improvements where needed.		✓ Detecting potential weakness		Agree that PSA helps to detect weakness. This section is on safety assessment and the use of PSA in safety assessment.
5.	6.12/2	6.12. The design shall ensure that the generation of radioactive waste and discharges are kept to the minimum practicable in terms of both activity and volume and are categorized.	The wording "are categorized" is unclear (due to the syntax): what is categorized (radioactive waste, discharges, or both)? and how the design is to ensure that categorization?		✓ ..and that waste and discharges are categorized.		Revised for clarity.
6.	6.29/3	6.29. The method for classifying the safety significance of items important to safety shall be based primarily on deterministic methods	Where the probabilistic methods are appropriate and necessary for performing safety assessments adequately these methods must be available.			✓	For research reactors the requirements is for deterministic assessment as the main method. Where

		complemented, where appropriate, by probabilistic methods ~~(if available)~~, with due account taken of factors such as: (…).					appropriate, probabilistic methods may be used as complementary method.
7.	6.81/2-3	6.81. Systems and components important to safety shall be designed for fail-safe behaviour, as appropriate, so that their failure or the failure of a support feature does not result~~s~~ in the loss ~~the performance~~ of their intended safety function.	Correction of the misleading wording.	✓			
8.	6.121/13	6.121. The scope of the safety analysis shall include: (…) (e) Design extension conditions (DEC) identification and how they are addressed; (…).	Editorial correction: the acronym „DEC" has not been explained above and is used below in the document.		✓ DEC is spelled out …in (g)		

9.	6.178/1	6.178. The reactor protection system shall be designed to permit periodic testing of its ~~their~~ functionality.	Editorial correction.	✓			
10.	Requirement 54	**Requirement 54: Supplementary control room for a research reactor facility** **Provision of a supplementary control room for a research reactor facility, separated and functionally independent from the main control room, shall be considered in the design.**	For existing research reactors this requirement should be applied to the extent practicable, for instance by implementing a backup control/shutdown panel.		✓ Text modified in 6.188 to clarify …supplementary control room (sometimes known as a remote shutdown panel)...		Revised for consistency with SSR 2/1.

Member State Comments on draft Safety Standards on

[DS476 –Safety of Research Reactors – Master Copy]

COMMENTS BY REVIEWER					RESOLUTION		
Reviewer Country Organisation: Office for Nuclear Regulation, United Kingdom.			Date: 06/05/15				
Comment Nr	Para Nr. & Line	Proposed new text	Reason	Accepted	Accepted modified as follows	Rejected	Reason if modified/rejected
1	Para. 1.8, page 2	*Low power reactors are defined ≤10 KW, Medium power as >10KW but ≤100MW and High power as >100MW.*	Define what is high medium and low power reactors for clarity.			✓	Low, medium and high power are defined differently by Member States.
2	Para. 3.7, line 2.	After …conditions for the reactor, add "and include any maintenance requirements essential for maintain safety."	To link in maintenance requirements from the safety report to operational limits and conditions.			✓	Maintenance is covered in 7.38 and 7.39. This text would dilute the focus on OLCs and SAR.
3	Para. 6.180	"(d) Protection shall be provided against accidental disruption of, or deliberate interference with system operation"	Apply this to computer based systems involved in reactor protection as well as those involved in safety systems (see 6.184.(f)).	✓			

COMMENTS BY REVIEWER					RESOLUTION		
Reviewer Country Organisation: Office for Nuclear Regulation, United Kingdom.			Date: 06/05/15				
Comment Nr	Para Nr. & Line	Proposed new text	Reason	Accepted	Accepted modified as follows	Rejected	Reason if modified/rejected
4	Para 7.32, page 75		Requirement 71 is silent on environmental limits.	✓			Req 71 and 7.32 cover operation in accordance with licence conditions. This includes limits set by the relevant authorities.

COMMENTS BY REVIEWER					RESOLUTION		
Reviewer Country Organisation: Office for Nuclear Regulation, United Kingdom.			Date: 06/05/15				
Comment Nr	Para Nr. & Line	Proposed new text	Reason	Accepted	Accepted modified as follows	Rejected	Reason if modified/rejected
5	Requirement 77 Paras 7.68 to 7.76 Page 82		Would have expected the requirement to refer to maintenance requirements derived directly from the safety case. e.g. maintenance intervals to assure reliability assumptions. As written there is only an indirect link to safety case requirements via design intent and operational limits and conditions.	✓			Para. 7.38 links maintenance directly to compliance with the Safety Analysis Report. OLCs are part of Safety Analysis Report.
6	General Comment		The document is mature, well written and clear.	✓			Thanks!

Comments on "Safety of Research Reactors"

(Draft Specific Safety Requirements to supersede Safety Standard Series No. NS-R-4) (DS476)

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	multiple	Eliminate (delete) all reference to subcritical assemblies from this document and limit the scope of the body of the document to research reactors exclusively. Proposed approach: Develop a focused appendix to gather the pertinent requirements for subcritical assemblies and have the appendix reviewed by specialists who are experts in the design and regulation of these facilities.	Generally, there are 2 categories of subcritical assemblies - those that utilize natural uranium fuel with a light water moderator and those that use enriched uranium that may or may not use more exotic moderating materials such as heavy water. The hazards associated with the natural uranium fuel and light water moderated subcritical assemblies are so minimal that their inclusion in this document is not warranted from a safety perspective.			✓	The scope of the DPP includes subcritical assemblies, therefore this cannot be deleted. IEXs with experience in subcritical assemblies participated and contributed to the development of this

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			In the case of subcritical assemblies using enriched uranium, criticality control is a very important safety consideration. As such, there are concerns with the level of relevant operational experience with these higher performance subcritical assemblies possessed by technical contributors to this document. Many years of research reactor operating experience supports the research reactor guidance contained in the document; however, due to the relative rarity of high performance subcritical assemblies, an equivalent level of expertise does not support the guidance				doc.

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			related to the subcritical assembly. The concern is that critical design and operating guidance specific to the high performance subcritical assemblies may have been overlooked and not included in this document. For this reason, it is important to develop a separate document related specifically to the safety of high performance subcritical assemblies drafted by technical contributors with significant design and operational experience with these facilities.				
2	multiple	With respect to the multiple references to the design extension conditions, the document needs to	The need for significant assessment of design extension conditions and additional mitigating actions may not			✓	In accordance with the approved DPP, the scope of this doc

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		recognize, through the addition of appropriate language related to the application of a graded approach, that smaller research reactors (typically less than 2 MW_t) may not have the same vulnerability to design extension conditions and do not require additional assessment and mitigating actions. Proposed resolution: Delete the concept of design extension conditions from the main body of the requirements document (Note: This is consistent with the IAEA Task Force review of the requirements documents, i.e., no	be necessary for all research reactors. The reader needs to be aware that under some conditions additional assessment and actions may not be needed. The need for action must be determined by the assessment of the hazards presented by a research reactor for each applicable design extension event and then compared to the State's criteria for unacceptable radiological consequences.				includes a requirement on DEC as a lesson learned from the feedback from FD that is applicable to a range of RRs. The graded approach is used to apply this requirement to small RRs including those less than 2 MW_t. We agree that the need for action must be determined by the assessment of the

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		changes were necessary for NS-R-4.) Write an annex to the document that highlights: 1) Design Extension Conditions apply to higher power research reactors, per paragraph 1.8. 2) The design of research reactors should consider operational history, per revised para. 6.37. 3) Important Fukushima considerations for research reactors					hazards presented by a research reactor; this is covered in the text.
3	1.3		Section 1.3 includes both critical assemblies and subcritical assemblies	✓ Added			

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			within the definition of a research reactor, but Footnote 2 only mentions critical assemblies. This seems inconsistent.	both to footnote 2			
4	1.9		Section 1.9 contains the term "research reactors or subcritical assembly," whereas above a research reactor was defined as including subcritical assemblies. A general comment (consistent with the preceding comments) is therefore that the scope and clarity of such terms throughout the document appears to vary, and care should be taken that the terms are used consistently.	✓ Document checked and revised for consistency.			
5	1.3	In footnote #2, consider defining			✓		The approved DPP

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		critical and subcritical assemblies similar to how the term research reactor was defined. Recommend separating subcritical assemblies from DG476 because reference to these facilities is disjointed and the document is not fully applicable to these facilities			Footnote 2 revised to include critical and subcritical assemblies		includes subcritical assemblies in the scope therefore it is not appropriate to separate.
6	1.8	Consider using a separate document to address homogenous reactor or accelerator driven systems.		✓			Considered. This may be addressed elsewhere.
7	2.8	Remove text “safety features for design extension conditions.” See proposed resolution of comment #2 on DECs.	1. Concept generally does not apply to the range of research reactors because of their small risk. 2. The concept is too vague to be layered upon the concept of			✓	See response to comment #2 above.

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			"graded approach." 3. See proposed change to para. 6.37. 4. The IAEA review of requirements documents for Fukushima did not identify this as a concern. 5. Design extension conditions apply to a small segment of high power research reactors, per paragraph 1.8.				
8	2.12		The application of the five-layer defense-in-depth structure to critical and subcritical assemblies is not readily apparent, and may be different than for other research reactors. This has been a topic of much discussion with regard to criticality safety at fuel			✓	It is recognized that the application of DiD may be different for subcritical assemblies than for other research reactors. However,

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			facilities, where many of these concepts don't seem to fit. As an example, item (3) states that engineered controls shall be capable of transferring the research reactor first to a controlled and then to a safe state, but for a subcritical assembly in particular, there's no such thing as a controlled state. Safety consists in keeping it subcritical.				this is addressed in para. 2.12 where it states that the concept shall be applied with account taken of the graded approach.
9	2.12		Clarify the requirement for containment vs. confinement functions		✓		This is clarified in footnote 26 and in the Glossary
10	2.14	Delete item (4), referring to design extension conditions.	1. Concept generally does not apply to the range of research reactors because of their small risk.			✓	DEC is part of the scope to include feedback from FD.

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			2. The concept is too vague to be layered upon the concept of "graded approach." 3. See proposed change to para. 6.37. 4. The IAEA review of requirements documents for Fukushima did not identify this as a concern. 5. Design extension conditions apply to a small segment of high power research reactors, per paragraph 1.8.				See comment #2
11	3.2		Clarify the term, "global safety regime."		✓		The term is clarified in GSR Part 1, Ref. [3].
12	4.6/1	The safety policy of the operating organization shall include a	The regulatory body shall define the minimum level of safety through their			✓	The text is coherent with SSR-2/2, 4.5.

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		commitment to achieve~~ing enhancements~~ and maintain~~in~~ compliance with all regulatory requirements established by the regulatory body to ensure operational safety. ~~The strategy of the operating organization for enhancing safety and for finding more effective ways of applying and, where feasible, improving existing standards shall be continuously monitored, periodically revised and supported by means of a clearly specified programme with clear objectives and targets.~~	regulatory framework, and an expectation of positive safety culture. The operator must achieve and maintain compliance with the regulatory body's requirements. To impose an expectation on the operator to continuously enhance the safety at their facility is an unreasonable expectation and likely very difficult for a small facility, with a small operating staff, and limited funding.				Continuous enhancement is consistent with a safety culture that discourages complacency and encourages a questioning and learning attitude.
13	Requireme	Requirement 4: Integrated	The regulatory body shall define the			✓	See above resolution

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	nt 4	management system for a research reactor facility The operating organization for a research reactor facility shall establish, implement, assess and ~~continuously~~ improve ~~an~~ the facility's integrated management system as necessary to ensure facility safety.	minimum level of safety through their regulatory framework. The operator must achieve and maintain compliance with the regulatory body's requirements through an integrated management system. To impose an expectation on the operator to continuously improve the integrated management system absent a potential adverse impact on facility safety the safety at their facility is an unreasonable expectation and likely very difficult for a small facility, with a small operating staff, and limited funding.				to comment #12.
14	4.7		Clarify whether the term 'governed by			✓	This is applied using

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			the potential hazard of the reactor' is the same as 'graded approach.'				the graded approach.
15	4.20, footnote 15, pg. 20	"…or by independent external ~~independent~~ organizations."	Editorial	✓			Covered in footnote 12
16	4.23	"Deterministic safety analysis shall be the primary tool for safety assessment of research reactors. Probabilistic safety analysis may be used as a complementary tool for improving the safety assessment." [no change]	We strongly agree with this statement.	✓			
17	5.5/1	5.5. If the evaluation of the site and the operations area for these *four factors*, including their foreseeable evolution,……..	It is not clear as to what the four factors are referred to in section 5.5. In the Step 7 version of the document, Section 5.4 listed 4 aspects to be	✓			5.5 changed to 6 aspects for consistency.

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			considered. In the Step 8 version of the document there are now 6 aspects to be considered. Section 5.5 appears to refer to the aspects for consideration provided in Section 5.4. If so, then the number needs to be changed from 4 to 6 and the reference to "aspects" in Section 5.4 and "factors" as used in 5.5 needs to be consistent between the two Sections.				
18	5.7	Delete "and postulated worst combination of low probability but high consequence events that may exceed those conditions assumed in the design basis accident resulting in design extension conditions."	1. This is a new requirement beyond Ref. 5. 2. Research reactors did not require any modifications based on IAEA Fukushima Task Force review.			✓	Combined events in DEC is in accordance with the approved scope of the document. See comments #2

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
19	5.8	"…it shall be confirmed that ~~there will be no insurmountable difficulties in the development of~~ off-site emergency arrangements, where appropriate, will be available prior to the start of reactor operation…"	Clarify the term "insurmountable difficulties."	✓			
20	5.12	"…the suitability of the site to accommodate a nuclear installation shall be carefully analysed to ensure agreement with regulations related to ~~avoid unacceptable~~ radiological risk to site personnel and public."	Clarify the phrase, "unacceptable radiological risk to site personnel and public."		✓ ensure agreement with regulations related to…		Text also revised to address comments from USA, GER and IRA
21	6.8	Delete "or large radioactive releases are practically eliminated." Delete footnote 22.	This is a power reactor concept that does not apply to research reactors except per paragraph 1.8. It only adds			✓	This applies to medium and high power research

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			complexity, without substantial benefit.				reactors.
22	6.17	Delete "In particular, safety features for design extension conditions (especially features for mitigating the consequences of accidents involving the melting of fuel) shall be as far as practicable independent of safety systems."	This is a power reactor concept that does not apply to research reactors except per paragraph 1.8. It only adds complexity, not clarity.			✓	DEC is within the scope of the doc. See resolution to comment #2.
23	6.24 / 3	"…reactor ~~and selected design extension conditions~~ shall be identified…"	This is a power reactor concept that does not apply to research reactors except per paragraph 1.8. It only adds complexity, not clarity.			✓	DEC is within the scope of the doc. See resolution to comment #2.
24	6.37	Add the following sentence to the end of the requirement: "This includes consideration of	This is a more practical and implementable design consideration for research reactors as compared to			✓	Req. 18, paras 6.35-6.44 and Appendix 1 together

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		events or conditions that are beyond those design practices of current research reactors, similar to the concept of design extension conditions for nuclear power plants."	the wholesale imposition of the power reactor concept of design extension conditions.				address PIEs adequately. The text is coherent with SSR-2/1 Rev 1.
25	6.49		It is difficult to conceive of how the addition of moderator from firefighting systems would not "increase the criticality risk" for a subcritical assembly. A more reasonable criterion would be to design subcritical assemblies to be safely subcritical when optimally or fully flooded.		✓		Text added (footnote 25) to indicate that subcritical assemblies shall be designed to be safely subcritical when fully flooded.
26	6.62/2	6.62. The design of subcritical assemblies shall include technical provisions to prevent ~~inadvertent~~	In a subcritical assembly, criticality is to be prevented under all circumstances. Section 6.66 confirms	✓			

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		criticality. ~~conditions~~ (see para. 6.66).	that intent				
27	Requirement 22	Delete Requirement and associated sub-paragraph. Write an annex to the document that highlights: 1. Design Extension Conditions apply to higher power research reactors, per paragraph 1.8. 2. The design of research reactors should consider operational history, per revised para. 6.37. 3. Important Fukushima	Deleting the concept of design extension conditions from the main body of the requirements document is consistent with the IAEA Task Force review of the requirements documents, i.e., no changes were necessary for NS-R-4.			✓	This concept of DEC is consistent with the approved DPP and is coherenent with SSR-2/1.

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		considerations for research reactors					
28	6.64/1	6.64. An analysis of design extension conditions shall be performed to determine if the potential radiological consequences exceed those deemed unacceptable by the State. The main technical…….	If the postulated radiological consequences exceed those the State has determined to be unacceptable, then some type of action is necessary. The tone of this paragraph (6.64) leads the reader to believe the only acceptable options are a revised design or extended capability of the safety system. It ignores the option for the inclusion of additional mitigative strategies using portable equipment and/or operator actions. The ignored option is likely to be the most reasonable option for existing research			✓	The text is coherent and consistent with SSR-2/1 Rev. 1, 5.27. Paragraph 6.64 does not ignore the option to include mitigative strategies. The text states "…or to mitigate their consequences, as far as reasonable practicable." This allows for the

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			reactors.				use of portable equipment.
29	6.66		The term "inherent safety provisions" is vague and not commonly used in the industry. Would this include fixed assembly geometry, spacing, and the use of fixed neutron absorbers? Limiting the assembly to natural uranium or a limited quantity of fissile material may not be feasible, and reliance on these other parameters may be necessary. The meaning of "mitigatory measures" is also unclear. Is this mitigation in the sense of limiting the resulting dose if criticality cannot be sufficiently		✓ "inherent" deleted.		Additional text added for clarification. Measures for mitigating the consequences shall be determined and implemented on the basis of safety analysis.

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			precluded (e.g., by shielding and/or remote assembly)? The meaning should be clarified.				
30	6.91/2	The availability of reliable and diverse means of communication necessary for safety and emergency response within the reactor facility, including the supplementary control room (if there is one), and with the emergency centre, shall be ensured at all times...	Footnote 28 should be included in the text to emphasize its importance as a design criterion, and not relegated to a footnote. Communication with the emergency centre should be added, consistent with paragraph 6.185. The necessity of the communications should include the purpose of "emergency response" consistent with the purpose statement of Requirement 32.			✓	The text is coherent with SSR-2/1, 5.66 and 5.67. Additional requirements here would introduce redundancy with 6.185 and FN 28. Communication systems for emergency response are also covered in 7.93.

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
31	6.121	Delete (e) and "and the safety features for DEC" in part (g).	1. The concept generally does not apply well to research reactors. 2. See comment on para. 6.37. 3. Not identified in IAEA Fukushima review.			✓	DEC is part of the approved scope.
32	6.128 / 7	Delete, "…and, to the extent practicable, in design extension conditions"	The graded approach and "to the extent practical" are overlapping and confusing concepts.			✓	To the extent practicable is not inconsistent with the graded approach.
33	6.131	Delete 2nd sentence: The resistance of barriers in design extension conditions shall be analysed for determination of adequacy considering planned mitigation measures.	This is a new and complex requirement that goes beyond even the power reactor requirements.	✓			
34	Requireme	Delete "and where appropriate	This is a new, unwarranted	✓			Coherent with

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	nt 44	design extension conditions."	requirement that goes beyond even the power reactor requirements.				SSR-2/1.
35	6.140	"All foreseeable intentional or abnormal reactor core configurations…"	Does the phrase "all foreseeable reactor core configurations" include those arrived at through abnormal conditions, such as by a fuel misload condition (as occurred in the 1983 accident)? This requirement should be applied in accordance with the double contingency principle, such that no single fuel misload can lead to criticality. It is interesting that the entire document does not mention such a fundamental principle of criticality safety (i.e., double contingency).		.	✓	"All foreseeable" covers all operating states and design basis accidents conditions. This includes intentional or abnormal conditions. Double contingency is commonly applied to fuel cycle facilities.
36	6.143,		Consider defining "critical facility."		✓ critical		Changed to critical

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	footnote 30				assembly		assembly.
37	6.145	"…criticality cannot be reached ~~in any~~ by any single change in the core configuration…"	The requirement stated here, that criticality in a subcritical assembly cannot be reached in any core configuration, temperature, moderation, or reflection conditions, seems to go beyond what is normally required for fuel applications, namely the double contingency principle. It is certainly possible to achieve criticality as long as greater than a critical mass is present. What is normally required in fuel applications is that the assembly must be shown to be subcritical following any single change in process conditions. Clarity would be achieved			✓	All planned core configurations are to be analyzed. The requirement for a subcritical assembly is that critically cannot be reached in any core configuration. A single change is a subset which is also covered here. See also NS-G-4.3

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			by putting this section in the context of meeting double contingency.				
38	6.147		Same comment as for 6.145 and 6.140. "The subcritical condition shall be justified for any configurations" is too broad and not consistent with the historical approach to criticality safety (double contingency).			✓	This is reasonable given the context of any core configuration for subcritical assemblies.
39	6.149		Same comment as for 6.147, 6.145, and 6.140. In addition, "may not be required" should be changed to "are not required," because it is never necessary to control reactivity if criticality is not possible.			✓	"may" is suitable as the designer or operator may choose to include this provision.
40	6.150		Footnote 31 to 6.150 does not make any sense. A subcritical assembly		✓ Add quote		The term "shutdown" is used

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			does not need to be "shut down," as it is already subcritical. The term "shut down" is normally taken to mean that it is rendered subcritical, but in this case, removing the neutron source will only reduce the fission rate which, for a critical assembly, is generally referred to as the power level. Either this section should refer to critical, and not subcritical, assemblies, or else the meaning of the term "shut down" should be explained.		"shutdown" to indicate no longer in operation mode		here to indicate that the subcritical assembly is no longer in operation mode.
41	6.155	Delete "and in design extension conditions without core melt"	This is a new requirement that is overly complex and prescriptive.		✓		Text revised to accident conditions for coherence with SSR-2/1 and Req. 46

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
42	6.162		Section 6.162 states that subcritical assemblies do not require cooling systems, but this disagrees with Footnote 30, which states that some critical and subcritical assemblies may not need cooling. Footnote 33 also says they do not need cooling systems, but Footnote 35 says they may not need emergency cooling systems. It is correct to say that subcritical assemblies do not require cooling for heat removal to prevent damaging the fuel (although conceivably cooling could be provided for other reasons). However, it is confusing to then say		✓ For heat removal		Clarification add to show cooling not required for heat removal, but provisions shall be provided in fluid systems to preserve the fuel elements and SSC. Footnote also clarified.

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			that, although they do not require cooling systems, they still need to monitor and control the coolant, etc. If there is no cooling system, there is no coolant.				
43	6.164	Delete 2nd sentence: "Special procedures for cooling the core shall be considered in the case of selected design extension conditions."	This is redundant to the graded approach.			✓	It is appropriate to consider special procedures. Important lesson learned from FD.
44	6.202/3	Where liquid ~~(and gaseous)~~ radioactive waste is to be handled, provision shall be made for the detection of leakage and the recovery of waste, if appropriate. Where gaseous radioactive waste is to be	It is not clear how, from a practical perspective, one would recover gaseous waste. Once leaked, one may be able prevent release via facility isolation, or one can delay its release allowing for radioactive decay, or one		✓ …below release limits.		Agreed. Further simplification …below release limits..

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		handled, provisions shall be made for the detection of leakage and to prevent or control its release to below State established environmental release limits.	can release it, if within regulatory release limits.				
45	6.210/6	(c) The facility layout permits safe movement of the lifting equipment and of items being transported~~;~~ in accordance with analyzed safe load pathways;	Pre-established safe load pathways can significantly reduce the risk of damage to SSC important to safety from lifting equipment failure or mishandling.	✓			The text is consistent with SSR-2/1.
46	6.210/10 (new)	(e) lifting equipment can be inspected on a periodic basis	It is essential, as a matter of industrial and nuclear safety, that lifting equipment is inspected routinely. The design of this equipment should facilitate such inspection.	✓			

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
47	Requirement 66/7	……will not compromise confinement or will not lead to ~~an~~ unacceptable ~~radiation exposure~~ radiological consequences.	There are other consequences other than radiation exposure (e.g; contamination of the environment)	✓			
48	Requirement 72	Requirement 72: Performance of ~~safety related~~ activities ~~for~~ at a research reactor facility The operating organization for a research reactor facility shall ensure that ~~safety related~~ activities are adequately analyzed and controlled to ensure that the risks associated with harmful effects of ionizing radiation are kept as low as reasonably achievable.	Not all activities performed in research reactor radiations areas are safety related; therefore, all activities performed in radiation areas at research reactors should be considered. The terminology used should not make unnecessary reference to safety classification schemes.			✓	Yes the Operating Organization should analyze all activities but the scope of Requirement 72 is appropriately focused on safety related activities. Others general activities are covered, for example, in Sec. **4**.

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
49	7.52		Section 7.52, together with Footnote 41, make it clear that some commissioning testing may not be needed for subcritical assemblies. This is correct, but the equivalent of "initial criticality tests," namely verifying adequate subcriticality (e.g., through 1/M calculations) is appropriate and advisable.	✓			Suggested text added to footnote for clarity.
50	7.58	In item (g), delete, "and, to the extent feasible, to design extension conditions"	This is not a practical concept for research reactors.			✓	DEC is within the scope. See comment # 2.
51	New requirement		This document should also include a requirement for the financial qualification of the operator that demonstrated sufficient financial			✓	This is covered in the Code of Conduct on the Safety of Research Reactors.

COMMENTS BY REVIEWER Reviewer: U.S. NRC Country/Organization: USA Date: April 27, 2015				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			assurance that the research reactor can be safely designed, constructed, operated and decommissioned.				

Draft Specific Safety Requirements DS476 "Safety of Research Reactors"

(Version dated 5 December 2014)

Status: STEP 8 – Submission to the Member States for comments

Note: Blue parts are those to be added in the text. ~~Red parts~~ are those to be deleted in the text.

	COMMENTS BY REVIEWER				RESOLUTION			
	Reviewer: **Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)** (with comments of BfS and GRS) Page 1 of 21 Country/Organization: **Germany** Date: 2015-04-30							
Relevance	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	1	General	Within DS476 the term *government* shall be used consistently wherever the function of the government with respect to GSR part 1 is addressed. This will improve the consistency within DS476 and within the IAEA safety standards in general. Mixing of the terms *government* and *state* should be avoided not to confuse the reader.			✓		Checked and used consistently. E.g. Ref [17]
2	2	General	Please use the general term *authorization* consistently within DS476 and avoiding similar terms like *licensing* or *approval*, etc..			✓		Footnote 8 clarifies that Authorization includes approval and

								licensing.
1	3	1.6	The safety requirements established in this publication are applicable for the site evaluation, design, manufacturing, construction, commissioning, operation, utilization and decommissioning of research reactors, including critical and subcritical assemblies as well as homogenous reactors and accelerator driven systems.	The main objective of a research reactor is its experimental and scientific utilization. This is also addressed in DS476 (see e.g. requirements 36 and 83 as well as para. 1.4). Please include homogeneous reactors and accelerator driven system. (Para. 1.6.) It is stated in para. 1.8 that accelerator driven systems are not within the scope of DS476. However, accelerator driven systems with a sub-critical core will be deployed in the near future (e.g. the MYRRHA project in Belgium). These kinds of research facilities have similar properties and shall be considered too by the IAEA.		✓ Utilization and modification added in text.		In accordance with the approved DPP, homogenous reactors and accelerator driven systems are out of scope.

1	4	1.8	Research reactors with power levels in excess of several tens of megawatts, fast reactors, and reactors using experimental devices such as high pressure and temperature loops, and cold or hot neutron sources may require the application of supplementary measures or even the application of requirements for power reactors and/or additional safety measures (e.g. in the case of reactors used for testing hazardous material). For such facilities, the requirements (and engineering standards) to be applied, the extent of their application and any additional safety measures that may need to be taken are required to be proposed by the operating organization and to be subject to approval by the regulatory body. ~~Homogeneous reactors and accelerator driven system are out of the scope of this publication.~~	To be consistent with our comment on para. 1.6.			✓	In accordance with the approved DPP, homogenous reactors and accelerator driven systems are out of scope.
3	5	1.11 /2	Terms in this publication are to be understood as defined and explained in the IAEA Safety Glossary Ref. [6], unless otherwise stated here (see under	Editorial	✓			

			Definitions).					
2	6	2.3	The fundamental safety objective applies to all facilities and activities and for all stages over the lifetime of a facility or radiation source, including planning, siting, design, manufacturing, construction, commissioning, ~~and~~ operation and utilization, as well as decommissioning and closure.	The main objective of a research reactor is its experimental and scientific utilization. This is also addressed in DS476 (see e.g. requirements 36 and 83 as well as para. 1.4).	✓			
3	7	2.16	Qualitative categorization of the facility should be performed on the basis of the potential risk of the research reactor (more guidance can be found in [2]).	Add here a reference to SSG-22.		✓ Added See Ref. [2]		Guidance text is discouraged in Requirements documents.
2	8	3.1 /1-2	~~For a nuclear installation that is built, is in operation or is to be built (or to undergo a major modification), a legal infrastructure is required to be established that~~ The government (i.e. the State) shall ensure that an adequate legal infrastructure for a nuclear installation is available. This shall provide~~s for~~ the regulation of nuclear activities and ~~for~~ the clear assignment of responsibilities for safety in all stages in the lifetime of the facility.	The government shall be responsible for a legal infrastructure.	✓			

2	9	3.1 / 4	According to the principles quoted below the government is responsible for the adoption of legislation that assigns the prime responsibility for safety to the operating organization and establishes a regulatory body. General safety requirements to fulfil these principles are presented in Governmental, Legal and Regulatory Framework for Safety Ref. [3]. […]	Clarification and link to GSR Part 1. (Ref [3])			✓	Redundant. The clarification and link is provided below in 3.2 which is useful for the reader of the document.
2	10	3.2 / 1-14	~~General safety requirements to fulfil these principles are presented in Governmental, Legal and Regulatory Framework for Safety [3]. This publication covers the essential aspects of the governmental and legal framework for establishing a regulatory body and for taking actions necessary to ensure the effective regulatory control of facilities and activities — existing and new — utilized for peaceful purposes. Other responsibilities and functions are also covered, such as liaison within the global safety regime and liaison for providing the~~	Delete. It is not the requirement but description of other publication. In this case an adequate reference is sufficient (and this one is given in 3.1.).			✓	The text provides clarification and a link to GSR Part I. It also provides useful information for the reader and for RBs without a NPP.

			~~necessary support services for the purposes of safety (including radiation protection), emergency preparedness and response, nuclear security9, and the State system of accounting for, and control of, nuclear material. These general safety requirements apply to the legal and governmental infrastructure for the safety of research reactors during site evaluation, design, construction, commissioning, operation, utilization, modification and decommissioning. The application of a graded approach that is commensurate with the potential hazards of the facility is essential and shall be used in the determination and implementation of adequate safety requirements (see paras 2.15–2.17).~~					
3	11	Footnote No. 10 to 3.4 (e)	"… their safety implications give rise to a large number of review and assessment activities that are repeated many times over the lifetime of the reactor facility (see paras 7.98~~99~~–7.106~~107~~)."	Wrong paragraphs are cited in the footnote.	✓			
2	12	3.6 / 1	The safety analysis report is the main	Clarification. Please use the	✓			

			document for the ~~licensing~~ authorization of the research reactor facility and an important link between the operating organization and the regulatory body.	same terms in the entire text. Compare e.g. Req. 1: […] The safety analysis report shall be reviewed and assessed by the regulatory body before the reactor project is authorized to progress to the next stage.				
3	13	4.20 / 2	The effectiveness of the integrated management system shall be periodically assessed through audits[~~15~~] and self -assessments.	Audits are already defined in footnote 12.	✓			
3	14	Footnote No. 13 to 4.5	" 'Senior management' means the person or persons who are accountable for meeting the terms established in the licence, and/or who~~, or group of people which,~~ direct~~s~~, control~~s~~ and assess~~es~~ an organization at the highest level. Many different terms are used, including, for example: board of directors, chief executive officer, director general, executive team, plant manager, top manager, chief regulator, site vice-president, managing director and	Text modified to be in line with the definition provided in the Draft Safety Requirements DS456 "Leadership and Management for Safety" (revision of GS-R-3, latest version dated 26 January 2015 – SPESS Step 10), see footnote No. 6 therein.	✓			

			laboratory director.”					
2	15	4.13	“The provisions of the integrated management system shall be based on four functional categories: (a) management responsibility; (b) ~~resource~~ management of resources; (c) management of processes and activities; ~~implementation~~ and (d) measurement, assessment~~, evaluation~~ and improvement of the management system.”	Ensuring consistency with the modified structuring in the Draft Safety Requirements DS456 “Leadership and Management for Safety” (revision of GS-R-3, latest version dated 26 January 2015 – SPESS Step 10), see Section 4 “Management for Safety” therein. The present categorization is still based on the existing Safety Requirements GS-R-3 “The Management System for Facilities and Activities”. Please include consecutive numbering in order to support structuring of the four functional categories. Modification of subsequent headlines in this subsection (Paras 4.14–4.20) may be necessary for maintaining	✓			

				consistency with the functional categories mentioned in Para. 4.13.				
3	16	4.15	1st sentence: "Resource management shall ensure that the resources[footnote] essential to the implementation of the organizational strategy and the achievement of the organization's objectives are identified and made available." Please assign a new footnote to the term 'resources' with the following text: "[footnote] 'Resources' includes individuals, infrastructure, the working environment, information and knowledge, and suppliers, as well as material and financial resources."	Clarification to be in line with the definition provided in the Draft Safety Requirements DS456 "Leadership and Management for Safety" (revision of GS-R-3, latest version dated 26 January 2015 – SPESS Step 10), see footnote No. 9 therein.	✓			
3	17	Req. 5	"The adequacy of the design of the research reactor shall be verified according to the management system by means of comprehensive deterministic safety assessment and compl~~i~~ementary probabilistic analysis as appropriate …"	Editorial.	✓			

1	18	4.26 / 5-6	Activities for systematic periodic assessments include, among others, periodic safety reviews such as self-assessments and peer reviews[17] to confirm that the safety analysis report and other selected documents (such as documentation for operational limits and conditions, maintenance, training and qualification) for the facility remain valid in view of current regulatory requirements; or, if necessary, to update or make improvements ~~to the extent practicable~~ to ensure the safety according to the actual state of the art in science and technology.	The main idea of PSR is to find possible improvements with respect to nuclear safety. The proposed changes will reflect the idea of continuous improvement.			✓	The text is coherent with SSR-2/1 Rev. 1 para. 1.3 that mentions periodic safety review is to determine whether safe operation could be further improved by means of reasonable practicable safety improvements.
3	19	5.3 / 3	The site evaluation shall establish the boundaries of the site area satisfying the main safety objective (5.1) and the exact localization of the reactor and associated facilities (operations area), which is under the control of the reactor management[21] ~~(see footnote 38)~~, […]	It is common to give a definition when a new term occurs for the first time in a text. (Please give an adequate definition as footnote 21).	✓			

2	20	5.5 / 1	If the evaluation of the site and the operations area for these ~~four~~ six factors mentioned in 5.4., including their foreseeable evolution, […]	Clarification	✓	✓ Six aspects		
1	21	5.12	When a new research reactor project is planned for an existing site such as research centre or university campus in an urban or suburban environment, the capacitiy and suitability of the site to accommodate a further nuclear installation shall be carefully analysed to avoid unacceptable radiological risk to site personnel and public.	The suitability of a site has to be evaluated in any case, independent if this is new or existing site. For an existing site it is more the question of the capacity of the site to host a further nuclear facility. (see also NS-R-3 para. 2.6)		✓ Capacity added.		The university campus or existing site may not have a nuclear installation "further" not added.
2	22	Req. 7	"The design for a research reactor facility shall ensure the fulfilment of the following ~~fundamental~~ main safety functions for the research reactor for all states of the facility: …"	Requirement 7 is entitled "Main safety functions for a research reactor". Consistency with the title as well as with the terminology used elsewhere in the document (Paras 6.6, 6.7, 6.14 (f), and 6.188) is strongly recommended. According to the IAEA Safety Glossary (2007	✓			Fundamental safety function is used in SRR-2/1.

				Edition), the term 'fundamental safety functions' is deprecated and 'main safety functions' is used instead.				
1	23	6.8	The design shall ensure that facility states that could lead to high radiation doses or significant ~~large~~ radioactive releases[FN] are practically eliminated[22] and that there are no, or only minor, potential radiological consequences for facility states with a significant likelihood of occurrence. [FN] "Significant radioactive releases": Large or early releases for which protective measures limited in area and time are insufficient to protect the people and the environment.	There are two different objectives: • Large releases will challenge the restriction to protective measures limited in area and time. • Early releases will challenge the implementation of off-site countermeasures in due time. See also footnote on "significant radioactive releases" in revised SSR 2/1.			✓	Text is coherent with SSR-2/1. Rev.1, 4.3. In the current version significant is deleted; the requirement is for large radioactive releases to be practically eliminated.
3	24	6.13	"The defence in depth concept (see paras 2.10–2.14) shall be applied to provide several levels of defence …"	Corresponding reference to subsection "Defence in depth concept" will be helpful for the reader of the document.		✓		
2	25	Require	~~Requirement 11: Interfaces of safety with~~	Please delete at this place.			✓	Req. 11 is a

		ment 11	~~security and safeguards for a research reactor facility~~ ~~Safety measures, nuclear security measures and arrangements for the State system of accounting for, and control of, nuclear material for a research reactor shall be designed and implemented in an integrated manner so that they do not compromise one another.~~	There is a separate chapter on the interface between nuclear safety and nuclear security. Please compare also with Req. 90 and our comments to Req.90.				"design' requirement. Req. 90 is an interface requirement.
2	26	6.26 / 3	The construction shall start only after the operating organization has verified that the main safety issues in the design have been resolved and after the regulatory body has granted an authorization ~~(e.g. construction license)~~.	This information is not necessary			✓	The information is useful for newcomer countries embarking on RR projects
3	27	6.27 (c)	"… provision for managing the radioactive waste that will be generated in the decommissioning of the ~~of the~~ facility."	Wording.	✓			
2	28	6.31	"Equipment that performs multiple functions shall be classified in a safety class that is assigned to those functions ~~performed by the equipment~~ having the highest safety significance."	To improve wording and to streamline the requirement without loss of information.	✓			
3	29	6.36	"The postulated initiating events shall be	Editorial.	✓			

			identified on the basis of engineering judgement, operational experience~~s~~ feedback and deterministic assessment …"					
2	30	6.51	1st sentence: "Fires and explosions shall not prevent achievement the ~~fundamental~~ main safety functions as well as monitoring the status of the facility."	The term *main safety functions* supersede the term *fundamental safety functions*.	✓			Fundamental used in SSR-2/1 Rev.1
2	31	6.52 / 1	An analysis of the list of postulated initiating events listed in appendix 1 shall be made to establish all those external events that could affect the safety of the research reactor facility. The design basis for items important to safety with respect to ~~natural and human induced~~ external ~~events~~ hazards shall be determined. The events to be considered shall include those that have been identified in the site evaluation (see Section 5).	Hazard shall not be considered as PIEs (see also discussions with respect to SSR 2/1 and the TECDOC to SSR 2/1 currently under development at IAEA). If for research reactors external hazards shall be considered as PIEs, please add the first sentence. Corresponding reference to Section 5 "Site evaluation for reasearch reactor facilities" will be helpful to guide the reader through the document.		✓ Ref. to Section 5 added.		This is for events not hazards. Suggested text redundant with requirements 18 and para. 6.35

1	32	6.54/ 1.3	Consideration shall be given to seismic hazards, including the possibility of equipping the research reactor facility with ~~The research reactor facility shall be equipped with a~~ seismic detection systems that actuate the~~. In case of earthquakes exceeding specified thresholds,~~ automatic reactor shutdown systems ~~shall be actuated~~ if a specified threshold value is exceeded.	Not all research reactors will need a seismically triggered reactor shut down system.		✓ … if a specified threshold value is exceeded.		Text also revised to address comments from CAN, RUS, ROM.
2	33	6.56	"The design shall be such as to ensure that all items important to safety are capable of withstanding the effects of external events considered in the design, and if not, other features such as passive barriers shall be provided to protect the reactor facility and to ensure that the ~~fundamental~~ main safety functions will be achieved."	The term *main safety functions* supersede the term *fundamental safety functions*.	✓			Fundamental used in SSR-2/1 Rev.1
2	34	6.60	"Where prompt reliable action is required in response to postulated initiating events, the design of the reactor shall include means of automatically initiating the operation of the necessary safety systems. The design shall reduce demands on the operator as far as reasonably practicable, in	In the case that prompt reliable action is required, the concept of 'within reason' for demands on the operator is very important, in particular during and following a design basis accident.	✓			

			particular during and following a design basis accident.”					
2	35	6.64	“… The main technical objective of considering the design extension conditions is to provide assurance that the design of the facility is such to prevent accident conditions beyond those considered in the design basis accidents, or to mitigate their consequences, as far as is reasonably practicable. This might require additional safety features for design extension conditions, or extension of the capability of safety systems to maintain the ~~fundamental~~ main safety functions, especially the confinement function. …”	The term *main safety functions supersede* the term *fundamental safety functions*.	✓			Fundamental is used in SSR-2/1
3	36	Footnote 26	Confinement Ref. [6] is the function of containing radioactive material within a nuclear reactor so as to prevent or mitigate its unplanned release.	Editorial	✓			
3	37	6.67	1st sentence: “The analysis undertaken shall include identification of the safety features that are designed for use in, or that are capable of preventing or mitigating, events	Adapt wording to be in line with the terminology used elsewhere in the document.	✓			

			considered in the design extension conditions."					
1	38	6.68	"The design shall be such that the possibility of conditions arising that could lead to early or large radioactive releases[footnote] is ~~are~~ practically eliminated. The design shall be such that for design extension conditions, ~~if not~~ protective measures that are limited in terms of times and areas of application shall be ~~established~~ sufficient for the protection of the public, and sufficient time shall be ~~made~~ available to ~~implement these~~ take such measures." In addition, please assign a new footnote to the term 'early or large radioactive releases' with the following text: "[footnote] The term 'early radioactive release' means a release for which off-site protective measures are necessary but are unlikely to be fully effective in due time. The term 'large radioactive release' means a release for which off-site protective	The present sentence construction is cumbersome and overly convoluted. Therefore, it gives rise to confusion. Splitting into two separate sentences is strongly recommended, in order to improve the readability and comprehensibility of the entire statement. Our proposed changes are fully consistent with the corresponding requirements in SSR-2/1 Rev. 1 "Safety of Nuclear Power Plants: Design" (DS462), final version November 2014 endorsed by the CSS (see Paras 5.31, 5.31a and Footnote No. 3 therein). Link: http://www-ns.iaea.org/committees/css/default.asp?fd=10	✓			

			measures limited in terms of times and areas of application are insufficient to protect people and the environment.”	84 A short explanation of the terms ‘early radioactive release’ and ‘large radioactive release’ should be provided in a footnote since both terms are defined neither in the Section “Definitions” at the end of the document nor in the IAEA Safety Glossary (2007 Edition).				
1	39	6.78	“Multiple sets of equipment that cannot be tested individually shall not be considered redundant. ~~Where multiple sets of redundant equipment can systematically fail by the same cause (see Requirement 26), it shall be considered to be a single failure.~~”	A common cause failure cannot be considered as a single failure. The single failure criterion is a deterministic approach to increase reliability of items important to safety by a redundant design. The degree of redundancy depends on the safety significance. A common cause failure will lead to a loss of all redundant	✓			

				trains and requires divers items important to safety. According to the argument above it is proposed to delete this paragraph. With respect to this proposal, compare with the IAEA resolution table of SSC members comments (November 2014), comment No. 85 provided by Germany. This comment has been accepted but not implemented in the latest version of DS476.				
1	40	after Requirement 25	The principle of redundancy shall be applied as an important design principle for improving the reliability of systems important to safety. The design shall be such as to ensure, on the basis of analysis, that no single failure could result in a loss of the capability of a system to perform its intended safety function.	Please, add a new paragraph explaining the principle of redundancy to cope with single failure events.			✓	This is suitable as guidance. Explanations are discouraged in Requirements docs. The text is coherent with SSR-2/1 Req.

								25.
1	41	after Requirement 26	The principle of diversity shall be considered in the design of research reactor facility to enhance reliability of items important to safety and to reduce the potential for common cause failure.	Please, include new paragraph after requirement 26 to explain the principle of diversity.			✓	This is adequately covered in Req.26 and 6.80. The text is coherent with SSR-2/1 Req. 24.
1	42	6.90 / 1-5	The inclusion of specific design features for facilitating emergency planning shall be considered, depending on the potential hazard deriving from the reactor. The need for such design features shall be determined by means of analyses of design extension conditions. The research reactor facility shall be provided with a sufficient number of safe escape routes, clearly and durably marked, with reliable emergency lighting, ventilation and other building services essential to their safe use. The escape routes shall meet the relevant national requirements for radiation zoning, fire protection, industrial safety and	Requirement should be more precise.			✓	The text on escape routes is coherent with SSR-2/1, 5.64. Analysis of DEC and the suggested additional text goes beyond that in SSR-2/1.

			nuclear security (see also Section 9) and shall consider the relevant international requirements.					
3	43	6.92 / 2	In the design of the research reactor and its experimental facilities and in any modifications of them, consideration shall be given to facilitating decommissioning Ref. [9].	Editorial	✓			
3	44	6.94 / 1	In accordance with the radiation protection objective (see para. 2.1. of Ref. [1]) for all […]	Editorial	✓			
3	45	6.97 /5	This shall be accomplished by establishing zones within the facility (in supervised and controlled areas see Requirement 24 of Ref. [12]) that are classified according to their hazard potential.	Editorial	✓			
2	46	6.110 / 1	Modifications of research reactors and experimental devices shall be designed preserving the means of confinement and shielding of the reactor.	Clarification that modifications of the research reactor itself as well as of experimental devices are meant here.	✓			
3	47	Require ment 41 / 2	A safety analysis of the design for a research reactor facility shall be conducted in which methods of ~~both~~ deterministic	Editorial	✓			

			analysis and complementary probabilistic analysis as appropriate shall be applied to enable the challenges to safety in all plant states to be evaluated and assessed.					
3	48	6.119 / 5	[…] that could lead either to anticipated operational occurrences or to accident conditions (see also Ref. [11]).	Editoral	✓			
3	49	6.119 (c)	[…] for the development of operating procedures, inspection and periodic testing programms, record keeping practices, maintenance schedules, proposals for modifications and emergency planning Ref. [10].	Editorial	✓			
2	50	6.121 (g) / 2	The analysis of safety systems and the engineered safety features and the safety features for DEC (design extension conditions);	Unclear. Please give a full name while using the abbreviation for the first time.	✓			
1	51	6.131 / 3	The barriers shall be designed to withstand with suitable margins for the highest calculated pressure and temperature loads expected in ~~design basis~~ accident conditions or in case of internal or external hazards.	The barriers should withstand internal as well as external hazards and all kinds of accident conditions.			✓	Requirement is for design basis accidents. Sentence on DEC deleted per comment 33 from USA

1	52	6.139	Please add a new last sentence: "… Consideration shall be given in the design of the fuel elements to the requirements relating to the long term management of irradiated elements. This may include either reprocessing and/or conditioning for disposal."	Clarification with regard to the term 'long term management'. For sure, storage cannot be considered the ultimate solution for the long term management of the irradiated fuel elements, which requires a defined end point such as reprocessing or disposal in order to ensure safety. Consequently, design of the fuel elements shall also consider the requirements relating to the final step in the management of irradiated fuel elements (i.e. reprocessing or conditioning for disposal). Storage is alrady covered in Para. 6.197 which states that "*The implications of the storage of irradiated fuel and core components over an extended time period shall be*		✓ … irradiated elements, which may include reprocessing and/or conditioning for disposal.		Further Clarity.

				considered in the design, where applicable." Both reprocessing and conditioning for disposal generate long lived radioactive wastes that need to be disposed of in a deep geological repository. However, HLW from reprocessing and LILW from conditioning have different impacts on deep geological disposal and impose different requirements on storage. We expressly disagree that our proposal is more suited to guidance, as stated in the IAEA resolution table of SSC members comments (November 2014), see comment No. 99 provided by Germany. Such 'may' statements are also used				

				elsewhere in the document. The back-end of the research reactor nuclear fuel cycle is not solely a technical issue. Non-proliferation, physical security and environmental concerns are equally as important as technical concerns. Final disposition of irradiated fuel elements is an important research reactor safety issue worldwide. For example, reprocessing of TRIGA spent fuel has only been demonstrated on a laboratory scale and no commercial service is currently available.				
3	53	6.144	"Wherever possible, the design of the reactor core shall make use of inherent safety characteristics to minimize the consequences of accident conditions ~~(that are produced by~~ due to transients and instabilities~~)~~."	Wording.	✓			

2	54	Req. 49	"Instrumentation shall be provided for a research reactor facility for monitoring the values of all the main variables that can affect the performance of the ~~fundamental~~ main safety functions, the main process variables that are necessary for its safe and reliable operation, to determine the status of the facility under accident conditions and for making decisions for accident management." Appropriate and reliable control systems shall be provided at the nuclear power plant to maintain and limit the relevant process variables within the specified operational ranges.	The term *main safety functions* supersede the term *fundamental safety functions*. Control systems are missing. Proposed text recaptures Requirement 60 if SSR 2/1.	✓			
3	55	Footnote No. 39 to 7.5	"The reactor manager does not necessarily need to hold a licence to operate the reactor, but needs to have passed through a training programme (see para. 7.30~~31~~)."	Wrong paragraph is cited in the footnote.	✓			
3	56	7.6	"… the operating organization shall have overall responsibility for the preparation and satisfactory completion of the commissioning programme (see para~~s~~ 7.51)."	Editorial.	✓			
2	57	7.26 /	~~In some States, an advisory group (or a~~	It is a statement, but not a		✓		Text revised for

		1-4	~~reactor safety committee) is established to advise the reactor manager on the safety aspects of the day to day operation and utilization of the reactor. Such committees normally review the adequacy and safety of proposed experiments and modifications and provide the reactor manager with recommendations for action.~~ As far as practicable an advisory group (or reactor safety committee) shall be established to advise the reactor manager on the safety aspects of the day to day operation and utilization of the reactor. Such committees shall review the adequacy and safety of proposed experiments and modifications and provide the reactor manager with recommendations for action.	requirement. We consider establishing an advisory group as a good practice and propose to formulate it as a requirement.		Statement changed to a requirement also considering comments from China 8.		clarity and brevity.
2	58	7.46 / 1-5	No experiments shall be conducted without adequate review and justification. If there is a need to conduct a non-routine operation or test that is not covered by existing operating procedures, a specific safety review shall be performed and a	Repetition (compare the first and the last sentence).	✓			

			special procedure shall be developed and subject to approval in accordance with national or other relevant regulations. ~~No experiments shall be conducted without adequate review and justification.~~					
3	59	Footnote No. 41 to 7.52 (b)	"Initial criticality tests and low-power test~~e~~s and …"	Editorial.	✓			
3	60	Footnote No. 43 to 7.58 (h)	"Emergency procedures are developed as an element of ~~a~~ separate emergency arrangements (see paras 7.89~~90~~ –7.93~~94~~) and in accordance with Ref. [10]."	Wrong paragraphs are cited in the footnote.	✓			
1	61	7.99	(f) Proper safety precautions and controls are applied with regard to all persons involved in the performance of the modification or experiments, and with regard to the public and the environment; (g) A management system is applied at all stages in the preparation and performance of the experiment or modification to ascertain whether all applicable safety requirements, and provisions have been satisfied;	Please include the responsibility for safety precautions and for safety management.		✓ (f) Safety precautions and controls are applied with regard to all personnel involved in the performance of the modification or experiment.		(g) is adequately covered under the integrated management system, 4.18.

1	62	after requirement 84	Radiation exposures at the research reactor facility shall be subject to dose constraints (see para. 7.112) for the purpose of ensuring that the relevant dose limits defined by the regulatory body or another competent authority are not exceeded. In all operational states, design basis accidents and design extension conditions without core melt the main aims of radiation protection shall be to avoid unnecessary exposure to radiation and to keep doses below the dose constraints and as low as reasonably achievable.	Please, add the following paragraph after Requirement 84. This new paragraph describes general expectation with respect to radiation protection in operational states and accident conditions without core melt.			✓	Paras 7.107 – 7.113 adequately describe the requirements. 7.107 covers all operational states and accident conditions; the benefit of parsing conditions without core melt is not compelling.
1	63	after Requirement 84	In case of severe accidents, the radiological consequences shall be kept low by means of appropriate engineered safety features, adequate accident management and measure for emergency response taking social and economic factors into account.	Please, add the following paragraph after Requirement 84. This new paragraph describes general expectation with respect to radiation protection in case of severe accidents.			✓	The term severe accidents is not commonly used for research reactors.
3	64	7.109 / 4	International Basic Safety Standards Ref.	Editorial	✓			

			[12] and shall be subject to the approval of the regulatory body.					
3	65	7.114 / 5	[…] the reactor manager, the regulatory body and other competent authorities as designated in the national regulations Ref. [15].	Editorial	✓			
2	66	7.115	Last sentence: "Records shall be maintained for waste generation and waste classification~~, as well as for the processing, transport, storage, and disposal of radioactive waste~~."	The second part of the last sentence in Para 7.115 is very similar to the statement in Para 7.119. To avoid unnecessary duplication of requirements, it is proposed to delete the redundant information in Para 7.115 and to modify Para 7.119 accordingly (see our related comment on this Para).	✓			
2	67	7.119	"~~An a~~Appropriate records shall be kept of the quantities, types and characteristics of the radioactive waste processed and stored ~~and disposed of~~ on the reactor site, or removed from the ~~reactor~~ site for purposes of processing, storage or disposal."	Fragments of text inserted from Para 7.115 due to the proposed deletion of the second part of the last sentence in Para 7.115, which repeats Para 7.119 partially.		✓ Records for transport added.		Text revised for clarity.

				With the modified wording, records on transport of radioactive waste are covered as well. Disposal of radioactive waste on the reactor site implies the availability of a licensed disposal facility collocated at the same site. In practice, disposal facilities are located outside the site area boundary of research reactor facilities.				
3	68	7.121	"On the basis of the results of the periodic safety review, the operating organization shall implement any necessary corrective actions and shall consider making justified modifications to enhance safety (see also para. 7.120~~119~~ on the interaction between ageing management and periodic safety reviews)."	Wrong paragraph is cited. The interaction between ageing management and periodic safety reviews is addressed in Para 7.120.	✓			
1	69	Requirement 90 /4	Safety measures and security measures and arrangements for the State system of accounting for, and control of, nuclear material shall be established and	Safeguards are missing (see also our comment on Requirement 11)		✓ Ref. [17] added.		Safeguards are part of the design requirement and

			implemented in such a manner that they do not compromise one another but enhance one another Ref. [17].	Editorial				retained in Sec. 6.
1	70	Appendix 1, I.1 (6) and (7)	(6) Special internal events: ~~– Internal fires or explosions, including internally generated missiles;~~ ~~– Internal flooding;~~ – Loss of support systems; – Security related incidents; – Malfunctions in reactor experiments; – Improper access by persons to restricted areas; – Fluid jets, pipe whip; ~~– Exothermic chemical reactions.~~ ~~– Drop of heavy loads~~ ~~(7) External events:~~ ~~– Earthquakes (including seismically induced faulting and landslides);~~ ~~– Flooding (including failure of an~~	Based on the discussions with respect to SSR 2/1 (see also TECDOC to SSR 2/1 under development at IAEA) and the safety glossary a hazard is not a postulating initiating event. During a hazard assessment the possible impact of a hazard on the plant should be analyzed. This will lead to the identification of protection measures and determining of possibly induced postulated initiating events, the plant has to cope with.			✓	This identifies events to be considered, not hazards. For continuity it is appropriate to include these events for research reactors rather than generate a separate Appendix for hazards.

			upstream/downstream dam and blockage of a river and damage due to tsunami or high waves); — Tornadoes and tornado missiles; — Sandstorms; — Hurricanes, storms and lightning; — Tropical cyclones; — Explosions; — Aircraft crashes; — Fires; — Toxic spills; — Accidents on transport routes (including collisions into the research reactor's building); — Effects from adjacent facilities (e.g. nuclear facilities, chemical facilities and waste management facilities); — Biological hazards such as microbial corrosion, structural damage or damage to equipment by rodents or insects; — Extreme meteorological phenomena;					

			~~– Lightning strikes;~~ ~~– Power or voltage surges on the external supply line.~~					
1	71	New Appendix		We propose giving all 'deleted hazards' (our comment to Appendix 1, I.1 (6) and (7)) its own list in a new appendix.			✓	See above comment on #70
2	72	App. II, II.7	2nd sentence: "Measures shall be established such as procedures, restrictions and controls to ensure that visitors have safe working conditions~~, and~~ that their activities will not affect the safety of the reactor, and that instructions given to them by the operating personnel are strictly observed."	There is some text missing in this paragraph (?). Clarification.	✓			

TITLE

COMMENTS BY REVIEWERS	RESOLUTION
Reviewers: Majid Fassi Fehri and Marcel de Vos (ROB); N. Shykinov, M. El-Havari, V. Khotylev, K. Conlon, S. Shim, B. Carroll, G. Renganathan, X. Wei, J. Vucetic, M. Xu, A. Delja, R. Kameswaran, A. Tanase and P. Wong (TSB) Country/Organization: Canada / Canadian Nuclear Safety Commission/ Date: April 2015	

Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	
1.	General comments	Clarification and/or correction is needed	• The document is inclusive of all main requirements mandated for power reactors. This is understood given that some research reactor reach high powers with large source terms. For smaller reactors however, the actual requirements are left for the discretion of the designer and the regulator in applying the				We have carefully considered the comments on requirements for high power reactors, smaller reactors, the graded approach , safety analysis and reformatting the text to "should" statements for

			recommended graded approach. This elaborate choice is also spread to other areas such as: o The acceptance criteria are "to be developed by the state depending on their legal and regulatory infrastructures" as stated in section 3.12. o Nature and scope of work to be done for Design Extension Conditions (DEC) is "as far as it is reasonably practical" as stated in Requirement 22. o Frequency limits are not specified for different classes of events to be analyzed. Although not avoidable, this amount of requirements is overwhelming for designers/ operators of very small reactors with limited manpower capabilities. On the other hand, the vast choices given in selecting requirements can present particular				SSCs. It is necessary to formulate the requirements as "shall" statements and "should" statements are more appropriate for lower tier Guidance documents. The nature of this standard, which is required to cover the full range of research reactors, makes it

			burden for the regulators for larger reactors. • The Graded Approach and its particular significance for research reactors, given their variety in size and purposes, are well described in sections 2.15 and 2.16. The concise list of factors to be considered in applying certain requirements given in section 2.17 provides good general guidance for designers and regulators. The mention of Graded Approach is however spread over many sections of the document with little or no further identification of factors to be considered that are specific to the subject being addressed. More detailed guidance in some sections of the document can be helpful. When feasible, add information on				necessary to include all of the safety requirements. Every attempt has been made to show where the graded approach can be use for small research reactors.

			main factors to be considered in different sections of the report where the use of Graded Approach is mentioned. • Safety Analysis requirements are spread over the document. The analysis of events related to Normal Operational (NO) modes, Anticipated Operational Occurrences (AOO), Design Basis Accidents (DBA) and design extension conditions is required under the defense in depth concept in section 2-14. The required analysis scope, methodology and update are described in sections 6-119 to 6-125. DBA and DEC are further elaborated in Requirement 20 & 22 respectively which might overshadow the significance of NO and AOO required analyses.				The main factors to be considered in applying the graded appraoach are summarized in 2.17. Repeating these factors in different sections of the document would involve unnecessary repetition. It is necessary to include the analysis requirements in Sec.2 and Sec. 6. The requirements for NO and AOO analysis are clear and not overshadowed by DBA and DEC.

			Most of the specifications and requirements are expressed by using “shall” as an obligation. The variety of research reactors system structures and components (SSC) and their contributions and relevance to the safety should be considered. Then the text should be reformulated using “should” statement for the SSC depending to their function and safety significance, or non-significance.			✓	The requirements in safety standards are expressed as “shall” statements. In lower tier guidance documents, it is more appropriate to use “should” statements.
2.	General comment	Remove footnotes (e.g. footnote 41) that waive requirements for subcritical and critical assemblies to make the requirements applicable to all type of nuclear reactors with the allowance to waive some of them by applying the graded approach based on the factors established	The applicability of some requirements may not relevant to the very low power reactors, critical assemblies and the subcritical assemblies. For example, requirements 47 and 48, regarding cooling systems, are not			✓	The comment to remove footnote 41 and to make allowance for waiving requirements is inconsistent with the expectation for this standard, i.e., that all

		in 2.19 and the approval of the regulatory body. Waiving some requirements by applying the graded approach requires changing the clause 6.18 from: "The use of a graded approach in the application of the safety requirements shall not be considered as a means of waiving safety requirements and shall not result in compromising safety. Grading of requirements shall be justified and supported by safety analysis or engineering judgement." to "The use of a graded approach in the application of the safety requirements shall not result in compromising safety. Grading of requirements shall be justified and supported by safety analysis, reactor design (e.g. subcritical reactor) or/and engineering judgement. Grading that result in waiving a requirement requires that the justification to be approved by the regulator." Similarly by removing footnotes (e.g. footnote 41) the clause 1.9 should be	applicable to subcritical assemblies only, according to footnotes 33 and 35. However, there are many nuclear reactors (not subcritical assemblies) of very low power that achieve criticality by filling a vessel with water and shutdown by draining the vessel (i.e. uncovering the core, which is in contradiction with clause 6.157). For these types of reactors, there is no need for reliable engineered cooling systems able to prevent uncovered core situations given that they are of very low power (a few watts) and with negligible decay heat. Similarly, the example of clause 6.129 that requires pressure control means to prevent uncontrolled releases are rarely needed for very low power reactors, critical and subcritical assemblies. Nevertheless, this clause seems to apply to all type of research				requirements apply to all research reactors (RRs) covered, but that the "application 'of the requirements may be graded based on the magnitude of the hazard and agreement between the regulatory body (RB) and operating organization (OO).

		modified to allow for waiving a requirements based on approved justification by the regulator from: "All the requirements established here are to be applied unless it can be justified that, for a specific research reactor or subcritical assembly, the application of certain requirements may be graded. For each such case the requirements to be graded shall be identified, with account taken of the nature and possible magnitude of the hazards presented by the given facility and the activities conducted. Hereafter subcritical assemblies will be mentioned separately if a specific requirement is not relevant or only applicable for subcritical assemblies. Paragraph 2.17 sets out the factors to be considered in deciding whether the application of certain requirements established here may be graded." to "All the requirements established here are to be applied unless it can be justified and approved by the regulator that, for a specific research reactor, the application of	reactors. It would be preferable to allow for grading all the requirements and even waiving some of them based on safety analysis, reactor design and engineering judgment with the approval of the regulator on a case-by-case basis. This would mean that all the requirements should be applicable for all type of reactors (regardless of whether they are subcritical or critical assemblies, or very low power reactors), but it would be possible that some requirements be graded or waived with a justification accepted by the regulator.				

		certain requirements may be graded or waived. For each such case the requirements to be graded or waived shall be identified, with account taken of the nature and possible magnitude of the hazards presented by the given facility and the activities conducted. Paragraph 2.17 sets out the factors to be considered in deciding whether the application of certain requirements established here may be graded or waived."					
3.	1.1	Suggest editing: "…protection of workers and other on-site personnel, the public and the environment…",	Suggest adding "on-site", because "other personnel" includes "the public".	✓			
4.	1.3 Note 2 1.7 1.8	Suggest add such the following: This document applies to research fusion, fission and test/prototype reactors, critical and subcritical assemblies. Requirements for other (power) reactors and reactors not cobed by this document are described in …	To avoid "lost" (highlighted) of some reactors the document applicability area should be clearly identified. May be fission, test and prototype reactors (some of them are close to research reactor, some are close to power reactors) to be excluded, but in this case they shall			✓	Fusion reactors are out of scope of the approved DPP.

			be included in other document. There is a redundant definition of research reactors, first are defined in footnote2 and after in 1.7 Rationale is needed why are homogeneous reactors excluded?				Some replication is unavoidable as 1.7 provides details of the scope of the document.
			1.7. … This definition excludes nuclear reactors used for the production of electricity, naval propulsion, desalination or district heating. 1.*8. Research reactors with power levels in excess of several tens of megawatts, fast reactors, and reactors using experimental devices such as high pressure … be applied, the extent of their application and any additional*				Homogeneous reactors are out of scope of the approved DPP.

			safety measures that may need to be taken are required to be proposed by the operating organization and to be subject to approval by the regulatory body. Homogeneous reactors and accelerator driven system are out of the scope of this publication.				
5.	1.4 (Footnote 3)	Suggest editing: " …all stages in the lifetime … site evaluation, design, construction, commissioning, operation, utilization and modification and decommissioning." Delete "The site boundary is the boundary of the site area" From Footnote 3.	Delete "planning for", because "all stages" should include decommissioning, not just planning for decommissioning. No function		✓ Revised: Boundary is the perimeter of the site area.	✓	The approved DPP only includes Planning for Decommissioning
6.	Clauses 1.7 and 1.9	Modify: "All the requirements established here are to be applied unless it can be justified that, for a specific research reactor	While the definition of nuclear reactor in clause 1.7 includes critical and subcritical assembly		✓ Critical or		The text has been revised to consistency between 1.7 and 1.9.

		or subcritical assembly, the application of certain requirements may be graded." To "All the requirements established here are to be applied unless it can be justified that, for a specific research reactor, the application of certain requirements may be graded."	("nuclear reactor (i.e. "a research reactor is a nuclear reactor (including critical and subcritical assemblies)"), clause 1.9 differentiates between a subcritical assembly and a research reactor (i.e. "a specific research reactor or subcritical assembly"). Inconsistent definition of nuclear reactor, research reactor or subcritical assembly may lead to inadequate application of graded approach for the different requirements.		subcritical assembly		
7.	1.7	Add a footnote to link to Para. 2.15 after the first sentence to provide details about 'other purposes'.	Para. 2.15 The further elaborates on what research reactors are used for: "Research reactors are used for special and varied purposes, such as research, training, education, radioisotope production, neutron radiography and material testing".				A footnote link to other purposes in 2.15 would unnecessarily distract the reader from the scope of the document.

		Change the sentence "…all systems needed for the operation of them, installations managed by the facility to maintain nuclear material (irradiated or not) and radioactive waste management and all other facilities relevant to either the reactor or its associated experimental facilities and devices located on the reactor site." to "…all systems needed for their installation and operation, and radioactive waste management."	Unclear sentence with redundancy.		✓ Changed to "…needed for their operation ~~of them~~…"		
	1.8	Suggest editing: 1.8. Research reactors with power levels in ~~excess of several tens of megawatts~~,	Should be formulated without "several tens of megawatts"			✓	This formulation was previously used in NS-R-4 and is retained for continuity.
8.	1.9	Suggest editing as below: All the requirements established here are to be applied unless it can be justified that, for a specific research reactor or subcritical	The reason for suggested changes is that the requirements themselves cannot be graded.	✓			

		assembly, the application of certain requirements may be graded. ~~For~~ Each ~~such~~ case where the application of requirements is ~~to be~~ graded shall be identified					
9.	2.14	Suggest editing as below: 2.14. The defence in depth concept is applied mainly through the safety analysis and the use of sound engineering practices based on research and operational experience. This analysis is carried out in the design to ensure that the safety objectives are met. It includes a systematic critical review of the ways in which the research reactor systems, structures and components could fail and identifies the consequences of such failures. The safety analysis examines: (1) all planned normal operational modes of the nuclear installation; and its performance in (2) anticipated operational occurrences, (3) design basis accident conditions and (4) ~~if necessary, event sequences that may lead~~	The reason for the suggested changes is to maintain consistency with the concept of DEC			✓	The text maintains consistency with DEC. The clause is retained because for some types of RRs the RB may deem it not necessary to consider some event sequences.

		~~to~~ design extension conditions (see Requirement 22 and paras 6.64–6.68).					
10.	Introduction or 2.16	Suggest adding: Specific features of research reactor which impact on safety are the following: - Older and lower safety requirements for design of majority of operating research reactors (about 50% reactors have age over 40 years) - Wide variety (comparing with industrial reactors) of operating activities and materials, and, as a result, high probability of human errors during operation - Low quality of design, manufacturing, construction and maintenance and of SSCs due to lower power and simpler design (comparing with industrial reactors)	OPEX from IAEA-TECDOC-1762, Operating Experience from "Events Reported to the IAEA Incident Reporting System for Research Reactors" May be it can be added in *2.16. Most research reactors give rise to fewer potential hazards to the public than nuclear power plants, but they may pose greater potential hazards to operators, researchers and other users owing to the relative ease of access to radiation or radioactive materials.*			✓	We do not agree that RRs have lower quality of design, manufacture, construction and maintenance of SSCs. While such OPEX provides useful feedback, the benefit of adding the suggested text in this standard is not clear.

11.	2.16	Optionally, suggest deleting this clause or rewrite with more clearly focused guidance wording. Original text: Research reactors are specifically designed to allow operators and researchers relative ease of access to radiation and radioactive materials for the purposes of performing research. Use of the graded approach should consider any additional risks presented to operators, researchers and the public as a result of the increased ease of access.	The purpose of this clause is not clear given that clauses 2.15 and 2.17 adequately explain both why research reactors are different and the factors that grading should address. General statements comparing research reactor safety to power reactors belong in a more generic section at the front of the document to explain why this document is necessary. If the intent is to keep this clause, the proposed text demonstrates an alternative wording that transitions better between clause 2.15 and 2.17.			✓	Clearly focused guidance wording is more appropriate for lower tier guidance documents.

12.	2.2	Suggest editing: (b) To limit the likelihood of events that might lead to a loss control, and cooling of nuclear reactor core, nuclear chain reaction, radioactive source or any other source of radiation;	Better words			✓	The original text is clear and consistent with Para. 2.1 of the Safety Fundamentals Ref [1], and SSR-2/1 Rev.1
13.	2.3	Suggest editing: 2.3. The fundamental safety objective applies to all facilities and activities and for all stages over the lifetime of a facility or radiation source, including planning, siting, safety evaluation, design, manufacturing, construction, commissioning and operation, as well	Better words			✓	The text is coherent with similar text in SSR-2/1 on the stages in the lifetime of a nuclear facility. Safety evaluation is not a stage but part of the design and analysis process.

14.		Add section “CONSTRUCTION”	Such reactor life stage as CONSTRUCTION is missed *1.4. The main objective of this Safety Requirements publication is to provide a basis for safety and for safety assessment for all stages in the lifetime of a research reactor by*			✓	Construction is covered in Requirement 14. Adding a separate section on construction is outside of the scope of the approved DPP.

15.	2.8 Sentence 6	Clarification and/or correction is needed	Is an assessment of instrumentation and equipment survivability being considered for design extension conditions?			✓	The comment not clear. There is no sentence 6. If you mean line 6 or footnote 6, the text here is coherent with SSR-2/1.

16.	2.14	Clarification and/or correction is needed Suggest editing: Defence-in-depth should consider research reactor configuration related to reactor and experimental facilities as part of the research nuclear installation. If experimental facility interacts with reactor and contain radioactive materials, nuclear heat generation, defence in depth should be considered following this concept and adequately define sublayers, levels and barriers of defence-in-depth reflecting such design.	Design extension conditions are used to replace all events commonly known as BDBA in section 2.14 and others. This needs to be clarified/ explained			✓	The suggested text is not clear, contains grammatical errors and does not provide further explanation.

17.	2.16;2.17	Clarification and/or correction is needed	In general “fewer potential hazards to the public” and “greater potential hazards” to operators should be considered and balanced with other factors like specific, unique and complex design of some research reactors that requires that safety design include more complex and non-standard safety assessment. The factor that should be there (in 2.17) are following: design configuration of the core and experimental facilities in the core.			✓	This is covered in (1) experimental devices. The factor “utilization of the reactor” looks at the design confinement of the core and the experimental facilities in the core.

18.	2.17 (H)	Proposed new text: The quality of the containment structure or other means of confinement or ventilation Clarification and/or correction is needed	For some research facilities, ventilation plays the role of confinement If possible, add to the document a matrix of the graded approach factors given in section 2.17 against all requirements included in the document. This will give the small reactor operators quick guidance to the few requirements they have to observe.				It is agreed that ventilation plays a role but it is not appropriate for this to be explicitly stated here. Means of confinement includes ventilation. It is not practical to add a matrix for quick guidance in this requirements document. This is more appropriate for a lower tier guidance document.

19.	2.5	Clarification and/or correction is needed *Principle 4: Justification of facilities and activities* *Facilities and activities that give rise to radiation risks must yield an overall benefit of ….* *Principle 5: Optimization of protection* *Protection of … must be optimized to provide the highest level of safety that can reasonably be achieved.* *Principle 8: Prevention of accidents* *All practical efforts must be made to prevent and mitigate nuclear or radiation accidents.* *Principle 9: Emergency preparedness and response* *Arrangements must be made for emergency preparedness and response for nuclear or radiation incidents.* *Principle 10: Protective actions to reduce*	Suggest clarifying "benefit", "protection" of what (reactor, facility, public, safety and etc.)? It is not clear what is new in Principle 10 (comparing with previous nine principles) and what is acceptable *unregulated risk*? It is not clear why such commonly understand safety principles (*2.9 defence in depth concept?)* as ALARA and DiD is not used here. It seems there is an inconsistency in the use of terms accidents and incidents			✓	The principles listed are coherent with these in the Safety Fundamentals, SF-1. ALARA is covered in Requirement 8. The concept of DiD is covered in 2.10-2.14 and Requirement 10. The terms Accidents and Incidents are used consistently with SF-1.

		existing or unregulated radiation risks *Protective actions to reduce existing or unregulated radiation risks must be justified and optimized.*					

20.	2.10- 2.14	Suggest re-writing in accordance with IAEA glossary and more consistently	Example of inconsistency: *(1)The objective of the first level of defence* *(2) The aim of the second level* *(3) For the third level of defence,* *(4) The aim of the fourth level* *(5) The purpose of the fifth and final level* 2.*10. … This concept is applied to all safety related activities, whether organizational, behavioural or design related, in all operational states* *2.14. The defence in depth concept is applied mainly through the safety analysis and the use of sound engineering practices based on research and operational experience.*		✓ Revised to "purpose" of each level …(3) Consistent with SSR-2/1		The terms objective aim and purposes are not inconsistent and are helpful to introduce the DiD concepts to the reader. 2.10 is coherent with SSR-2/1, para. 2.12

21.	2.17	Suggest adding such the following: (k) number and design safety systems (l) work schedule (e.g. operation on demand or continuous operation with 24 hours supervision) (m) surrounding area (e.g. high populated city) (n) external hazards (natural and human induced) (o) state (national and international obligations and practice, risk of war or terrorism, safeguards aspects, external power reliability and etc.) (q) design life (p) planned using/purpose (e.g. type of experiments, irradiated materials, operating of new equipment and design for test/prototype reactors)	Incomplete requirements			✓	These additional factors are more appropriate for a Guidance document rather than as requirements here.

22.	3	Suggest adding that state shall establish requirements for financial guarantee and nuclear risk insurance.	Clarification and/or correction is needed			✓	This is already covered in GSR Part 3.

23.	3.6	Suggest editing: 3.6. The safety analysis report is one of the main documents	Design, procedures and etc. are the same or more important to licensing.	✓			

24.	3.7; 3.9	3.7. The safety analyses in the safety analysis report shall form the basis for the operational limits and conditions for the reactor. The safety analysis report shall provide details about the operating organization, the conduct of operations and the integrated management system throughout the reactor facility life.	Suggest discussing and editing highlighted: the level of details. Safety report cannot reflect details sufficient for safety assessment: it could refer to other design and operating organization documents (see 3.9)			✓	It is recognized that the safety analysis report could refer to other design and OO documents, however it must provide suitable details of the OO, COP and IMS.

25.	Requirement 2 4.2	Suggest editing to add case of changing operating organization or/and owner during facility life.	Owner and Licensee or operating organization could be not the same one. Operating organization could be changed during facility life; this is not reflected in this requirement. The life of some research reactor is already over 60 years. So operating organization, management system, even an owner, may be changed for some of them, may be not one time (see 4.2).			✓	This requirement does not preclude a change of Owner or Licensee.

26.	4.11	Suggest adding: (c) Any additional requirements formally agreed with interested parties. (d) accepted deviation from state and regulatory requirements and its evaluation and compensation measures (e.g. confirmation that used graded approach does not compromise safety)	Clarification and/or correction is needed			✓	Superfluous, any requirements covers any additional requirements. Any requirements formally agreed would also include deviations. Confirmation of the graded approach is treated elsewhere.

27.	4.13	4.13. The provisions of the integrated management system shall be based on four functional categories: management responsibility; resource management; process implementation and measurement, assessment, evaluation and improvement (including use of OPEX from research and power reactors), self and independent audit, compliance records.	Clarification and/or correction is needed It may be useful to consider operating experience (OPEX) from nuclear power reactors		✓ Text revised		The text has been revised to improve consistency with DS 456/ GSR-Part 2 OPEX is useful to consider but more appropriate as guidance than a requirement here.

28.	4.14	Suggest editing: In this regard, the integrated management system shall include provisions for effective communication and clear assignment of responsibilities to ensure that processes and activities important to safety are controlled and performed in a manner that ensure safety and meeting their defined objectives.	The original sentence does not make sense. Processes and activities important to safety are not controlled and performed so that they ensure effective communication and clear assignment of responsibilities. It is the reverse of this.		✓ …to ensure that safety objectives are achieved.		The text has been revised to improve clarity.

29.	4.15	Suggest adding: (a) Suppliers, external users, manufacturers and designers of services, systems, structures and components important to safety have an effective integrated management system in place and audited to confirm its effectiveness;	Clarification and/or correction is needed Added "and audited to confirm its effectiveness" to align with Ref. [14] (Safety in the Utilization and Modification of Research Reactors, SSG-24) Para. 2.13.		✓ Added "and audited"		Designers of services not clear Text revised to add "and audited"

30.	4.20 (Footnote 15)	Suggest editing: 4.20. The effectiveness of the integrated management system shall be periodically assessed through audits[15] and self assessments. Weaknesses in processes shall be identified and corrected. The operating organization shall evaluate the results of such audits and shall determine and implement the necessary actions for continuous improvements. The audits and correction actions results shall be recorded and stored for all facility life. Footnote 15: Change "…by independent external independent organizations" to "by independent external organizations"	Clarification and/or correction is needed Redundancy		✓		Requirements for storage of records are in GSR-Part 2. Control of records GS-R-3. Note: Footnote 15 also changed to 12 per comment from GER.

31.	4.22	Suggest editing: The safety assessment ~~shall~~ should be part of the design process, with iterations made between the design activities and the confirmatory analytical activities and with increases in the scope and the level of detail of the safety assessment as the design progresses.	Probably “should” be more appropriate.			✓	The requirements are formulated as “shall” statements and guidance is formulated as “should” statements. The text is coherent with SSR-2/1, 4.17.

32.	4.23	Clarification is needed The safety assessments shall commence at an early stage in the design process. Deterministic safety analysis shall be the primary tool for safety assessment of research reactors. Probabilistic safety analysis may be used as a complementary tool for improving the safety assessment. *Deterministic safety analysis shall be the primary tool for safety assessment of research reactors*	I support strongly this statement , but it should be defined what is "primary tool" and process how to use the primary tool.	✓			Thanks. We also agree on deterministic assessments. "Primary" is in the context of PSA being a complementary tool. Primary = main tool. It is not appropriate to show process to use tools in a Requirements doc. PSA text also clarified per comment #4 from POL.
33.	4.23	Suggest adding: 4.23. The safety assessments shall include deterministic and probabilistic (at least levels 1 and 2) safety analysis and	PSA is not a big technical or financial problem now. Graded approach allows simplifying these requirements including PSA scope			✓	This comment contradicts #32 from CAN which agrees with the deterministic

		commence at an early stage in the design process. Deterministic safety analysis shall be the primary tool for safety assessment of research reactors. Probabilistic safety analysis shall be used as a complementary tool for improving the safety assessment. Additional assessment shall be performed in case of using new (not included in previous assessment) materials for research or new test/experiments. 4.25. Systematic periodic safety reassessments of the research reactor in accordance with the regulatory requirement shall be performed throughout its operational lifetime, with account taken of new regulatory requirements, OPEX (including applicabl OPEX from power reactors), operating experience, the cumulative effects of aging and new safety information from all relevant sources.	if needed. OPEX from IAEA-TECDOC-1762, Clarification and/or correction is needed				analysis being the primary tool. PSA is a complementary tool. New materials for research is covered in SSG-24. Operating experience is mentioned. It is not appropriate to reference lower level TECDOCs in a Safety Requirements Standard.

34.	**Requirement 6** **Note 18**	Suggest clarifying what does it mean "**independent from the reactor manager**[18] **": e**.g. not directly reported, not paid, not members of operating organization. ***An advisory group (or a safety committee) for a research reactor facility that is independent from the reactor manager***[18] ***shall be established to advise the operating organization***[19] ***on all the safety aspects of the research reactor.***	Level of independence shall be clarified			✓	Independence level is determined by the operating organization to avoid conflict of interest. It is not appropriate to add further details here.

35.	4.26	Suggest editing: It shall be verified that selected systems, structures and components, and software comply with the design requirements. Specific design requirements are established in Section 6 and functional requirements in Section 7.	Section 6 discusses design aspects. Section 7 discusses safety functions. It is not clear, what should be verified. Or the expectations should be clearly mentioned or this should refer to section 6.32.	✓			
36.	4.27	Suggest adding: (l) qualification of management, internal and external research staff, contractors, suppliers and etc. (m) training and qualification of operators	Clarification and/or correction is needed			✓	The review of management qualification and training on qualification of operators is part of the normal management function, not the specific purview of the Safety Committee. Req. 70 covers training and qualification of personnel.

37.	Footnote 14	The font size is not correct.		✓			Thanks. Font changed.
38.	5.1	Suggest adding a footnote to define "low power research reactors", "medium power research reactors", and "high power research reactors"	The terms of "low power", "medium power" and "high power" for a research reactor should be clarified.			✓	This has been discussed in the consultancies to develop the document. In several Member States the regulatory bodies decide for their jurisdictions. There is no consensus on the power levels that could be included as a standard.

39.	5.3	Suggest adding like the following: 5.3. The site evaluation shall establish the boundaries of the site area including exclusion and monitoring areas satisfying the main safety objective (5.1) and the exact localization of the reactor and associated facilities (operations area), which is under the control of the reactor management (see footnote 38), and its legal rights within the site area. Any activities that are unrelated to the operation of the research reactor within these boundaries shall be evaluated and justified.	Clarification and/or correction is needed	✓			

40.	5.4	Suggest editing: (a)The effects of external natural and human induced (including expected area development for planned facility life) events (e.g. seismic with accounting of destroying, for example, upstream dam, fire or flooding) that may occur in the region of the site (the events could be of natural or human induced origin);	Clarification and/or correction is needed		✓ Natural or human induced events.		The suggested wording is not clear. Text revised to include natural or human induced events.

41.	5.9	(b)Meteorological events including extreme values (including expectation during climate change trend during facility life) of meteorological phenomena and rare events such as: lightning, tornadoes and tropical cyclones; (c)Flooding including water waves (with cascade effect from destroyed upstream dams) induced by earthquakes or other geological phenomena or floods and waves caused by failure of water control structures; (d) Geotechnical hazards including slope instability, collapse, subsidence or uplift of the site surface and soil liquefaction (accounting human induced events e.g. due to mining, underground gas storage);	Clarification and/or correction is needed			✓	Additional details are at the level of Guidance which is discouraged.

42.	5.11.	Suggest adding: Changes in site characteristics such as climate, population or use of nearby facilities that may affect the safety of the research reactor facility shall be investigated and periodically reassessed with review of safety analysis.	Clarification and/or correction is needed			✓	Periodic reassessment includes review of safety analysis. Superfluous.

43.	**Requirement 7**	Suggest adding: **Requirement 7: Main safety functions for a research reactor** **The design for a research reactor facility shall ensure the fulfilment of the following fundamental safety functions for the research reactor for all states of the facility: (i) control of reactivity, (ii) removal of heat from the reactor and from the fuel storage and (iii) confinement of the radioactive material, shielding against radiation and control of planned radioactive releases, as well as limitation of accidental radioactive releases; and (iv) monitoring of safety parameters and conditions during all reactor states.**	Clarification and/or correction is needed			✓	The three main safety functions are consistent with the Glossary and SSR-2/1. Monitoring is important but not considered one of the three main safety functions.

44.	Para. 6.1	Suggest editing: The research reactor shall be designed in such a way that the fundamental safety objectives (see paras 2.2, 2.3) ~~are~~ is achieved.	The safety objective referred to (Para. 2.2 and 2.3) is the fundamental safety objective. No other safety objectives are specified in Para. 2.2 and 2.3	✓			
45.	6.4	Suggest editing: The design of the reactor facility shall consider not only the reactor itself but also any associated facilities such as experimental devices that may affect safety. In addition, the reactor design shall also consider the effects of the reactor on the associated facilities in all the stages of the reactor's lifetime (e.g. in terms of service conditions, electromagnetic fields and other interferences).	The design process of reactor and experimental facility (in, or coupled the reactor) could be relatively independent. However safety evaluation of these two systems should be integrated to capture potential accident scenario that could be caused by events propagation between these systems.			✓	It is not clear what is requested here. The requirement is to consider the reactor and the experimental facilities in an integrated manner, including event propagation between systems.

46.	6.64 Footnote 26	It is recommended to change the text from "Confinement [6] is the function of containing radioactive material within a nuclear reactor so as to prevent or mitigate its unplanned release." To "Confinement [6] is the function of containing radioactive material within a nuclear facility so as to prevent or mitigate its unplanned release."	The confinement is to prevent uncontrolled release from the nuclear facility, not the nuclear reactor.			✓	This text is from the Glossary. See Para. 1.7, the reactor includes all other facilities relevant to either the reactor or its associated experimental facilities.
47.	Clause 6.66	It is recommended to change the clause from "For subcritical facilities, criticality shall be considered as a design extension condition." To "For subcritical facilities, the likelihood of criticality shall be sufficiently remote to be considered as a design extension condition."	It would be preferable to state explicitly that the likelihood of criticality for a subcritical assembly should be sufficiently remote to be considered in the design extension conditions.	✓			.

48.	6.8	Suggest adding: Equipment for monitoring radioactive conditions shall be designed for all plane states from normal operation to DEC as for facility site so for exclusion and monitoring areas.	Clarification and/or correction is needed			✓	It is not clear what this means. 6.94 includes design provisions for monitoring instrumentation
49.	6.11	Suggest editing: 6.11. The design shall take due account of the results of deterministic safety analyses and (remove: as appropriate complementary) probabilistic safety analyses to ensure that due consideration has been given to the prevention of accidents and to mitigation of the consequences of any postulated initiating event.	PSA shall be a requirement at least levels 1 and 2. For ”simple” reactors it will not make safety analysis too expensive or may be excluded by graded approach, for “complex” (test and prototype or high power reactors) it is necessary for quality of safety assessment.			✓	This conflicts with other comment from CAN and other MS that agree that deterministic safety analysis shall be required and PSA shall be used as a complementary tool as appropriate

50.	6.14	The design: (a) Shall, in consideration of all foreseeable uses including attachment of supplementary experimental apparatuses, provide for successive verifiable physical barriers to the release of radioactive material from the reactor Suggest adding: (g) Shall provide effective means for continues monitoring of safety related parameters and conditions for reactor, facility site and monitoring area for all reactor states including DEC (h) Shall ensure measures for accident management as internal so external to facility	Although silently implied in the original text, the additional text at left draws out the fact that the design must consider the use of supplementary experimental apparatuses when developing barriers. This is worth clarifying because OPEX has shown that events have occurred where this was not adequately Clarification and/or correction is needed			✓ ✓	"The design shall provide for successive verifiable physical barriers" covers supplementary experimental apparatus. The suggested additional text would not help to improve clarity. Para. 6.7 already covers the means of monitoring for all states.

51.	6.17 Requirement 12	Use of the graded approach in application of the safety requirements for a research reactor shall be commensurate with the potential hazards and complexity posed by activities concerning the facility and shall be based on a safety analysis and regulatory requirements.	Clarification and/or correction is needed A facility by itself is not hazardous. It's the activities of the operator when operating the facility that leads to hazardous situations. These requirements exist to prevent accidents due to human error. The graded approach must be applied with the understanding of the human-machine interactions.			✓	Complexity by itself may not be an issue if the complex activity is not hazardous. The key factor is the potential hazard.

52.	6.18	Suggest adding: 6.18. The use of a graded approach in the application of the safety requirements shall not be considered as a means of waiving safety requirements and shall not result in compromising safety. Grading of requirements shall be justified and supported by safety analysis or engineering judgement. List of graded requirements with evaluation of impact on safety shall be included in safety analysis	Clarification and/or correction is needed The use of a graded approach in the application of the safety requirements shall not be considered as a means of waiving safety requirements and shall not result in compromising safety. Grading of requirements shall be justified and supported by safety analysis or engineering judgement. If we have lower hazards, which could be easy justified for research reactors, we can simplify safety assessment significantly. For some research reactors complexity of thermal			✓	The important requirement is that grading must be justified and supported by analysis. Whether or not to include this as a separate list is up to the RB and is more appropriate as guidance on what to include in the safety analysis. The demands for complex analysis is not ignored here.

			hydraulic, neutronic , experimental research phenomena are dominant. In this case safety requirements for safety assessment, safety consideration and evaluation should be very demanding. This must not be ignored.				
53.	6.19	Suggest editing: Items important to safety shall preferably be of a design that …. .	Shall and preferably have different degrees of strength and they don't go well together			✓	This is difficult to balance. It is not always possible to use item that are proven and this formulation allows for high quality items of a technology that has been qualified and tested.

54.	Requirement 13: 6.21	Suggest discussing and editing. **Requirement 13: Proven engineering practices for a research reactor** **Items important to safety for a research reactor shall be designed in accordance with the relevant national and international codes and standards.** 6.21. Codes and standards applicable to systems, structures and components shall be identified and their use shall be in accordance with their classification (see paras 6.29, 6.32). In particular, if different codes and standards are used for different types of items (e.g. for piping and for electrical systems), consistency between the codes and standards shall be demonstrated.	All SSCs as important to safety so not important to safety shall be designed in accordance with applicable codes and standards (just different codes and standards to be used). Also some states can have not national nuclear standards (reactor is designed with vendor's national standards), or foreign vendor can design reactor in accordance with his standards. Mechanical and electrical components cannot be designed using the same codes and standards, consistency cannot be due to different physical nature of such SSCs	"	✓ Change to "for piping or for electrical systems".		This was discussed in the development of the document. For states without national standards the use of relevant international standards is recommended.

55.	6.24	Suggest editing as below: 6.24. Acceptance criteria shall be established for operational states and for accident conditions. In particular, the design basis accidents considered in the design of the research reactor and ~~selected~~ design extension conditions shall be identified for the purposes of establishing acceptance criteria.	The reason for the suggested changes is to maintain consistency with the concept of DEC			✓	This change to expand from "selected DEC" to cover all DEC is in conflict with other MS (USA) comment to delete DEC here.
56.	6.29	Suggest adding: (e)The design codes and standards applicable	Clarification and/or correction is needed			✓	The classification of the safety significance should be based on the function , failure to perform the function, etc. The applicable design codes and standards is not in itself a key factor.

57.	6.30	Suggest adding 6.30. The design shall be such as to ensure that any interference between items important to safety will be prevented, and in particular that any failure of items important to safety in a system in a lower safety class will not propagate to a system in a higher safety class. The interfacing component shall have higher safety class even if it is included in lower safety class system	Clarification and/or correction is needed		✓ Covered in revised 6.31		This additional text is covered adequately in 6.31 which had been revised and strengthen.
58.	6.34	Change the last sentence in Clause 6.34 to "……the design process. (remove: For example)These challenges include all the foreseeable conditions and events relating to stages in the operational lifetime of the reactor and to operational states and accident conditions, site characteristics, and modes of operation."	1) The wording "For example" is not necessary (Redundancy) 2) It does not make sense to include in the sentence "design requirements and the limits of parameters"	✓			

59.	6.44.	Suggest adding 6.44 The operator actions necessary to diagnose the state of the reactor following a postulated initiating event and to put it into a stable long term shutdown condition in a timely manner shall be facilitated by the provision in the design of adequate instrumentation to monitor the status of the reactor, and adequate means for the manual operation of equipment. Shall be identified all reactor state when operator must be present for reactor control, and reactor conditions/states when reactor can be unsupervised including after NO, AOO, DBA and DEC periods.	Clarification and/or correction is needed			✓	This section is on PIEs. Identification of the reactor states when the operator must be present is not germane to this section. Reactor condition or states where the reactor can be unsupervised will depend on the RB.

60.	6.48	Suggest adding: (b) Detect, alarm and extinguish quickly those fires that do start, thus limiting the damage caused including unsupervised reactor periods;	Clarification and/or correction is needed			✓	Alarm Syntax. Limiting damage during all periods.
61.	6.50	6.50. Non-combustible or fire retardant and heat resistant materials shall be used wherever practicable throughout the research reactor facility, in particular in locations such as the reactor building and the control room. Flammable gases and liquids and combustible materials that could produce or contribute to explosive mixtures shall be kept to the minimum necessary amounts and shall be stored in adequate facilities to keep reacting substances segregated. Also this requirement is applicable for materials used during tests and experiments.	Clarification and/or correction is needed		✓ (including for tests and experiments)		Improved flow and readability.

62.	Requirement 22	Suggest editing as below: Requirement 22: Design extension conditions for a research reactor A set of design extension conditions for a research reactor shall be derived for the purpose of enhancing the safety of the research reactor by enhancing its capabilities to withstand, without unacceptable radiological consequences, accidents that are either more severe than design basis accidents or that involve additional failures. The set of design extension conditions shall be derived on the basis of engineering judgement and by using ~~a graded approach,~~ deterministic ~~assessments~~ and ~~complementary~~ probabilistic assessments~~, if available~~.	The reason for suggested changes is that the requirements themselves cannot be graded. Under Requirement 22, specify the type/size of reactor where design extension conditions have to be derived and implemented. Add to the document "Requirement" sections for normal operation modes and for AOOs similar to Requirements 20 for DBA and Requirements 22 for DEC. NO and AOO events are more probable than DBA and DEC.			✓	This does not indicate that the requirements itself will be graded, but that the set of design extension conditions for the particular RR shall be derived by using the graded approach. It is not practical to specify the type /size of RR in Req.22 NO and AOO are adequately covered in the design basis. NO is not an event.

63.	6.54	6.54. A research reactor facility located in a seismically active region shall be equipped with a seismic detection system. In case of earthquakes exceeding specified thresholds, automatic reactor shutdown systems shall be considered in the design.	The use of a seismic trip in all cases may not be necessary. The decision to require such a trip should be in consideration of regional seismic risk and the specific characteristics of the reactor under postulated seismic conditions.		✓ Revised		Also revised to address comments from RUS, ROM and GER

64.	6.64 Note 26 6.64	Suggest reviewing and editing 26 Confinement [6] is the function of containing radioactive material within a nuclear reactor so as to prevent or mitigate its unplanned release. Confinement is a basic safety function that is required to be fulfilled in normal operational modes, for anticipated operational occurrences, in design basis accidents and, to the extent practicable, in selected design extension conditions. The function of confinement is usually fulfilled by means of several barriers surrounding the main parts of a nuclear reactor that contain radioactive material. For design extension conditions, add the following statement:	The function of confinement (but confinement is the function) so a function is a function? IAEA glossary: *Confinement* in *nuclear safety* is the *safety function* that is performed by *containment*. A *confinement system* as defined in the Transport Regulations has the primary function of controlling *criticality* (as compared with the *containment system*, the function of which is to prevent leakage of *radioactive material*). Clarification		✓ Confinement Ref [6] is the safety function		Revised. The footnote provides explanation to the reader and a link to the glossary. The text is consistent with SSR-2/1. The suggested formulation is not suitable for a requirement. The clause is that

		The rules and practices applied for complementary design features do not have to incorporate the same degree of conservatism as those applied to design basis.					additional safety features shall be such as to ensure the capability for managing accidents.
65.	6.70	Suggest editing as highlighted: 6.70. Examples of engineered safety features for a research reactor are an emergency core cooling system and means of confinement (in particular, an emergency ventilation system). Specific requirements on these systems and their supplementary features are established in paras 6.128–6.137, 6.164–6.166. All engineered safety features, such as a ~~second~~ shutdown systems or a containment structure, shall also be designed in accordance with these requirements.	Clarification and/or correction is needed			✓	Req. 23 covers all engineering features. Modifying this sentence as suggested would introduce redundancy. This clause cover other engineered systems such as a second shutdown system.

66.	Requirement 25, 26 6.76-6.80	The criterion is not written or referred, suggest adding reference to national practice or to IAEA definition: **single failure** A *failure* which results in the loss of capability of a *system* or *component* to perform its intended *safety function(s)*, and any consequential *failure(s)*which result from it. **single failure criterion** A criterion (or requirement) applied to a *system* such that it must be capable of performing its task in the presence of any *single failure*. ***common cause failure.*** *Failure* of two or more *structures, systems and components* due to a single specific *event* or cause. Suggest editing as below: The single failure criterion ~~for a research reactor~~ shall be applied to each safety group ~~incorporated in the design~~ of the research reactor.	Clarification and/or correction is needed There is no research reactor specific single failure criterion.		✓ 6.78 Modified. Second sentence deleted Deleted “for a research reactor” in Req. 25.		The single failure criterion is a well understood concept. The information is in the glossary. “Incorporated in the design” adds clarity. This is also consistent with SSR-2/1 Req. 25

67.	Para. 6.78	~~Suggest editing:~~ ~~Multiple sets of equipment that cannot be tested individually shall not be considered redundant.~~ Implicit in the application of the single failure criterion is the requirements for testability of the systems and components to which the single failure criterion is applied. When analyzing the effects of each single failure, all identified non-detectable failure shall be assumed to have occurred.	**Comment 1**: If the first statement is used to describe the necessary conditions for redundancy, then, it should be deleted, because it does not in alignment with the IAEA Safety Glossary definition of redundancy "provisions of alternative (identical or diverse) structures, systems, and components, so that anyone can perform the required function regardless of the state of operation or failure of any other." Redundant system should be analyzed to ensure that no single failure can cause the loss of a safety function. **Comment 2**: If the first statement of the paragraph is regarding the		✓ The highlighted text was deleted per CAN and other MS comments. Para. 6.78 revised for clarity		The para. has been modified also considering comment GER 39. The suggested additional text is more appropriate as guidance.

			testability requirement, then, it should be modified. The suggested modification was extracted from both IAEA Safety Series No-50-P-1 Application of the Single Failure Criterion and IEEE 379, IEEE Std for Application of the Single Failure Criterion to Nuclear Power Generating Station Safety Systems.				

68.	Requirement 27	Suggest adding: **Requirement 27: Physical separation and independence of safety systems for a research reactor facility** **Interference between safety systems or between redundant elements of a system, or safety system and safety support or process systems for a research reactor facility shall be prevented by means such as physical separation, electrical isolation, functional independence and independence of communication (data transfer), as appropriate.**	Clarification and/or correction is needed			✓	The focus is on safety systems. The interface with/between other support or process systems is covered elsewhere. The text is coherent with SSR-2/1 Req.64 and Req.21

69.	6.82	Suggest adding: 6.82. Any environmental (including internal and external hazard) and service conditions that could reasonably be anticipated and that could arise in specific operational states shall be included in the qualification programme. Qualification level (e.g. for seismic for DEC) shall be in accordance with importance to safety (or safety class) of SSC.	Clarification and/or correction is needed			✓	It is not clear what is meant by qualification level. An item is either qualified for the conditions or it is not. The suggested language not sufficiently precise. The text is coherent with GSR-2/1, 5.50
70.	**Requirement 32**	Suggest adding: -Effective means for monitoring and alarm of radiation conditions (including created by uncontrolled criticality) including DEC for site and monitored area -Accident management centre (separated from main control room) and equipped with required documentation, communication means and safety	Clarification and/or correction is needed			✓	Monitoring of radiation conditions is covered elsewhere -Alarm is covered in 6.91 -An accident management centre may not be required for all RRs. Remote shutdown panel is already covered.

		related information -access to site required services (e.g. firefighters and police)					
	6.91	6.91. Suitable alarm systems (including for evacuation routes) and means of communication shall be provided so that all persons present at the reactor facility and on the site can be warned and instructed, in an emergency. The availability of reliable and diverse means of communication necessary for safety within the reactor facility[28] shall be ensured at all times with due account of postulated initiating events that may compromise their availability.					Text for escape routes and means of communication is consistent with SSR-2/1 Req. 37 and Req. 38. Text in 6.91 is coherent with SSR-2/1 Para.5.66 and 5.77.

71.	6.93	Suggest editing: Full details shall be retained of the design requirements and of information relating to the site and its final design, construction, and modifications, such as…	For a research reactor, during its service life, there may be many modifications as a result of using the reactor for different purposes. These modifications may change the configuration of the facilities.	✓			
72.	6.94	Suggest adding: 6.94. In accordance with the radiation protection objective (see para. 2.1. of [1]) for all operational states and accident conditions, adequate provision shall be made in the design, on the basis of the radiation protection programme for shielding, ventilation, filtration and decay systems for radioactive material (such as delay tanks), and for monitoring and alarm instrumentation for radiation and airborne radioactive material inside and outside the controlled area.	Clarification and/or correction is needed			✓	The text is coherent with SSR-2/1.

73.	6.101	6.101. Provision shall be made in the design for handling the radioactive waste generated by the research reactor facilities including operation, decommissioning and accident conditions. Provision shall be made for appropriate decontamination facilities for both personnel and equipment and for handling the radioactive waste arising from decontamination activities.	Clarification and/or correction is needed			✓	Provisions for predisposal management of waste from operation and decommissioning are covered in 6.92 (c)
74.	6.103	Original text: Cannot propose new text. The decision to rely on administrative controls and procedures shall be part of the overall defence-in-depth safety approach for the facility and shall be informed by assessment of human errors that can contribute to accidents and malfunctions.	The existing wording of the clause is unclear from an application perspective. How does one demonstrate that this has been met? The use of administrative controls has to be part of the overall defence in depth safety approach.			✓	This can be done by reviewing and verifying that such administrative controls are feasible and procedures are applicable.

75.	6.104	Suggest adding: 6.104. Consideration shall be given to human factors and the application of ergonomic principles in the design of the control room and reactor systems. Such aspect as shift completeness, length of work hours, qualification, special conditions (e.g. reactor is not continuously supervised and operators come to and leave reactor unsupervised), new operation modes or experiments to be accounted.	Clarification and/or correction is needed			✓	This is at the level of guidance. The proposed text is not precise enough for a requirement. Not consistent with SSR-2/1.

76.	**Requirement 37**	Suggest adding: **Requirement 37: Ageing management for a research reactor facility** **The design life of items important to safety at a research reactor facility shall be determined and described in safety analysis including periodic safety analysis. Appropriate margins shall be provided in the design to take due account of relevant mechanisms of ageing, such as neutron embrittlement and wear-out and of the potential for age related degradation, to ensure the capability of items important to safety to perform their necessary safety functions in operational states and accident conditions in case of demand throughout their design life. The life cycles of the utilized technology and possible obsolescences of the technology shall be considered.**	Clarification and/or correction is needed			✓	This can also be covered in the ageing management programme and is not mandatory for the SAR.

77.	6.112	Suggest editing: …of ageing and the effects of wear and tear in all…" to "…of physical ageing and obsolescence in all…	Wear and tear are included in ageing, therefore no need to repeat. Physical ageing and obsolescence are two major aspects for ageing management.		✓ …physical ageing, the effects of wear and tear and obsolescence...		Current text is coherent with SSR-2/1 Rev.1 , 5.51
78.	6.113	Suggest editing: A suitable programme of inspection and periodic testing of materials… to An integrated ageing management programme that includes periodic testing and inspection of materials…	1) The wording "integrated ageing management programme" is consistent with IAEA NS-G2.12. 2) Inspection should also be conducted periodically.	✓ ✓			

79.	Clause 6.114	It is suggested to change "The aging management of the research reactor facility shall include the management of obsolete systems, structures and components and the management of spare parts." To "The ageing management of the research reactor facility shall include the management of obsolete systems, structures and components and the management of spare parts."	"Aging" is mostly used in North America while "Ageing" is used in Britain. The use of "ageing" should be consistent throughout the text.	✓			

80.	6.115	Suggest adding: 6.115. Provision shall be made in the design to meet the needs arising in long shutdown periods, such as the need for supervising by operators, maintaining the conditions of the nuclear fuel, the coolant or the moderator, appropriate preservation of structures, systems and components and for the maintenance, periodic testing and inspection of the relevant systems, structures and components. Consideration shall be given to long lived neutron poisoning of the reflector material, which may affect the restarting of the reactor.	Clarification and/or correction is needed			✓	Need for "Supervising by operators" is more suitable for guidance.
81.	6.118	If two systems important to safety and containing ~~liquid~~ fluid are interconnected and are operating at different pressures, both systems shall be designed to withstand the higher pressure, or provision shall be made to prevent the design pressure of the system operating at the lower pressure from being exceeded.	For a gas-cooled reactor, the working coolant is a fluid, not a liquid.	✓			

82.	Requirement 39	Suggest reviewing **Requirement 39: Prevention of unauthorized access to or interference with, items important to safety for a research reactor facility.** **Unauthorized access to, or interference with, items important to safety at a research reactor facility, including computer hardware and software, shall be prevented.**	If "unauthorized" relates to "interference" this requirement is unnecessary strict: items important to safety includes not safety system only, usual nuclear design for research and power reactors allows interference of some system important to safety: other way all such SSCs shall be isolated.			✓	Isolation of SSC shall always be authorized. Unauthorized access covers interference.

83.	Requirement 41	Suggest editing: **Requirement 41: Safety analysis of the design for a research reactor facility** **A safety analysis of the design for a research reactor facility shall be conducted in which methods of both deterministic analysis and complementary probabilistic analysis as appropriate shall be applied to enable the challenges to safety in all plant states to be evaluated and assessed.**	PSA, or evaluation of it is applicability, shall be included as a general requirement and excluded by graded approach if applicable.			✓	For RRs the requirement is for deterministic analysis. PSA is complementary, as appropriate.

84.	6.123	6.123 For each accident sequence considered, the extent to which the safety systems and any operable process systems are required to function under accident conditions shall be indicated. These events are usually evaluated by deterministic methods. Probabilistic techniques can be used to complement the evaluation. The results of these complementary analyses provide input to the design of the safety systems and the definition of their functions.			✓		No comment so it is not clear what is suggested. Text unchanged.
85.	6.126	Suggest editing as below: 6.126. The buildings and structures important to safety shall be designed for all operational states, design basis accidents and~~, as far as practicable~~ for design extension conditions.	The reason for the suggested changes is to maintain consistency with the concept of DEC			✓	As far as practicable is useful for existing RRs. This is not inconsistent with DEC.

86.	6.128	Suggest editing as below: 6.128. Means of confinement shall be designed to ensure that a release of radioactive material (fission products and activation products) following an accident involving disruption or damage of the nuclear fuel, core components or experimental devices does not exceed acceptable limits. The means of confinement may include physical barriers surrounding the main parts of the research reactor that contain radioactive material. Such barriers shall be designed to prevent or mitigate an unplanned release of radioactive material in operational states in design basis accidents and~~, to the extent practicable,~~ in design extension conditions.	The reason for the suggested changes is to maintain consistency with the concept of DEC			✓	For RRs it is appropriate to limit this to the extent practicable. This is not inconsistent with DEC.

87.	Requirement 44	Clarification and/or correction is needed	Somewhere in Requirement 44, the authors need to include a statement that requirements 6.138 thru 6.145 also apply to Isotope Production Targets. Section 6.142 pertains to "design limits" of "fuels elements, reactivity control mechanisms and experimental devices". Shall "isotope targets" be considered the equivalent of "fuel elements"? If the answer to question above is "No", this will have to be directly addressed by the authors as an additional set of requirements			✓	This section includes reactor core components and isotope targets components that are considered reactor core components. Not all isotope targets contain fissile material. For Mo-99 targets that use U-235, Yes these may be considered equivalent to fuel elements.

88.	6.142	Clarification and/or correction is needed	Pertaining to 6.142, it is not clear that burn-up is considered to be (or "ought to be") a "design limit" (i.e. a hard limit with sufficient margin). There have been instances in NRU of fuels suspected to be operated outside of the fuel qualification envelope, but were never confirmed because of the time and expense of conducting actual burn-up measurements.			✓	It is reasonable that Design Limits shall be established. If it is possible that the fuel mentioned could withstand high burnup in this case the limit could be set accordingly. The RB could set suitable limits such as EFPD if burnup is not practical.

89.	6.143	Suggest adding: 6.143. The reactor core shall be designed so that the reactor can be shutdown, cooled[30] and held subcritical with an adequate margin for all operational states and accident conditions. The end state of the reactor core shall be assessed for ~~selected~~ design extension conditions. The maximum rate of addition of positive reactivity allowed by the core transient (reactivity coefficients) including an experiment shall be specified and shall be limited to values justified in the safety analysis report and documented in the operational limits and conditions.	The reason for suggested changes is that the requirements themselves cannot be graded. OPEX			✓ ✓	Selected DEC retained to maintain consistency. Repetition. 6.148 covers max rate of addition of positive reactivity.

90.		**Suggest adding:** **Requirement 46: Reactor shutdown systems for a research reactor** **Means shall be provided for a research reactor to ensure that there is a capability to shut down the reactor in operational states and in accident conditions without fuel and core damage exceeding design conditions, and that the shutdown condition can be maintained for a long period of time with margins even for the most reactive conditions of the reactor core.**	Clarification and/or correction is needed			✓	This requirement covers accident conditions. The text is coherent with SSR-2/1 Req.46

91.	6.150-6.151	Suggest adding: 6.150. At least two shutdown systems, including one automatic shutdown system, shall be incorporated into the design. The provision of a second independent shutdown system may be necessary, depending on the characteristics of the reactor, and this shall be given due consideration. 6.151. The effectiveness, speed of action and shutdown margin of the reactor shutdown system shall be such that the conditions and the design limits for fuel limits specified in the safety analysis report are met for NO, AOO, and DBA. Core damage during DEC shall be assessed in safety analysis.	Clarification and/or correction is needed and OPEX			✓ ✓	The suggested formulation is redundant with the second sentence of 6.150 The text in 6.151 is coherent with SSR-2/1, 6.7.

92.	6.152.	No single or common course failure in the shutdown systems shall be capable of preventing the system from fulfilling its safety function when required.	Single failure is applicable for safety group	✓			
93.	6.155	Suggest editing as below: 6.155. It shall be demonstrated in the design that the reactor shutdown system will function properly under all operational states of the reactor and will maintain its reactor shutdown capability under all design basis accidents and in design extension conditions ~~without core melt,~~ including failures of the control system itself.	The reason for suggested changes is that the requirements themselves cannot be graded.		✓ 6.155 Text revised for consistency with Req. 46. …will maintain its reactor shutdown capability under accident conditions..		Text revised to be coherent with Req. 46 and SSR-2/1
94.	Clause 6.157	It is recommended to add "Special attention shall be given to prevent exothermal reaction with water for alkali metals cooled reactors".	For metal cooled reactors (particularly alkali metals), special attention should be given to the coolant's exothermic reaction with water that might jeopardize the fuel integrity.			✓	Metal cooled reactors and fast reactors are out of scope. Text revised to …the design of water cooled reactors…

95.	6.164	Suggest editing as below: 6.164. The emergency core cooling system shall be capable of preventing significant failure of fuel for the range of accidents specified in the design basis (i.e. under design basis accidents, damage to the fuel and the releases of radioactive material shall be kept within authorized limits). Special procedures for cooling the core shall be considered in the case of ~~selected~~ design extension conditions.	The reason for suggested changes is that the requirements themselves cannot be graded.			✓	This conflicts with USA comment 43 to delete DEC

96.	Para. 6.171	Interference between the reactor protection system and experimental devices shall be prevented by means of separation or by suitable functional independence. If specific parameters of experimental devices are mandatory for the safe operation of the reactor and signals used in common by both the reactor protection system and experimental devices, separation (such as by adequate decoupling) shall be ensured and the signal system shall be classified as part of the protection system.	This is the extension of the reactor protection system shall be independent to other systems as required by Para. 6.173		✓ Interconnections between reactor instrumentation and control systems and systems to control experimental devices shall in general be prohibited. Exceptions shall only be permitted if interconnections to control specific parameters of experimental devices are mandatory for the safe operation of the reactor.		Revised for coherence with comments from CAN, UKR and FRA.

97.	Para. 6.173 Para. 6.173 and Para. 6.176	The reactor protection system shall be capable of automatically initiating ~~the required protective~~ safety actions for the full range of postulated initiating events ~~to terminate the event safely.~~ to actuate the safety systems necessary for achieving and maintaining safe research reactor facility conditions. The possible malfunction (single failure) of parts of the system shall be taken into account in providing this capability.	**Comment 1**: Not all actions initiated by the reactor protection system are "protective" in nature, some of them are "mitigating" actions. For example, if there is a LOCA, the protection system initiating action(s) is "mitigate" not "protective". **Comment 2**: In most cases, the reactor protection system is not designed to terminate the PIE, but to bring the research reactor facility in a safe condition The Para. 6.176 is repeating the second statement in Para. 6.173		✓ The reactor protection system shall be capable of automatically initiating the required safety actions, for the full range of postulated initiating events, to actuate safety systems necessary to terminate the event safely. ✓ 2nd statement deleted.		Safety action added. The second sentence was deleted.

98.	Para. 6.174	The reactor protection system shall be designed in such a way that ~~necessary protective actions,~~ once initiated automatically or manually ~~by the reactor protection system proceed to~~ the indented sequence of protective actions shall continue until completion. ~~and that no manual actions are necessary within a short period of time following a protective action. Such automatic actions by the reactor protection system shall not be self-resetting and a return to operation shall require deliberate operator action.~~ Deliberate operator action shall be required to return the reactor protection system to normal.	**Comment 1:** This requirement is not only limited to automatically initiated actions only. **Comment 2**: Deliberate operator manual action is required		✓ The reactor protection system shall be designed in such a way that once initiated automatically by the reactor protection system, the sequence of protective actions shall proceed to completion and that no manual actions are necessary within a short period of time following a protective action. Such automatic actions by the reactor protection system shall not be self-resetting and deliberate operator		Revised for clarity.

					action shall be required to return to normal operation.		
99.	Para. 6.175	~~The possibility of bypassing interlocks and trips of the reactor protection system shall be carefully evaluated and justified.~~ Bypassing interlocks that are important to safety might result in bypassing safety function(s) of the reactor protection system; ; therefore, appropriate means of ~~protecting~~ preventing interlocks ~~and trips~~ that are important to safety being inadvertently bypassed shall be incorporated into the design of reactor protection system.	**Comment 1** Reactor protective functions might by bypassed. **Comment 2** Means of "preventing" not "protecting" interlocks being passed.	✓		✓	The first clause is not framed as a "shall" requirement. Means of preventing added.
100.	6.177	The reactor protection function shall be designed to bring the reactor into a safe condition and to maintain it in a safe condition even if the reactor protection system is subjected to a ~~feasible~~ credible common cause failure.	**Better wording.**	✓			

101.	6.178	The reactor protection system shall be designed to permit periodic testing of its functionalities ~~their functionality~~.	**Better wording.**	✓			Its functionality.
102.	Para. 6.180 6.184	Clarification and/or correction is needed	Para. 6.180 describes requirements / guidance for using computer based equipment in reactor protection system, while Para. 6.184 describes requirements / guidance for using computer based equipment in systems important to safety. It is suggested to merge these two paragraphs. It should be noted that Para. 6.184 contain more requirements / guidance than those in Para. 6.180. In reality, it should be the opposite, more requirements / guidance on how to use			✓	It is important to keep the requirements for the reactor protection system clear and separate from those for the general computer systems. Merging the two would reduce clarity.

			computer-based equipment ion reactor protection system.				
103.	Requirement 49	Suggest adding: Requirement 49: Provision of instrumentation and control systems for a research reactor facility Instrumentation shall be provided for a research reactor facility for monitoring the values of all the main variables that can affect the performance of the fundamental safety functions, the main process variables that are necessary for its safe and reliable operation, to determine the status of the facility under accident conditions including DEC and for making decisions for accident management.	Clarification and/or correction is needed			✓	Redundant. Accident conditions includes DEC.

104.	**Requirement 50**	Suggest removing this requirement or link it with other safety systems. May be call it as “control system of safety system”? **Requirement 50: Reactor protection system for a research reactor**	It is not clear what is a difference between reactor protection system and other safety systems (each safety system includes its control part). List of safety function does not include “reactor protection function” (see 6.178). E.g. how to make reactor protection system independent from shut down system or ECC (see 6.172)? Or it will be interference of safety systems through this reactor protection system?			✓	Reactor protection system is a well understood and long established system for RRs. It is not helpful to remove this requirement or link it with other safety systems.

105.	6.182	Suggest adding: 6.182. The required level of reliability shall be identified by design and verified safety analysis (PSA) and achieved by means of a comprehensive strategy that uses various complementary means (including an effective regime of analysis …	Clarification and/or correction is needed . It shall be linked with PSA due to impossible to establish required reliability level without PSA.			✓	PSA is considered as a complementary analysis tool for RRs.
106.	6.184 (c)	Assurance of high reliability shall be demonstrated using appropriate methods consistent with applicable codes and standards. (For example, independent third party assessment)	Clause (c) "An assessment of the equipment shall be undertaken by experts who are independent of the design team and the supplier team to provide assurance of its high reliability" is overly prescriptive and should be determined by the application of appropriate I&C codes and standards			✓	The text is coherent with SSR-2/1, 6.37. For many research reactors peer review is more practical.

107.	6.187 Requirement 53	Suggest adding: **Requirement 53: Control room for a research reactor facility** **A main control room shall be provided at a research reactor facility from which the facility can be safely operated in all operational states, either automatically or manually, and from which measures can be taken to maintain the research reactor in a safe state or to bring it back into a safe state after anticipated operational occurrences and accident conditions. Test equipment control and operating measurements (needed for test) shall be operated from control room if other place is not defined by design.3** 6.187. The design of the control room shall provide an adequate margin against natural hazards more severe than those selected for the design basis.	Clarification and/or correction is needed			✓ ✓	It is not appropriate to prescribe in a requirements document the room or location from where test equipment and test measurements shall be operated. Test equipment is covered in Req. 36 and human factors in Req.35. Control room in 6.104.

		Operation of test equipment in MCR (if applicable) shall not prevent safety operation of reactor including human factor aspects (e.g. overload of operator).					
108.	6.187 Requirement 54	Provision of ~~a~~ supplementary control functions and features for a research reactor facility, separated and functionally independent from the main control room, shall be considered in the design.	The decision to have a completely separate backup control room is informed by the specific safety case. Smaller designs may simply need an auxiliary panel outside the main control room.			✓	The requirements is only to consider this in the design. If a small reactor simply needs an auxiliary panel, then a panel would fulfill the requirement. 1.88 also revised to include a shutdown panel.
109.	6.188	The means provided in the supplementary control ~~room~~ functions and features shall be sufficient for fulfilment of the main safety functions (shutdown, cooling, confinement and monitoring of the facility status) in the event of an emergency. The safety case	Clarification and/or correction is needed			✓	Architectural layout provisions are more suitable for guidance documents.

		of the facility may require the use of a supplementary control room to contain these features. The architectural layout of the supplementary features shall be justified on the basis of a comprehensive analysis. Information on important parameters and the radiological conditions in the facility and its surroundings shall be made available in the supplementary features. Systems designed for this purpose shall be considered as items important to safety. ~~A supplementary control room may not be needed for critical and subcritical assemblies.~~ In this case, the decision shall be justified on the basis of a comprehensive analysis. There shall be safe routes from MCR to SCR for all NO, AOO, DBA and DEC conditions. Design shall provide switching of control from MCR to SCR.				✓	Critical and subcritical assemblies are within scope and need to be addressed in this requirement. Safe routes covered elsewhere.

110.	**Requirement 56: 6.190, 6.191 6.192**	It is recommended to reference IAEA Safety Standard Series, Design of Electrical Power Systems for NPPS (SSG 34 under publication)	Clarification and/or correction is needed			✓	Including a reference to the NPP Standard is not appropriate here.
111.	Requirement 57 6.193	Suggest adding: **Requirement 57: Zoning and radiation protection systems for a research reactor facility** **Different zones shall be established for facility as per potential radiation hazard. Equipment shall be provided at a research reactor facility to ensure that there is adequate radiation monitoring in operational states and accident conditions.** 6.193. The design of radiation protection systems shall include: g) local and MCR/SCR alarms h) monitoring and alarm during experiments for room and materials			✓ (c) revised to add "experimental areas"	✓	Zoning is a means of achieving the requirements for radiation protection. See 6.97 for Zoning. See also Req. 34 Alarms are covered in communications systems for EPR 6.170 and 6.91

112.	6.198	Suggest adding: 6.198. The handling and storage systems shall be designed to: (a) Prevent criticality with adequate margins by physical means such as the use of an appropriate geometry and fixed absorbers for all NO, AOO, DBA and DEC conditions such seismic, flooding, fire and etc.; (k) provide sufficient space for full core unload in case of accident (l) provide means for storage of damaged fuel	Clarification and/or correction is needed			✓ ✓ ✓	Redundant. The requirements apply for all operational states and accident conditions unless stated otherwise. Full core unload is already covered in 6.196. Damaged fuel is covered in (c)
113.	**Requirement 59:**	Suggest adding: **Requirement 59: Radioactive waste systems for a research reactor facility**	Clarification and/or correction is needed			✓	Superfluos. Waste generated in experimental facilities also covers waste

		The design of a research reactor facility and its associated experimental facilities shall include provisions to enhance safety in waste management and to minimize generation of radioactive waste including generated during research. Systems shall be provided for treating solid, liquid and gaseous radioactive waste to keep the amounts and concentrations of radioactive releases as low as reasonably achievable and below authorized limits on discharges. 6.201. Appropriate means, such as shielding and decay systems, to reduce the exposure of personnel and radioactive releases to the environment shall be considered in the design and provided as necessary for all internal and external hazards and accidents.				✓	generated during research. Internal hazard are covered in 6.46-6.47.. External events and hazzards are covered in 6.52-6.54

114.	6.204.	Suggest adding: 6.204 The failure of any auxiliary system, irrespective of its importance to safety, shall not be able to jeopardize the safety of the reactor. Adequate measures shall be taken to prevent the personal over exposure or release of radioactive material to the environment in the event of the failure of an auxiliary system containing radioactive material.	Clarification and/or correction is needed			✓	Exposure is covered in 2.6-2.8. This section is focused on auxiliary system and limiting releases to the environment.

115.	6.205	The fire protection systems installed at the research reactor shall be capable of ~~dealing safely with~~ addressing postulated fire events in different locations such MCR or SCR, reactor building, radioactive waste storage and etc., so as to ensure the safety objectives and goals of the facility are met. ~~of the various types that are postulated~~. Activation of fire protection system shall not lead additional hazards to reactor and safety systems, or personal overexposure or unplanned release of radiation to environment.	Clarification and/or correction is needed The words "dealing safely with" is imprecise. The goal of fire suppression is to protect the control-cool-contain features so that the safety objectives & goals are met.		✓ …with postulated fire events. Fire hazards due to experiments shall be considered.		The term "dealing safely with" is used in SSR-2/1. Text revised for clarity.

116.	6.207	6.207. Fire detection systems shall be designed to provide alarm and prompt information on the location and spread of fires that start in the reactor facility at any time. Fire hazards during experiment shall be accounted.			✓ Fire hazards due to experiments shall be considered.		6.205 revised to address this comment.
117.	6.210	Suggest adding: 6.210. The lifting equipment shall be designed so that: (e) handling of materials as per experiment program (f) prevent personal exposure or radioactive contamination/release over safety/design limits during transport activities	Clarification and/or correction is needed OPEX		✓ Experiments added to (a)	✓	(e) is not clear. Experimental programmes added to (a) (g) It is not clear how lifting equipment can be designed to prevent personal exposure or radioactive contamination during transport activities. This may be a requirement for the transport flask.

118.	6.211	Add new item (a) as follows: (a) Maintain a habitable environment for plant personnel necessary to oversee ongoing operations at the facility under normal operation as well as accident conditions.	Uninhabitable control rooms during accidents make maintaining ongoing safety at a facility very challenging.			✓	Habitability of the control room is already covered in Req. 75 and 7.63. (a), (b), (c), and (d) together help to maintain a habitable environment.

119.	7.1	**Suggest adding:** 7.1The prime responsibility for safety shall be assigned to the operating organization of the research reactor. This prime responsibility shall cover all the activities related to the operation directly and indirectly including experiments. It includes the responsibility for supervising the activities of all other related groups, such as designers, suppliers, manufacturers and constructors, employees and contractors, additional personal for experiments, as well as the responsibility for operation of the reactor facility by the operating organization itself. The operating organization shall discharge this responsibility in accordance with its management system [4].	Clarification and/or correction is needed OPEX		✓ …including activities for experiments.		For clarity.

120.	7.6	Suggest adding: 7.6. In collaboration with the supplier or design group, the operating organization shall have overall responsibility for the preparation and satisfactory completion of the construction and commissioning programmes (see paras 7.51).	Clarification and/or correction is needed			✓	For some new builds, the construction may not be the responsibility of the operating organization. Redundant. Commissioning cannot be satisfactorily completed if construction is not completed.

121.	7.9(e)	The commissioning process demonstrates that the design requirements have been met and that the reactor can be operated in accordance with the design basis.	Reactors are not operated in accordance with assumptions. This sends the wrong message to the public. Commissioning is used to support the credibility of the design basis including confirming that assumptions used are valid.	✓			
122.	7.9(l)	Safety culture is fostered in the organization to ensure that the attitudes of personnel and the actions and interactions of all individuals and organizations are conducive to safe conduct of activities during operation of the facility (see paras 4.1, 4.4);	Many activities occur in a research reactor, not just operation: maintenance, conduct of experiments. The suggested change clarifies that safety culture must permeate all activities, not just operation.	✓			

123.	7.25	Clarification and/or correction is needed	The operating organization shall arrange for the provision of assistance by contractor personnel as required.	✓			It is not clear what is suggested here. Text unchanged.
124.	7.26	Suggest discuss and editing: In some States, an advisory group (or a reactor safety committee) is established to advise the reactor manager on the safety aspects of the day to day operation and utilization of the reactor. Such committees normally review the adequacy and safety of proposed experiments and modifications and provide the reactor manager with recommendations for action.	Regulator should be attached to this committee. Planning, design and execution experiments should be comprehensively evaluated by the operator and accepted by the regulator.			✓	The regulator is not required to be part of the internal safety committee. If an experiment is within preapproved limits and conditions it may not be required by the regulator that such experiments be submitted for acceptance.

125.	7.29, 7.30	In Clause 7.29, 7.30, or any other clauses, change the wording "suitably qualified" or "suitable training" to "adequately qualified" or "adequate training"	"Suitably" or "suitable" is not appropriate wording for requirements.			✓	"Suitably qualified" is consistent with SSR-2/2, 6.6
126.	7.31	Suggest adding: 7.31. Procedures shall be put in place for the validation of the training to verify its effectiveness and the qualification of the staff. As appropriate, depending on reactor design, simulator (simplified or full scale) shall be used for operator training.	Clarification and/or correction is needed			✓	Specifying a simulator for operator training is not appropriate for most RRs. This is a requirement for NPP. The requirement text is general enough to accommodate simulators as appropriate.

127.	**Requirement 71**	**Suggest editing:** **Operational limits and conditions for a research reactor** **The operating organization for a research reactor facility shall ensure that the research reactor is operated in accordance with operational limits and conditions.**	For research reactors that have experimental facilities linked, or attached as a part of the reactor core, the limits and conditions for reactor operation shall be specified for all modes of operation (reactor alone, reactor+ experimental facilities, and other combinations).			✓	The text allows for this OLC to be specified by the RB. It does not need to be detailed separately in this requirement as reactor, reactor + experiment, etc. The text is consistent with SSR-2/2.

128.	Clause 7.34	It is suggested to change "The operational limits and conditions shall be adequately defined clearly established and appropriately substantiated (e.g. by clearly stating for each operational limit and condition its object, its applicability and its specification; i.e. its specified limit and its basis)." To "The operational limits and conditions shall be adequately defined, clearly established and appropriately substantiated (e.g. by clearly stating for each operational limit and condition its objective, its applicability and its specification; i.e. its specified limit and its basis)."	There is a syntax problem with the sentence.	✓			Thanks. Typo fixed.

129.	7.35	Suggest editing and adding: **Requirement 71: Operational limits and conditions for a research reactor** **The operating organization for a research reactor facility shall ensure that the research reactor is operated in accordance with operational limits and conditions.** **Safety limits** 7.35. Safety limits shall be set to protect the integrity of the physical barriers that protect against the uncontrolled release of radioactive material or exposure over limit.	Inconsistency with IAEA definitions: ***safety limits.*** *Limits* on operational parameters within which an *authorized facility* has been shown to be safe. □□*Safety limits* are *operational limits and conditions* beyond those for *normal operation*. **operational limits and conditions** See *limit*. **limit** The value of a quantity used in certain specified *activities* or circumstances that must not be exceeded. (From Ref. [1].) **!** The term *limit* should only	✓			

			be used for a criterion that must not be exceeded, e.g. where exceeding the *limit* would cause some form of legal sanction to be invoked. Criteria used for other purposes — e.g. to indicate a need for closer investigation or a review of *procedures*, or as a threshold for reporting to a *regulatory body* — should be described using other terms, such as *reference level*.				

130.	7.37	Suggest editing highlighted: **Limiting conditions for safe operation** 7.37. Limiting conditions for safe operation shall be established to ensure that there are acceptable margins between normal operating values and the safety system settings. Limiting conditions for safe operations shall include limits on operating parameters, requirements relating to minimum operable equipment and minimal staffing levels, and prescribed actions to be taken by operating personnel to preserve the settings of the safety system.	The values and safety system setting exist for limits (process or neutron parameters). Conditions shall be only***: requirements relating to minimum operable equipment and minimal staffing levels, and prescribed actions to be taken by operating personnel to preserve the settings of the safety system.*** There is no IAEA definition for limiting conditions, suggest using safety or operational conditions			✓	Retained for coherency. Limiting conditions are described in the safety document NS-G-4.4

131.	7.39 / All	The requirements for maintenance, surveillance, periodic testing and inspection shall include a specification that clearly ***defines objectives, identifies the required frequency for the performance of activities and establishes criteria that must be meet to gain acceptance of deviations from program requirements***. In order to provide operational flexibility, the specification shall state ***frequencies of activities in terms of*** average intervals ***with maximum intervals that are*** not to be exceeded. ***Deferral of activities*** that exceed the maximum ***specified intervals*** shall be ***justified, approved by the operating organization and the regulatory authority, and*** safety measures shall be put in place ***when necessary***.	Current text is not clearly written and could cause confusion for users of the document.		✓ … states the objectives, applicability and the frequency…		Text revised for coherency with requirements for maintenance specifications.

132.	**Requirement 72** **7.45** **7.58**	Suggest editing highlighted: **Requirement 72: Performance of safety related activities for a research reactor facility** **The operating organization for a research reactor facility shall ensure that safety related activities are adequately analysed and controlled to ensure that the risks associated with harmful effects of ionizing radiation are kept as low as reasonably achievable.** 7.45. All activities important to safety shall be carried out in accordance with approved written procedures to ensure that the research reactor is operated within the established operational limits and conditions. Acceptable margins shall be ensured between normal operating values and the established safety system settings to avoid undesirably frequent actuation of safety	Suggest defining what is safety related or important to safety activities (e.g. all activities with SSCs important to safety): as written it is not clear and all operating activities could be safety related. There is no such definition in IAEA glossary			✓	Safety related activities are activities related to SSCs important to safety. The text is consistent with SSR-2/2 Rev.1 Req.8 and associated paras.

		systems (see para. 7.37). 7.58. Operating procedures shall be developed for all safety related operations that may be conducted over the entire lifetime of the facility, including:					
133.	7.47	Suggest adding: 7.47. An adequate commissioning programme shall be prepared for the testing of experimental equipment and tools, reactor components and systems after their construction or modification to demonstrate that they are in accordance with the design objective and meet the performance criteria.	Clarification and/or correction is needed			✓	7.50 covers this – it states that the experiment devices (including equipment) shall be given adequate consideration. In many reactors the experimental equipment is provided after the reactor has been commissioned. It useful to keep the two requirements separately for clarity.

134.	7.50 Sentence 1	Experimental devices shall be subject to commissioning test protocols prior to being placed in service to confirm design requirements are met. The potential impact on reactor operation shall be assessed to determine whether additional reactor commissioning tests are required with the experimental devices in service. ~~given adequate consideration during the commissioning of the reactor.~~ Commissioning programmes shall establish requirements related to the addition and modification of experimental devices for operating reactors.	The term 'adequate consideration' is vague and as a result very difficult to address in a safety case. All experimental devices should go through some form of commissioning testing to confirm safety continues to be met. In some cases, such as new fuel types, the reactor itself may need to go through supplementary commissioning testing. The current statement does not clarify that commissioning activities may be required specifically to permit the use of some experimental devices.		✓ Experimental devices shall be subject to an adequate commissioning program prior to being placed in service.		It is agreed that all experimental devices should go through a commissioning test to confirm safety requirements are meet.

135.	7.52	Suggest adding **Commissioning tests and stages** 7.52. Commissioning tests shall be arranged in functional groups and in a logical sequence. This sequence includes pre-operational tests, initial criticality tests, low power tests and power ascension and power tests. Commissioning and operating staff shall be trained for commissioning activities.	Clarification and/or correction is needed			✓	7.52 addresses tests and stages. Staff training is covered elsewhere.

136.	7.58	Suggest editing as below: 7.58. Operating procedures shall be developed for all safety related operations that may be conducted over the entire lifetime of the facility, including: (g) The reactor operator's response to anticipated operational occurrences and design basis accidents, and~~, to the extent feasible,~~ to design extension conditions;	The reason for suggested changes is that the requirements themselves cannot be graded.			✓	To the extent feasible is an important consideration for existing reactors.

137.	7.60 Sentence 1	The operating procedures shall be reviewed and updated periodically on the basis of the lessons learned in using the procedure ***and external operating experience***, or, if the need arises, in accordance with predetermined internal procedures.	External operating experience may provide useful information concerning the effectiveness of operating procedures.		✓ The operating procedures shall be reviewed and updated periodically on the basis of lessons learned from operating experience, or, in accordance with predetermined internal procedures.		Revised for clarity.

138.	7.62 Sentence 1	When activities that are not covered by existing procedures are planned, an appropriate procedure shall be prepared and shall be subject to ***approval by the operating organization*** and***, if necessary, the regulatory authority,*** before the operation is started.	Adding a requirement to "review" a procedure does not define who should carry out the review and "appropriate approval" is too vague of a term. Review and approvals should be subject to processes established by the operating organization and regulatory authority.			✓	The text is consistent with SSR-2/2 "subject to approval" 7.4.

139.	7.66 Sentence 2	Equipment that is degraded (***corrosion***, loose parts or damaged thermal insulation, for example) shall be identified, ***reported to the operating organization and, if necessary, the regulatory authority***, and corrected in a timely manner.	Leaks are the result of degradation, not a form of degradation or a mechanism. Corrosion "spots" is not correct terminology. The morphology of the corrosion should not matter. Any form of corrosion that degrades equipment should be considered. The reporting requirements should be clarified.		✓ Equipment that is degraded (owing to leaks, corrosion, loose parts or damaged thermal insulation, for example) shall be identified, reported and corrected in a timely manner		Revised, "spots" deleted.

140.	7.69 Sentence 4	A system of work permits in accordance with the requirements of the integrated management systems shall be used for maintenance, periodic testing and inspection, including appropriate ***procedures and checklists***, before and after the conduct of the work.	"checking off procedures" is not proper terminology	✓			
141.	7.76 Sentence 2	***An assessment of the programme shall be carried out to confirm the adequacy of the programme or identify required improvements.***	The meaning of "maintenance assessment" is not clear. Second sentence should be changed to clarify meaning.		✓ An assessment shall be made of the impact of the non-conformance on the maintenance programme.		For clarity.
142.	7.73	Change Clause 7.73 to "…periodic testing and inspection shall be identified…"	Periodic inspection should be included in the requirement.	✓			

143.	7.77	Suggest adding: 7.77. Core management and fuel handling comprise the movement, storage, transfer, packaging and transport of fresh and irradiated fuel and other core components. Applicable safety requirements shall be documented in the operational limits and conditions and the relevant procedures shall be applied. All activities with fuel and core shall be performed by trained and certified operators. All activities with fuel shall be done in accordance with procedures, programs, schedules, schemes and other required documents developed by qualified operating organization staff.	Clarification and/or correction is needed			✓	These requirements for trained and certified operators and procedures, etc., apply to all safety related activities. It is redundant to add the additional text here in 7.77.

144.	7.81	Pertaining to section 7.81, it reads: "The integrity of the core shall be continuously monitored by a cladding failure detection system, not necessarily online.". Suggest modifying 7.81 entirely to read as follows: "The fission product activity of the reactor heat transport system shall be monitored continuously during normal operating conditions of the core".	It would be directed the authors to stroke out the words "Not Necessarily Online"		7.82 not 7.81 ✓ The integrity of the reactor core and the fuel shall be continuously monitored by a cladding failure detection system (e.g., by monitoring fission product activity in the coolant).		Provides helpful clarification

145.	7.93	Suggest adding: 7.93Facilities, instruments, tools, equipment, documentation and communication systems to be used in an emergency, including those needed for communication with off-site authorities, shall be kept available for use in a range of postulated emergencies including DEC. They shall be maintained in good operational conditions such that it is unlikely that they would be affected or made unavailable as a result of the accident or by an initiating event. The operating organization shall ensure the relevant information on the research reactor safety parameters and facility conditions is available in the emergency centre and that communication is effective between the control rooms and this centre in the event of an accident. These capabilities shall be tested periodically.	Clarification and/or correction is needed			✓	Postulated emergencies include DEC. Superfluous.

146.	7.97 Requirement 83	Instead of "Utilization and modification of a research reactor" Change to: Configuration Management The operating organization shall establish and implement a configuration management program that controls and documents all engineered changes to the facility including experiments. The configuration management program shall be informed by the safety classification and code classification approaches used.	The term of "programme to manage utilizations and modifications of the reactor" is not clear English. "Configuration Management" is a universally understood terminology in the nuclear sector.			✓	For a RR, utilization and modification is addressed in SSG 24. This goes beyond configuration management. It covers reactor utilization as well as modifications that may change the configuration.

147.	7.99(d) Sentence 1	It is recommended to complete the sentence as follow: "All personnel who will be involved in making a proposed modification or in conducting the proposed utilization are suitably trained, qualified and experienced for the task;" Add "utilization or modification" to the end of Clause 7.99 (d)	Greater clarity around the word qualified There is a part of the sentence missing.	✓			

148.	7.100	Suggest adding: …on the basis of a statement of whether or not the proposed change will put the operation of the reactor outside the operational limits and conditions	Any proposed change should not be allowed to put the operation of the reactor outside the operational limits and conditions.	✓			The suggested wording is already in 7.100
149.	7.102 Sentence 1	In implementing utilization and modification projects for research reactors, the radiation exposure of the workers and other personnel at the facility shall be kept ***below authorized limits and*** as low as reasonably achievable.	Radiation exposures should also be below authorized limits.	✓			

150.		Suggest adding: 7.110. The radiation protection programme is subject to the requirements for occupational radiation protection (see Refs [12, 15]) and shall include in particular measures for the following: (a)Ensuring that there is cooperation between the experimental staff, radiation protection staff and the operating staff in establishing operating procedures and maintenance procedures when radiation hazards are anticipated, and ensuring that direct assistance is provided when required; (i)Providing the review and analysis of materials, equipment and conditions for experiments as per radiation protection aspects (including update of safety analysis as applicable)	Clarification and/or correction is needed OPEX	✓			

151.	7.120	Suggest adding: 7.120. The ageing management programme shall determine the consequences of ageing and the activities necessary to maintain the operability and reliability of systems including experimental devices and equipment, structures and components. The ageing management programme shall be coordinated with, and be consistent with, other relevant programmes, including the programme for in-service inspections, periodic safety review[47] and maintenance. A systematic approach shall be taken to provide for the development, implementation and continuous improvement of ageing management programmes.	Clarification and/or correction is needed			✓	Ageing management is for SSCs important to safety. Some routine experimental devices may or may not have an impact on safety.

152.	7.121 Sentence 1	Suggest editing: 7.121. On the basis of the results of the periodic safety review, the operating organization shall implement any necessary corrective actions and shall consider making justified modifications to enhance safety (see also para. 7.119 on the interaction between ageing management and periodic safety reviews).	Incorrect reference to paragraph 7.119. Not sure which paragraph should be referred to so cannot make a recommendation for a change.	✓			Changed Ref to 7.120

153.	**Requirement 87**	Suggest adding: **Requirement 87: Extended shutdown for a research reactor48** **If an extended shutdown is planned or occurs, the operating organization for a research reactor facility shall establish and implement arrangements to ensure safe management, planning, effective performance and control of work activities during extended shutdown.** **Start of operation after extended shutdown shall be similar to start after construction with using of graded approach to scope of inspections, tests and commissioning as appropriate.**	Clarification and/or correction is needed			✓	This requirement covers shut down. Adding a clause on start up here would dilute the focus.

154.	**Requirement 88** 7.127.	Suggest adding: **Requirement 88: Feedback of operating experience for a research reactor facility** **The operating organization for a research reactor facility shall establish a programme to learn and incorporate required modifications from events at the reactor facility and events in other research reactors and from the nuclear industry.** 7.127 Events with significant implications for safety shall be investigated to identify their direct and root causes, including causes relating to equipment design, operation and maintenance, or to human and organizational factors. The results of such analyses shall be included, as appropriate, in relevant modification and training programmes and shall be used in reviewing procedures and instructions.	Clarification and/or correction is needed : OPEX shall lead increasing of safety which requires some actions both facility modifications and additional training and analysis. Without this OPEX is useless.			✓	It is useful to learn and incorporate modifications. Agreed, but the action is covered here by corrective action in 7.28. This may or may not require a modification. 7.127 is coherent with SSR-2/2 Rev.1 Para. 5.28

155.	**Requirement 90:**	Suggest adding: **Requirement 90: Interfaces between nuclear safety and nuclear security for a research reactor facility** **The interfaces between safety and security for a research reactor facility shall be addressed in an integrated manner throughout the lifetime of the reactor for all reactor states including DBA and DEC. Safety measures and security measures shall be established and implemented in such a manner that they do not compromise one another but enhance one another [17].**	Clarification and/or correction is needed			✓	Including DEC in the interface between safety and security goes beyond the requirements for NPP

156.	Annex??	Suggest adding: I.1. The following are selected postulated initiating events for research reactors: (l) Loss of electrical power supplies: − Loss of external electrical power[50] including full loss of alternating power (full black-out) if applicable. (2) Insertion of excess reactivity: -removing of poison in coolant or moderator - insertion positive reactivity due to experiment (operating of experimental devices and materials, many of which represent considerable reactivity value)	Clarification and/or correction is needed		✓ Added - removal of poison in coolant or moderator		(2) Insertion of reactivity is covered by the bullet - Influence by experiments…

157.	Appendix I (3)	It is recommended to modify "Fuel channel blockage;" to "Fuel channel blockage or flow reduction (e.g. due to foreign material or erroneous fuel assembly position);"	This is to give additional examples that could cause insufficient fuel cooling.	✓			
158.	II.5 Sentence 2	Special attention shall be given to the need to verify that every modification has been properly assessed, documented and reported in terms of its potential effects on safety, and that the research reactor ***is*** not restarted without formal approval ***of the operating organization and the regulatory authority*** after completion of the modifications with major implications for safety.	Approvers should be specified.		✓ Operating organization		Depending on the arrangements, this may not be required by the RB in every member state.

159.	**ANNEX SELECTED SAFETY FUNCTIONS FOR RESEARCH REACTORS**	Suggest adding: TABLE I-1. ….. (b) To provide negative feedback of reactivity (c) To provide a means of moderating and controlling neutron fluxes (d) To prevent internal events propagation from/between subsystems (e.g. reactor and experimental facility) in the reactor core and other safety areas. Fuel matrix and cladding (a) To form a barrier to the release of fis products and other radioactive material f fuel (b) To provide a ~~constant~~ coolable fuel configuration	Clarification and/or correction is needed		✓ To provide a coolable fuel configuration		Proposed text (d) is not clear.

COMMENTS BY REVIEWER Country/Organization: China/CAEA				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Page 20 Req. 5					✓	Independent verification is an important requirement for safety.
2	Page 29 Req.12 Line2-4					✓	The graded approach is based on the potential hazards not the grade of the facility.
3	Page 34 Req.19				✓		A guidance document is being considered.
4	Page 38 Req.22					✓	The term Design Extension Conditions

							is used in light of the feedback from FD. This is consistent with SSR-2/1 Rev.1
5	Page 70 Para 7.7					✓	Most operating organization collaborate with the supplier or design group. Overall responsibility remains with the operating organization.
6	Page 72 Para 7.10					✓	Not clear as text does not fit in 7.10? The radiation protection programme is covered in Req. 84.
7	Page 72 Para 7.10					✓	Not clear as 7.10 is on responsibilities. In 7.9, events with safety significance is clear; reportable

							incidents is not clearly defined.
8	Page 74 Para 7.27				✓ Text revised		7.26 not 7.27 Rewritten as a shall requirement.
9	Page 87 Para 7.0					✓	This list of emergency arrangements is useful detail. However this level of detail is more suited to a guidance document, rather than this higher tier safety requirements document. Details are provided in Ref. [10].
10	Page 89 Req.83			✓			The regulatory body controls utilisation and modification through the approval process.
11	Page 23			✓			Text changed to Six

	Para 5.5 Line 3-4						aspects for consistency.
12	Page 77 Para. 7.43 Line 3-5					✓	Yes the RB may also carry out an independent investigation after the OO has properly notified the RB. However the responsibility lies with the operating organization and adding "or" would dilute this requirement.
13	Page 99 Appendix I Line 14			✓			

COMMENTS BY REVIEWER Reviewer: Dr Farhad Farmoodi, Mohammad Sotoudeh, Nahid Sadeghi Country/Organization. IRAN/ Nuclear Science and Technology Institute /Atomic Energy Organization of Iran				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.6				✓ Research reactor facility added.	✓ ✓	The text on ‘operational states” is coherent with SSR-2/1 Rev.1, 5.11 Text on “as low as reasonable achievable” is coherent with SSR-2/1 Rev.1, 5.11
2	2.9(3)			✓			
3	2.12, item (1) line 3			✓			
4	2.13 item					✓	“implementation of

	(1)						defence in depth" is acceptable text and coherent with SSR-2/1 Rev.1
5	2.14 (6)			✓			
6	2.16 (4)			✓			
7	3.1 (1)			✓			
8	After 3.11				✓ 7.9 revised to include an exclusion programme on foreign objects, in accordance with regulatory requirements		This is now addressed in the revision to 7.9 "in accordance with regulatory requirements".
9	5.9 (e)				✓ …including security related incidents		Revised for consistency with Appendix I (6).

10	5.12 (3)			✓			
11	6.27 (c)			✓			
12	6.47 (1)			✓			
13	6.90 (4)					✓	National requirements for "medical assistant" is not clear. Medical provisions may be covered in industrial safety requirements.
14	Req. 67				✓7.9 revised to include an exclusion programme on foreign objects		7.9 revised to include an exclusion programme coherent with SSR-2/2.
15	Commisioning page 78					✓	The scope of the approved DPP focuses on Design and Operation, with

							design provisions for commissioning covered in 6. Adding a separate section would increase the scope beyond the approved DPP.
16	7.108 (10				✓ of		Grammar.
17	7.110				✓ Other added	✓ Reject other comments within 17	This would provide unnecessary duplication of NS-G-4.6. The program shall include in particular measures for the following: Here “in particular” indicates only some particular measures are included. It is not appropriate to include the full list from NS-G-4.6 and

							NS-G-2.6.
18	Req. 88 Line 3					✓	The intention is to learn from all, not either RR or NPP.
19	7.126 (3,4,5)				✓ Research reactor addded		It is not appropriate to reference lower tier documents such as IRSRR in this requirements standard.

COMMENTS BY REVIEWER Reviewer: Ukraine				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	6.149					✓	Any condition includes any PIEs
	6.140			✓			
	Appendix 1. Para 1.1					✓	See 1.8 Accelerator driven systems are out of scope of this publication.
	6.171				✓ Instrumentation and control systems and systems to control experimental devices...		Text modified. For clarity delete "of" experimental devices

	6.176				✓ 2nd sentence of 6.173 deleted to avoid duplication.		To avoid duplication.
	6.181				✓ Text modified. Integrity deleted and high reliability added.		The text is useful for research reactors and deleting it would reduce clarity. Spelling is correct
	6.184 d					✓	The text is consistent with SSR-2/1 6.27(d)
	Req. 52 6.184					✓	Not only a, e and g apply, it is important to retain b, c, d, and f also for computer based equipment. This is consistent with 6.104 of NS-R-4.

COMMENTS BY REVIEWER Reviewer: Daniel Bogdan Country: Romania Organization: National Commission for Nuclear Activities Control				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Paragraph 1.6/ line No. 4					✓	'Applied to existing research reactor to the extent practicable' is a useful statement and consistent with text in SSR-2/1.
2	Paragraph;2 /12 Line No. 8					✓	The text provides a useful link to the reference for the reader and an introduction to DiD.
3	Paragraph 2.17. Lines					✓	This is difficult as different MS use

	No.3-14.						different values. The regulatory body in each MS will define the values.
4	Paragraph 4.25 Lines 1-4.				✓ New applicable safety standards added.		Periodic safety reviews shall be done in accordance with MS regulatory requirements. Therefore it is not appropriate to state the frequency or period here. “new safety information” covers pertinent feedback and lessons learned even if these have not been codified as new standards.
5	Paragraph				✓		For clarity and

	6.54 lines 1-3				Text revised to address these and comments from other MS (CAN,RUS,GER)		coherence
6	Paragraph 6.65 Lines 5-6				✓ ... shall be performed to determine if there is a need...		For clarity
7	Paragraph 6.63 Lines 8					✓	The text is in Req. 22 not para. 6.63. The requirement include provisions for engineering judgement of what is reasonable possible to happen. Coherent with SSR-2/1.
8	Paragraph 6.187				✓ Text revised to add “remote shutdown panel”. Consistent with		Text in 6.188. Secondary control room or remote shutdown panel is consistent with

					SSR-2/1.		SSR-2/1.
9	Paragraph 6.187					✓	The control room shall is required to withstand natural hazards more severe than the design basis. This is coherent with SSR-2/1 Rev.1 Paragraph 6.40
10	Paragraph 7.64					✓	Text in 6.188 revised to clarify that a supplement control room is sometimes considered a remote shutdown panel. No further repetition needed here.

COMMENTS BY REVIEWER Reviewer: Russia/Scientific and Engineering Center for Nuclear and Radiation Safety (SEC NRS)				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	6.54			✓			
2	6.121			✓			
3	6.137			✓			
4	7.22					✓	7.22 needs to refer to both 7.38 and 7.39 for coherence

COMMENTS BY REVIEWER Reviewer: India/NPCIL				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2/2/5th			✓			
2	3.1.10/d			✓			
3	4/1/1st			✓			
4	6/2.7/4			✓			
5	13/3.10/9			✓			
6	8/(2)/5th			✓			
7	12/Requirement 1/4th			✓			
8	8/(1)/4th			✓			
9	9/ (5)/4th			✓			

10	11/3.2/4th					✓	The text is consistent with GSR Part 1 which covers facilities.
11	11/3.4/26th				✓ ...release from regulator control.		Changed decommissioning... to “release from regulatory control” for consistency.
12	22(g)/9th				✓ Research reactor facility		For consistency
13	31/6.28 (c)/4th			✓	‘of the’ deleted		typo
14	18/4.15 (b)			✓			
15	22/additional item after ‘k’ as ‘l’.					✓	This is not the scope of the safety committee. This is part of the Integrated Management System.
16	23/5.4 (b)			✓			

	editorial						
17	26/6.10/26th Editorial				✓ shall		6.9 Requirements are shall statements.
18	30/6.25					✓	The document structure does not easily accommodate this split.
19	37/6.44				The para. # cited in comments 19, 22-27 are incorrect. You may have reviewed an old version. An attempt was made to correlate the comment text with revised para. # shown.	✓	This text is not in 6.60. Para. 6.44 already has “stable long term shutdown conditions”.
20	40/6.73/item b					✓	Superfluous text.
21	40/6.73/ite					✓	Superfluous text.

	m b						
22	47/6.101				✓ Safe handling		6.101, sampling and analysis requires safe handling.
23	49/6.115			✓			
24	56/6.147					✓	Superfluous text.
25	65/6.191					✓	Not all RRs require a UPS for shutdown cooling.
26	67/6.211/f					✓	Comment is not clear.
27	68/6.216/2-3 lines					✓	There is no 6.216. Handling covers sampling.
28	109/II.7					✓	Scientists may have unaccompanied access to experimental areas after completing required training.

COMMENTS BY REVIEWER Reviewer: Guy Scheveneels Benedikt Martens Country/Organization: SCK•CEN/Belgium				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	Requirement 2.8 C						Req. 2.8 is coherent with SSR-2/1, 2.6 and Req. 5, to mitigate the consequences of accidents that do occur.
	Requirement 2.11 C						Req. 2.11 is coherent with SSR-2/1 Rev.1
	Requirement 2.12 (1) C!						The text of 2.12 is coherent with approved text in SSR-2/1. Rev1 and

							SF-1.
	Requirement 2.12 (2) Q!						Escalating or progressing to accidents. The implication is accidents have higher consequences than AOOs. The text is consistent with SSR-2/1 Rev.1, 2.13(2)
	Requirement 2.12 (3) C!						Text revised for consistency with SSR-2/1 Rev.1, 2-13(3): ... safety systems and procedures be capable of preventing damage to the reactor core or releases requiring off-site protective measures

							and returning the plant to a safe state.
	Requirement 2.12 (4) C						Agree that DEC does not originate from failure of DiD#3. However the text is coherent with SSR-2/1 Rev.1 2.13 (4)
	Requirement 2.17 C						In considering this factor, potential source term, the potential radiological impact of the source term shall be assessed.
	Requirement 1 C						Agreed. This is covered in 5.5 to include provisions to compensate for deficiencies of means

							of design features.
	Requirement 4.21 C						Yes. Conditional approvals may be granted by the regulatory body.
	Requirement 4.15 (a,b) C						It is appropriate to include this stringent requirement for SSCs. A graded approach may be taken with the concurrence of the regulatory body.
	Requirement 5.6 Q!						Text revised to clarify external and consequential internal events.
	Requirement 8 C!						Guidance is available in Ref. [12] GSR Part 3 and NS-G-4.6

	Requirement 6.13 C						Consistent with SSR-2/1, 4.9. The aim is to prevent consequences; if this fails, to mitigate consequences.
	Requirement 6.14(e) Q						This is to maintain consistency with SSR-2/1 Rev.1.
	Requirement 6.16 C						The text is consistent with SRR-2/1 Rev.1, 4.13
	Requirement 6.22 Q						The results based approach is for the case where there are no established codes or standards.
	Requirement 6.24 C						The acceptance criteria would be design rules, e.g.

							maximum load plus acceptable margin that the regulator body would accept. Acceptance criteria consistent with SSR-2/1.
	Requirement 6.30 C!						Consistent with SSR-2/1 Rev.1, 5.35
	Requirement 6.34 Q						It is framed as the design shall consider all challenges that the reactor may face.
	Requirement 6.37 C!						The text is coherent with SRR-2/1 Rev.1, 5.6.
	Requirement 6.41 C						Coherent with SSR-2/1 Rev. 1, 5.10
	Requirement 6.43 C!						Coherent with SSR-2/1, Rev.1, 5.12

	Requirement 6.46 Q!						It provides clarification.
	Requirement 6.48 C						Yes
	Requirement 6.48(c) C!						Coherent with SSR-2/1, Rev.1, 5.16.
	Requirement 6.49 C!						Coherent with SSR-2/1 Rev. 1
	Requirement 6.54 Q!			✓			Not appropriate to specify amplitude in this requirement document. The RB shall specify based on local seismic conditions.
	Requirement 6.56 Q!						This requirement was in SSR-2/1.

	Requirement 6.57 C!						This is coherent with SSR-2/1 Rev.1, 5.21a
	Requirement 6.64 C						As far as reasonably practical is consistent with the graded approach. Coherent with SSR-2/1 Rev. 1 , 5.27
	Requirement 6.65 Q!						Guidance is provided in Safety series Report No. 80.
	Requirement 6.66 C!						The requirement does not preclude this approach.
	Requirement 6.67(a) C!						Independent, to the extent practicable.
	Requirement 6.69 C!						The text is consistent with SSR 2/1, 5.32. It is reasonable to

							consider combined events for DBA, and based on likelihood consider some combined events as DEC.
	Requirement 25 Q!						The text is coherent with SSR-2/1 Rev. 1, Req. 25
	Requirement 6.76 C!						Spurious action is coherent with SSR-2/1 Rev.1, 5.39
	Requirement 6.78 C						Text revised and sentence deleted also per GER comment # 39.
	Requirement 6.79 C						Not redundancy alone. Diversity is covered in Req. 26 and 6.80

	Requirement 6.81 C!						The statement is coherent with SSR-2/1 Rev. 1, 5.41
	Requirement 6.87 C						OK. Agree
	Requirement 6.104 Q						Systems important to safety.
	Requirement 6.110 C!						Yes
	Requirement 40 C!						This is coherent with SSR-2/1 Rev.1, Req. 40
	Requirement 6.121(h) C!						Confinement to prevent or control the release of radioactive material in operation or in accidents.

	Requirement 6.122(d) C!/Q!						Operating errors: Failures to execute as well as inadvertent actions.
	Requirement 42 C!						Regulatory body will define authorized limits for all operating states, DBA and as far as practicable DEC.
	Requirement 6.126 C						Requirements for RR are different then WENRA Req. for NPP. Many MS support as far as practicable for DEC.
	Requirement 6.133 Q!						If it can be demonstrated that limits will not be exceeded for the barriers.

	Requirement 6.136 C!						The text is technology independent and based on OPEX lessons learned.
	Requirement 6.137 C						Yes. This document states that high power reactor may apply requirements limits for NPP, See 1.8
	Requirement 6.153 Q!						Yes Manual scram should shut down the reactor directly.
	Requirement 48 Q!						No - as required. To prevent damage to the fuel.
	Requirement 6.173 C!						Postulate initiating events are not DEC. See Appendix I

	Requirement 6.177 Q!						Requirement is to maintain the reactor in a safe condition.
	Requirement 6.180 C						Clarification of protection system versus other systems important to safety. Protection system has higher requirements.
	Requirement 6.181 C						Changed to “high reliability”.
	Requirement 6.182 C						The text is consistent with SSR-2/1 Rev. 1, 6.34
	Requirement 6.187 C!						A second control room or control panel is included in Req. 59
	Requirement 6.188 C!						The text is coherent with SSR-2/1, 7.8.

	Requirement 55 C						This is coherent with SSR-2/1.
	Requirement 6.199 C!						Accident conditions = DBA plus DEC. See definition Page 108
	Requirement 6.204 C!						This is coherent with SSR-2/1 Rev. 1, Req. 69
	Requirement 6.206 C!						The revised to be coherent with SSR-2/1 Rev.1, 6.51
	Requirement 6.208 C!						A fire following the PIE. Coherent with SSR-2/1, 6.53.
	Requirement 6.209 C!						The requirement is for the use of non combustible material

							in the means of confinement.
	Requirement 6.210(d) C!						This requirement is not simple, it is based on OPEX from Research Reactors.
	Requirement 7.42 C						Yes. The requirement to take action in a prescribed time does not always mean to act fast, but to take corrective action in an allowed period.
	Requirement 7.43 C						It is appropriate that events where safety limits are exceeded are analysed. In the cases you mentioned the root cause analysis should be straight forward and

							not onerous.
	Requirement 7.79(e) Q!						Yes. This is considered in the context of the degradation of the fuel and the radiological consequences of the failure if the fuel were to remain in the core.
	Requirement 7.82 C!						Yes. The continuous monitoring would show when the LCO is exceeded. Higher sensitivity measurements could be done subsequently.
	Requirement 7.124 C						Text revised accordingly.