TITLE; Argentinean NUSSC comments DS476

COMMENTS BY REVIEWER Reviewer: Ricardo Waldman Page.1.. of.3.. Country/Organization: Argentina, Nuclear Regulatory Authority Date: 14-11-17				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General	The modifications related to NS-R-4, are improvements in conceptual clarity and are more directly applicable. Newcomers and organizations designing new generation RRs will surely be grateful. In brief, NUSSC should approve this document.		X			
2	General Terminology Par. 3.3 Page 21 Footnote 18 Section 7.13	~~Discharge its responsibilities~~ Fulfil its responsibilities	Avoid confusion with "delegate its responsibilities" for non-anglo speakers	X			
3	Par. 6.15 (f)	(f) Shall provide effective ~~multiple~~ means for ensuring that each of the fundamental safety functions is performed, using redundancy and diversity in provisions as appropriate for ~~thereby~~ ensuring the ~~effectiveness~~ integrity of the barriers and mitigating the consequences of	Posing as mandatory the use of **multiple** means for ensuring **each of the FSF** is far too demanding for small Research Reactors.		X Changed multiple means to effective means.		Redundancy and diversity are covered in Requirement 25

		any design basis failure or deviation from normal operation and a spectrum of multiple failures scenarios as broad as possible.					
4	Par. 6.45 Move it	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.	The operator actions mentioned and the provision in the design of adequate instrumentation are not included in the requirement 18.			X	Operator action following a postulated initiating event is germane to Requirement 18 and should be retained.
5	Requirement 21	A set of Safety Limits ~~design limits~~ for a research reactor, consistent with the ~~key physical parameters for~~ design limits of each item important to safety ~~for the research reactor~~ shall be specified for all operational states and for accident conditions.	"Design limit" is a component specific issue (there may be no such thing as a set of design limits for a reactor). The proposed wording is consistent with the OLC concept.		X A set of design limits consistent with the key physical parameters for each item important to safety…		Text revised to be consistent with SSR-2/1 rev 1.
6	Appendix 1	Add a footnote: "It is an example of events selection and should be checked for specific designs"	This list starts form a list of SSCs and a description of their functions. Some of these cover several states and levels of Defense in Depth. In a healthy classification procedure the starting point is a list of Specific			X	App 1 provides a list of selected PIEs to be analyzed/ checked. It is not clear what is required to be added in the footnote.

7			Safety Functions that implement the Fundamental Safety Functions in different Plant States and levels of Defense in Depth. Then they are categorized, and only after the SSCs that execute the functions are identified and classified.				

TITLE: DS 476 Safety of research reactors

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Thierry Aoust Country/Organization: Belgium/Bel V			Page 1 of 9 Date: 17/10/2014				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.3	… (see paras 2.15-**2.17** and Ref. [2)]	Para 2.18 does not exist	X			
2	Footnote 1	This includes: maintenance, testing and inspection**;** fuel handling and handling of radioactive material (including the production of radioisotopes)**;** the installation, testing and operation of experimental devices**;** the use of neutron beams**;** research and …	Proposition to replace ":" by ";" in the list of activities to include.	X			
3	1.8 / last line	… Homogeneous reactors and accelerator driven system **shall require additional, specific requirements than the one proposed in the present publication.**	A lot of requirements presented in this publication could be applied to the core of ADS dedicated to research.			X	Technically correct but out of scope of this document.
4	2.8 / lines 4 - 6	Measures shall therefore be taken to **mitigate** accidents and emergency arrangements shall be applied to ensure that the consequences of any accident that do occur are mitigated.	Since the accident occurs, it is too late for prevention.	X			
5	2.12, point (3) last line	… and maintaining **more than one** barrier for the confinement of radioactive material	Maintaining only one barrier in DID 3 is not acceptable: for instance it is not acceptable to allow	X			

			important fuel damage since the integrity of the containment is still garanty.				
7	3.2	Delete "utilized for peaceful purposes"	What is the added value ? Military research reactors should also fulfil safety requirements!			X	Military – out of scope.
8	3.2 / last line	(see paras 2.15 – **2.17**)	Para 2.18 does not exist.	X			
9	3.8 / line 2-4	The level of detail of the information to be presented in the safety analysis report shall be determined using a graded approach ~~considering the type, characteristics (its design, power and level of usage) and site of the reactor~~ **(see 2.15 to 2.17)**		X			
10	4.3 / last sentence	… in each of the above **stages** and activities are presented …	"stages" (already used before) instead of "phases" to avoid confusion.	X			
11	4.7 / last line	(see paras 2.15 – **2.17**)	Para 2.18 does not exist.	X			
12	4.27 (a)	The design of structures, systems and components, **and in particular** the design and qualification of nuclear fuel elements and reactivity control elements.	The use of "including" suggests that fuel and control elements are (or could) not included in the SSCs.	X			

13	5.1	~~For low power research reactors, critical and subcritical assemblies the amount of detail to be provided can be substantially reduced below that required for a medium or high power research reactor (see also paras 1.6 1.9).~~ **The detail to be provided should take into account of the graded approach (2.15 – 2.17).** The results of the site evaluation shall be documented and presented in sufficient detail to permit an independent assessment by the regulatory body.	Replace 3rd sentence "For low power research …" by "the detail to be provided should take into account of the graded approach (2.15 – 2.17) Covered by paras 2.15 to 2.17 which are more complete.			X	The text is beneficial for readers, particularly those with low power reactor and subcritical assemblies. It clarifies the detail required for low power reactors
14	6.15, point (e)	Shall provide for systems, structures and components**, ~~and~~** procedures to control the course …		X			
15	Req 12	To be deleted ?				X	Req 12 on the graded approach is an important requirement for research reactor safety
16	6.50, 2nd sentence	Firefighting systems shall be designed and located so as to ensure that their use or rupture or spurious or inadvertent operation would not increase the criticality risk, **would not** harm operating personnel**,** would not significantly …		X			
17	6.88		This para is similar to para 6.86. The two can be merged.			X	It is beneficial to keep the requirements on design basis

18	6.130 / last line	… are established in paras 6.71 – **6.73**		X			separate from that on qualification.
19	6.133 / last line	requirements established in paras **6.68-6.73**		X			
20	6.151	Sufficient negative reactivity shall be available in the reactivity control devices(s) so that the reactor can be brought into a subcritical condition and maintained subcritical in all operational states **and** in accident conditions, with account taken of the experimental arrangements with the highest positive reactivity contribution		X			
21	6.158 / last line	capability under all design basis accidents **and some design extension conditions**, including failures of the control system itself.				X	It will weaken the requirement include "some" DEC
22	6.160 / first line	In the design **of liquid (water or metal)** cooled reactors …		X			
23	6.166	Delete sentence : "Despite the fact that subcritical assemblies do not require cooling systems, such provisions shall be applied to preserve fuel elements and structures, systems and components and to avoid radioactive releases."	Depending on the source and of the subcritical level, the power generated could need heat removal.			X	Beneficial to keep for operating organizations of subcritical assesmblies
24	6.169 / first	The emergency core cooling system shall be designed with sufficient	To cover paras concerning emergency	X			

	sentence	reliability to meet the requirements of paras **6.71**–6.85.	systems.				
25	6.185 and 6.186	Delete this para	This para is already covers by requirement 52.			X	Text is beneficial for small Oprating Organizations converting from analog to digital I&C systems
26	6.187		This para could be moved to requirement 45.	X			
27	Req 57 - 59		Requirement 57 – 59 have nothing to do with "POWER SUPPLY"	X			Headings will be revised per the DPP
28	Req. 59 / second sentence	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.		X			
29	6.126 / second sentence	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.		X			
30	7.7	In collaboration with the supplier or design group**,** the operating organization shall have overall responsibility for the preparation and satisfactory completion of the commissioning programme (see paras 7.53).		X			

31	7.10 point (o)	The research reactor is operated and maintained in accordance with the operational limits and conditions and operating procedures (see paras 7.33–7.36 **and 7.59-7.64**);		X	X Added text: as described in the safety analysis…		
32	7.33	The operational limits and conditions shall form an important part of the basis for the authorization of the operating organization to operate the research reactor facility. The facility shall be operated within the operational limits and conditions to prevent **that** situations arising ~~**that**~~ could lead to anticipated operational occurrences or accident conditions, and to mitigate the consequences of such events if they do occur. The operational limits and conditions shall be developed for ensuring that the reactor is being operated in accordance with the design assumptions **as described in the safety analysis report** and intent, as well as in accordance with its licence conditions.					
33	7.34		The first sentence is covered by 7.33.	X			
34	Footnote 35	**Some** critical and subcritical assemblies **could** not require emergency core cooling systems.			X Revised footnote to: ..may not require…		
35	7.35 /						

	second sentence	**O**perational ….		X			
36	7.36 / first sentce	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**~~OLC~~ its object, its applicability and its specification; i.e. its specified limit and its basis).	"OLC" still appears in the 7.42!	X			
37	Req 74 to 88		Requirement 74 – 88 have nothing to do with "COMMISSIONING"	X			Headings will be revised per the DPP
38	Footnote 41	**Some** initial criticality tests and low-power testes and Stage C of the commissioning programme **could** ~~**do**~~ not apply to subcritical assemblies.			X ..may not apply..		
39	7.91		The last sentence ("Emergency plans … hazard assessment") could be moved to para 7.90 which is more generic.			X	Conflicts with NUSCC comments
40	7.94	The operating organization shall ensure **that** the relevant information ...					Not clear what change is required?
41	7.98	The arrangements made for storing and maintaining records and reports shall be in accordance with the **integrated management system**		X			

		~~quality assurance programme~~.					
42	7.102	Utilization and modification (including temporary modifications, see para. **7.105**) projects having major safety significance (see paras 3.13–3.19 of Ref. [14]) shall be subject to safety analyses and to procedures for design, construction and commissioning that are equivalent to those described in paras **6.124** and 6.125 for the reactor itself.		X			
43	7.117	If the applicable dose limits for occupational or public exposure or the authorized limits for radioactive releases are exceeded, the reactor manager, the safety committee**, ~~and~~** the regulatory body and other competent authorities shall be informed in accordance with the requirements.		X			
44	7.118	… these records shall be made available to the supervisor of the health surveillance programme, the reactor manager**, ~~and~~** the regulatory body and other competent authorities as designated in the national regulations [15].		X			
45	8.2	~~For some operating research reactors, where the need for their ultimate decommissioning was not~~	Suggestion to move the first sentence to the end of 8.2. So the para goes	X			

		~~taken into account in their design a decommissioning plan shall be prepared to ensure safety throughout the decommissioning process.~~ The plan shall be submitted for review and approval by the safety committee and the regulatory body as appropriate before decommissioning activities are commenced. Documentation of the reactor shall be kept up to date and information on experience with the handling of contaminated or irradiated systems, structures and components in the maintenance or modification of the reactor shall be recorded to facilitate the planning of decommissioning. **For some operating research reactors, where the need for their ultimate decommissioning was not taken into account in their design, a decommissioning plan shall be prepared to ensure safety throughout the decommissioning process.**	from generic topics to particular ones.				

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Majid Fassi Fehri /Marcel de Vos Country/Organization: Canada/Canadian Nuclear Safety Commission Date: 17/10/14							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.9	"All the requirements established here are to be applied unless, in the regulator's judgment, there is an adequately justified case for a specific research reactor, critical assembly or subcritical assembly, that the application of certain requirements may be waived. For each such case the requirements to be 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 certain requirements established here may be waived."	Two points: Firstly: This sentence "For each such case the requirements to be 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." is a key element (along with section 1.3 that allows for the application of the requirements in a graded approach) of the document as it allows to tailor the requirements to the nature and magnitude of hazard posed by the reactor based on a systematic justification to waive non-applicable or apply in graded manner requirements. However, there is a need to add under section 2.17 the item "criticality". Therefore, there is no need to differentiate between reactors and subcritical assemblies, and allows to remove footnotes or sentences to specify that a section is applicable or not to a subcritical assembly. Secondly: Requirement 12 Item 6.19 and Para 1.9 contradict one another. Para 1.9 implies that a graded		X 1.9. 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		Para 1.9 modified to reflect the use of a graded approach in the application of the requirements. Criticality added as suggested (in Par 2.17) but text related to subcritical assemblies in some requirements were kept for clarity and for user benefits. The role of the regulator is covered in Req 12. Use of the graded approach…shall be based on "…regulatory requirements" Paras 1.9 and 6.19 are not contradictory.

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			approach (which is a decision-making mechanism) can be used to waive a requirement. Para 6.19 forbids this. In addition, an important fact is missing in these two statements in the document: The document recognizes that a proponent may propose and justify waiving a requirement with appropriate supporting evidence. BUT, the decision to "waive" a requirement is always ultimately the regulator's to make in concert with regulatory requirements.		graded.		
2	2.9 and foot note 6	"Such measures and arrangements include: engineered safety features; safety features for design extension conditions6; on-site emergency plans procedures established by the operating organization; and possibly off-site emergency plans and procedures put in place by the appropriate authorities in accordance with Ref. [10]." "6 Design extension conditions are postulated accident conditions that are not considered for design basis accidents, but that are considered in the design process of the facility in accordance with best estimate methodology, and for which releases of radioactive material are kept within acceptable limits. Design extension conditions include conditions in events without	The safety features should be equipment available to mitigate design extension conditions (DEC), but not designed for the DEC. Indeed, there are no limits associated with the DEC for which the equipment should be designed. The equipment may or may not withstand a DEC, since it cannot be designed and qualified for all DEC. (see comment 18)		X Emergency arrangements shall therefore be applied to ensure that the consequences of any accident that do occur are mitigated. Such measures and arrangements include: engineered safety features; safety features for design extension conditions[1]; on-site emergency plans and procedures established by the operating organization; and possibly off-site emergency intervention measures put in place		The proposed text and footnote are currently in Req 2.8. It is not clear if the comment is meant to move the text to 2.9? The text on DEC is retained in 2.8. Revised text added to 2.8 to address other members comments.

[1] Design extension conditions are postulated accident conditions that are not considered for design basis accidents, but that are considered in the design process of the facility in accordance with best estimate methodology, and for which releases of radioactive material are kept within acceptable limits. Design extension conditions include conditions in events without significant fuel degradation and conditions with core melting.

		significant fuel degradation and conditions with core melting."			by the appropriate authorities in accordance with Ref. [10].		
3	2.8 (1)	"This leads to the requirement that the nuclear installation shall be soundly and conservatively sited, designed, constructed, maintained and operated, in accordance with the management system and proven engineering practices, such as the application of redundancy, independence and diversity. To meet this objective, careful attention is paid to the selection of appropriate design codes and materials, and to control of the fabrication of components and control of the construction, commissioning, operation and maintenance of the research reactor. Particular attention should be given to experimental fuel, for which there is no proven engineering practices and operational experience, by establishing sufficient design and safety margins to accommodate for unknown behaviour."	There should be a sentence that talks about experimental fuel (to be tested in the experimental facilities) which has not been tested or designed according to proven engineering practices or standards.			X	The cited text is currently in Req. 2.11 (1) on Defence in Depth, not 2.8. Agree that the proposed additional text is useful guidance, but it is too detailed/specific for a requirement on the first level of defence. Experiments (including experimental fuel to be tested in experimental facilities) are appropriately covered in Req. 36 and Req. 83 on Utilization and Modifications (Experiments). Suitable guidance is given in Ref. [14].
4	2.17	(a) The criticality; (b) The reactor power; (c) The potential source term; (d) The amount and enrichment of fissile and fissionable material; (e) Spent fuel elements, high pressure systems, heating systems and the storage of flammable materials, which may affect the safety of the reactor; (f) The type of fuel elements; (g) The type and the mass of moderator, reflector and coolant;	See comment 1. This will allow removing the footnotes and sentences, throughout the document, that distinguish between the nuclear reactors and the critical or subcritical assemblies. The section 1.9 is a key element of the document that allows to waive some requirements based on the reactor characteristics. It is a complement to the section 1.3 that allows for the application of the requirements in a graded approach.		X 2.17. The factors to be considered in deciding whether the application of certain requirements established here may be graded shall include: (g) The amount of reactivity that can be introduced and its rate of introduction,		The text of Req. 2.17 had been revised for clarity regarding application of the graded approach and 2.17 Item (g) has been revised to highlight criticality.

		(h) The amount of reactivity that can be introduced and its rate of introduction, reactivity control, and inherent and additional safety features; (i) The quality of the containment structure or other means of confinement; (j) The utilization of the reactor (experimental devices, tests, reactor physics experiments); (k) Siting, including external hazards associated with the site and proximity to population groups.			reactivity control, and inherent and additional safety features (including those to prevent inadvertent criticality);		
5	Requirement 1	"The safety analysis report shall be periodically reviewed over the reactor facility's operating lifetime, and confirmed or updated, to reflect modifications made to the facility, the changes around the site and on the basis of the experience and in accordance with regulatory requirements."	There is no need to update a safety analysis report for a facility if no change to the facility, around the site (e.g. population, new facilities with associated risk built) or to the regulatory requirements occurred.			X	Periodic reviews and updates are required to ensure that safety requirements are met throughout the lifetime of the research reactor. The update could include a verified confirmation that no safety significant changes have occurred.
6	Footnote 11	"The operating personnel comprises the reactor manager"	Typo.	X			
7	4.7	"The extent of the detailed integrated management system that is required for a particular research reactor or experiment shall be governed by the potential hazard of the reactor and the experiment (see paras 2.15–2.18 on graded approach). The research reactor facility may or may not credit items of the management system of the university or the research center to which it belong as long as they achieve the same safety objectives."	The development of and integrated management system for research reactor should be able to take credit of items of the management system existing at the universities or research laboratories as long as they achieve the same safety objectives.			X	The university or research centre to which the research reactor belongs is the operating organization. The role of the OO to establish the IMS is covered in Req 4.8. It may or may not credit existing items that achieve the safety objectives. Additional text is not needed in 4.7

8	4.11	"(a) The statutory and regulatory requirements of the State; (b) Any requirements formally agreed with interested parties, including requirements established by the relevant IAEA safety standards."	It is up to the State to identify which requirements apply to its facilities. (i.e. "as well as" is too prescriptive) Other IAEA documents already promote the adoption of IAEA principles, standards etc into member state statutory and regulatory requirements.		X (a) The statutory and regulatory requirements of the State; (b)The requirements established by the relevant IAEA safety standards; (c) Any requirements formally agreed with interested parties		4.11 establishes that the IMS shall identify the requirements. "As well as" is not too prescriptive but text revised for further clarity.
9	4.15	"(b) External personnel (including suppliers and experimenters) are adequately trained and qualified and are performing their activities under the same controls and to the same standards as the reactor personnel;"	Typo.	X			
10	4.23	"The safety assessments shall be commenced at an early point in the design process. Deterministic safety analysis shall be the primary tool for safety assessment of research reactors. The degree of probabilistic safety analysis used in the safety assessment should be commensurate with the factors discussed in Para 2.17 and Para 6.8.	1. Large and complex research reactors can approach the same levels of risk as a NPP (or even be even higher risk), so use of PSA should be based on 2.17. 2. Section 6.8 "Practical Elimination" cannot arguably be achieved in certain cases (i.e. larger more complex facilities) without probabilistic discussions, so Section 6.8 must factor into line 4.23.			X	It is considered that additional text is not necessary, as it is evident that the graded approach applies to safety assessments. It is covered by text in Req. 5 "shall be conducted in accordance with the potential magnitude and nature of the hazards…". Req 1.7 indicates that large and complex RRs may require the application of requirements for NPP.
11	4.26	"Activities for systematic periodic assessments include, among others, periodic safety reviews such as self-assessments and peer reviews17 to confirm that the safety analysis report and other selected documents	The research reactor cannot be licensed if it doesn't meet the current regulatory requirements. The changes or improvements to be made following a periodic reassessment and based on modern			X	It is important to retain "current regulatory requirements" to account for possible update of the regulatory requirements.

		(such as documentation for operational limits and conditions, maintenance, training and qualification) for the facility remain valid in view of modern practices; or, if necessary, to update or make improvements to the extent practicable."	practices and standards can only be done to the extent practicable.				
12	5.1	"Information shall be collected in sufficient detail to support the safety analysis to demonstrate that the research reactor facility can be safely operated at the proposed site. IAEA NS-R-3 *Site Evaluation for Nuclear Installations and related guides* provide requirements for site evaluation that can be applied using a graded approach. ~~For low power research reactors, critical and subcritical assemblies~~ The amount of detail to be provided should be commensurate with the characteristics discussed in para 2.17 and in consideration of potential consequences of accidents in space and time. For low power research reactors, critical and subcritical assemblies these consequences are likely to be very small.~~ that required for a medium or high power research reactor~~ (see also paras 1.6–1.9). The results of the site evaluation shall be documented and presented in sufficient detail to permit an independent assessment by the regulatory body. This may constitute the first part of the development of the safety analysis report for the research reactor."	NS-R-3 should be referenced because it applies to research reactors. The statement "… For low power research reactors, critical and subcritical assemblies the amount of detail to be provided can be substantially reduced below that required for a medium or high power research reactor (see also paras 1.6–1.9). " Although it may be intuitively obvious to people close to this document, this paragraph does not clearly convey the rationale that the decision to provide less detail must be based on evidence of potential consequences in space and time….rather than size of reactor.		.	X	The comment is valid but the proposed addition is redundant. NS-R-3 already cited in the Para, in the preceding sentence, Ref [5].
13	Footnote 20	"20 The nuclear fuel elements are the elements containing fissionable	See comment 3 regarding experimental fuel. There is a need to	X			Experimental fuel is covered in Req 36 and

		and fissile nuclear material that are used in the core of a research reactor for the purpose of generating neutrons. Experimental fuel may not be qualified but adequate design and safety margins should be established to accommodate for unknown behaviour"	explain that experimental fuel to be tested or irradiated in the research reactor may not be qualified.				Req 83, utilization and modification Suitable guidance is given in Ref. [14]
14	5.12	Delete paragraph or consider expanding the scope to include any "urban" or "suburban" environment	Paragraph 5.4 already adequately covers off considerations for where a research reactor is situated on a research centre or university campus. There is nothing that makes a research centre or academic campus unique from any other publicly located site. (i.e. the protection principles in Para 5.4 remain valid)	X			
15	Requirement 8	"The design of a research reactor facility shall ensure that radiation doses to workers and other personnel at the facility for operational states, and to members of the public for all plant states do not exceed the established dose limits. The doses shall be kept as low as reasonably achievable for the entire lifetime of the facility."	It is not possible to meet a limit for the workers or personnel under accident conditions, particularly when the workers are close the radiation source when an event happens.			X	The proposed text conflicts with comments from other members to make Req. 8 consistent with SSR-2/1 Req. 5
16	6.8	See also comment 10	"Practical Elimination" cannot arguably be achieved in certain cases (i.e. larger more complex facilities) without some probabilistic discussions, so para 6.8 needs to integrate better with para 4.23.				See above response to comment 10
17	6.18	"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	Remove "is" to make the sentence easier to read.	X			

		of safety systems."					
18	6.19	"The use of a graded approach in the application of the safety requirements shall not result in compromising safety. A requirement can only be waived with a justification (see paras 1.9, 2.17)" Or Delete para 6.19 and retain the message about not compromising safety in the definition of graded approach in the IAEA Glossary.	Requirement 12 Item 6.19 and Para 1.9 contradict one another. There should be a possibility to waive requirements based on a systematic justification as established in 1.9 and 2.17. One of the primary mandates of a regulator is to set requirements (using accepted nuclear safety principles and practices). This means that they have the authority to perform risk informed decision making (one application of graded approach) to recommend in specific cases where a requirement can be waived. This para gives the impression that a regulatory does not have this authority		X 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 requirement shall be justified by analysis or engineering judgement.		See above response to comments 1, 2. The text is also revised to address comments from other members (G55)
19	6.25	"Design extension conditions shall have established safety goals."	There are no criteria to select DEC that should have acceptance criteria. It is more realistic to establish goals rather than criteria, particularly that it is not clear why some DEC should be selected and not others.			X	The proposed approach is not consistent with SSR-2/1
20	6.30, 6.31, 6.32, 6.33	Delete paragraphs and replace with the following: 6.30 The method of classifying the safety significance of items important to safety shall consider the principles and requirements of IAEA SSG-30 *Safety Classification of Structures, Systems and Components in Nuclear Power Plants* which can be can also be applied to other nuclear installations subject to appropriate adjustments relevant to the specific design of the type of facility being considered.	Para 1.6 of SSG-30 specifically mentions this. The existing 4 paragraphs do not contain enough information to drive proper formation of a Safety Classification approach.			X	SSG-30 does not apply to RRs. The text "subject to appropriate adjustments relevant to the specific design of the type of facility being considered" is more suited to guidance.
21	Footnote 23	"There are other possible	It is not clear whether quality includes	X			

		classifications or categorizations of systems, structures and components according to other aspects (e.g. seismic or environmental qualification, or quality categorization of systems, structures and components).”	environmental qualification. The proposed change includes it.				
22	6.56	“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 safety functions will be achieved.”	Typo	X			
23	6.64	Footnote 26: “For a research reactor, the reactor building may be the ultimate barrier for ensuring confinement in certain cases.	Some modern research reactors are becoming quite large and complex, leading to consideration of multiple confinement barriers like containment liners etc. As a result, the footnote needs to be less categorical.			X	Inconsistency with the IAEA Glossary
24	6.65	“The design extension conditions shall be used to define the design basis for safety features and for the design of all other items important to safety that are necessary for preventing such conditions from arising, or, if they do arise, for controlling them and mitigating their consequences. For existing research reactors complementary safety reassessment shall be performed to determine the need for implementing mitigating measures or modifications of the facility.”	The safety features or items important to safety cannot be designed to prevent or cope with all the DEC. The DEC should be considered to identify the need for safety features. Should a safety feature or an item important to safety withstand to a DEC, it will be used by the facility personnel to prevent and mitigate the DEC. (see comment 2)			X	Text is consistent with SSR-2/1
25	6.67 and 6.68	“6.67. The analysis undertaken shall include identification of the features that are needed for use in, or that are	See comment above and comment 2.		X 6.67 (b) Shall be capable of performing,		Text also revised to

		capable of preventing or mitigating, events considered in the design extension conditions. These features: (a) Shall be independent, to the extent practicable, of those used in more frequent accidents; (b) Shall be capable of performing, to the extent practicable, in the environmental conditions pertaining to design extension conditions; (c) Shall be reliable commensurate with the function that they are required to fulfil. 6.68. The means of confinement shall be able to withstand, to the extent practicable, extreme scenarios that result in unacceptable radiological release. These scenarios shall be selected using a graded approach, engineering judgement and from probabilistic safety assessments as appropriate."			to the extent practicable, in the environmental conditions pertaining to design extension conditions, as appropriate; 6.68. The means of confinement shall be able to withstand, to the extent practicable, extreme scenarios that would result, without these means, in unacceptable radiological release. These scenarios shall be selected using ~~a graded approach~~, engineering judgement and input from probabilistic safety assessments as appropriate.		address comments accepted from France and Germany.
26	6.72	"The accidents where these systems are required to be able to cope shall be specified and analyses shall be provided to demonstrate that the systems fulfil the requirements."	Syntax	X			
27	6.86	"The environmental conditions considered in the qualification programme for items important to safety at a research reactor shall include the variations in ambient environmental conditions that are anticipated in the anticipated operational occurrences and the design basis accidents of the facility."	Clarify that the qualification programme applies only for anticipated operational occurrences and design basis accidents. Again, it is not possible to qualify the safety features for the DEC.	X			
28	6.87	"The qualification programme for items important to safety shall	Remove "is" to make the sentence easier to read.	X			

		include the consideration of ageing effects caused by environmental factors (such as conditions of vibration, irradiation, humidity or temperature) over the expected service life of the items important to safety. When the items important to safety are subject to external events and are required to perform a safety function during or following such an event, the qualification programme shall replicate as far as practicable the conditions imposed on the items important to safety by the natural event, either by test or by analysis or by a combination of both."					
29	6.95	"The escape routes shall meet the relevant national requirements for radiation zoning and fire protection as well as the requirements for industrial safety and nuclear security (see also Section 9)."	It is up to the State to establish the applicable requirements, including international standards and requirements.		X The escape routes shall meet the relevant national requirements for radiation zoning, fire protection, industrial safety and nuclear security (see also Section 9) and shall consider the relevant international requirements.		Agree but text should indicate that international requirements should be considered.
30	6.119	"The aging management of the research reactor facility shall include the management of obsolete SSC and the management of spare parts."	There should be a sentence related to the management of obsolescence and spare parts.	X			
31	6.124	"A safety analysis shall be conducted for the design of the research reactor."	Syntax.	X			
32	6.126	"(a) The input parameters, initial conditions, boundary conditions, assumptions, models, uncertainties and codes used;"	Uncertainties associated with the simulations should be also considered.	X			

33	6.132	"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."	Again, it is not possible to design SSC for all DEC and there are not explicit criteria to select some of them.	X			
34	6.144	"These analyses shall be supported by data from experiments and from experience with irradiation, except for experimental fuel."	This should exclude experimental fuel tested in the research reactor.			X	Experimental fuel is covered in Req 36 and Req 83, utilization and modification.
35	6.151	"Sufficient negative reactivity shall be available in the reactivity control devices(s) so that the reactor can be brought into a subcritical condition and maintained subcritical in all operational states and in accident conditions, with account taken of the experimental arrangements with the highest positive reactivity contribution. In the design of reactivity control devices, account shall be taken of wear and tear and the effects of irradiation, such as burnup, poison buildup and decay, changes in physical properties and the production of gas."	Clarification that negative reactivity should be available for operational states and accident conditions. The poison build-up and decay was added for completeness.	X			
36	Requirement 70	"The operating organization for a research reactor facility shall ensure that all activities that may affect safety are performed by suitably qualified, competent and fit for duty persons."	There is a need to add the fitness for duty for operation staff.		X Safety related functions shall be performed by suitably qualified, competent and fit for duty personnel.		Text simplified to be consistent with 7.29
37	7.41	"In order to provide operational flexibility, the specification concerning frequency shall state average intervals with a maximum that is not to be exceeded. Deferral that exceed the maximum frequency shall be justified and approved, and	There is a need for justification and gradual approvals, as well as safety measures for deferrals that exceed the maximum.	X			

		safety measures shall be put in place where needed."					
38	7.83	"If a failure of fuel or unusual contamination is detected, the reactor may be shut down and the failed fuel or the origin of the contamination shall be identified and unloaded from the core and isolated, wherever possible."	The research reactors are not systematically shutdown if there is an unexpected activity raise, as long as the doses and releases remain sufficiently low. In many cases, there are no instruments in the core to identify which fuel rod or assembly has failed.	X			
39	7.90	"Emergency arrangements shall be made for preparedness and response for a nuclear or radiological emergency in relation to the research reactor in accordance with Ref. [10]. The emergency arrangements shall be commensurate with the hazards assessed and the potential consequences of an emergency should it occur in relation to the research reactor."	Font size problem.	X			
40	7.91	"The operating organization shall develop emergency arrangements that include emergency plans and procedures for on-site preparedness and response to an emergency in relation to the research reactor under its responsibility and shall demonstrate to, and provide, the regulatory body with an assurance that emergency arrangements provide for an effective response on the site. The on-site emergency arrangements shall be coordinated with those of off-site response organizations with responsibilities in emergency preparedness and response, as relevant (see Ref. [10])"	Font size problem.	X			
41	7.97	"The operating organization shall specify the records to be retained	State have requirements regarding the records to be retained as well as the		X The operating		Simplified

		and their retention periods. The records to be retained as well as retention period shall comply with regulatory requirements.”	retention period. The operating organization might have additional records and retention period than what’s required by the State.		organization shall specify the records to be retained and their retention periods, in accordance with regulatory requirements.		
42	7.113	“It shall comply with the requirements of Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards [12] and shall be subject to the approval of the regulatory body. This programme shall include a policy statement from the operating organization that includes the radiation protection objective (see para. 2.1 of Ref. [1] and Requirement 1 of Ref. [12]) and a statement of the operating organization’s commitment to the principle of optimization of protection (Requirement 11 of Ref. [12]).”	Typo	X			
43	Appendix I	“Insertion of cold/hot water ;”	The reactivity change due to the insertion of cold/hot water depends on the physics of the research reactor.	X			
44	Footnote 50	Remove	Loss of normal electrical power is an initiating event.	X			

Safety of Research Reactors (DS476)

COMMENTS BY REVIEWER Reviewer: Page 1 of 2 Country/Organization: Japan/ Nuclear Regulation Authority (NRA) Date: 27. Oct. 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Req.15/5	Special consideration shall be given at the design stage of a research reactor facility to the incorporation of features to facilitate radioactive waste management and the future decommissioning ~~and dismantling~~ of the facility.	Decommissioning includes dismantling. See Safety Glossary 2007 Edition.	X			
2	Req.15, 33, 59	Review the feasibility of consolidation 3 Requirements as Req.15.	Streamlining Although Requirement 59 is included in "POWER SUPPLIES", the intent is somewhat vague.	X			Considered but requirements kept as is for reactor user benefit.
3	6.97/5	…to ensuring adequate protection of the environment from ~~undue radioactive contamination~~ harmful effects of radiation.	Consistency with GSR Part3.	X			
4	6.97 (a)	The selection of materials to minimize activation in regard to decommissioning actions and radioactive waste management	Comparing with para.6.101, the content of this bullet is too simple. From decommissioning, it should be clearly mentioned so that prevention of activation is seen as important for conducting work (radiation protection of workers and workability) and subsequent disposal.				
5	6.106/2	Provision shall be made in the design for handling the radioactive waste generated by the research reactor facilities.	Radioactive waste is generated not only in the research reactor but also the associated experimental facility, hence "research reactor facility" is more appropriate.	X			
6	6.216/2	Means shall be provided in the design taking into account of ~~for~~ the handling, collecting, processing, storage, removal from the site and disposal of radioactive waste.	It is thought that 'taking into account of' is appropriate.				

Safety of Research Reactors (DS476)

COMMENTS BY REVIEWER Reviewer: Page 2 of 2 Country/Organization: Japan/ Nuclear Regulation Authority (NRA) Date: 27. Oct. 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
7	6.217/2	Systems shall be provided for the handling of solid or concentrated radioactive waste and for its storage ~~on~~ at the site…	Editorial	X			
8	7.122/2	Releases of radioactive effluents shall be monitored and the results shall be recorded in order to verify compliance with the ~~applicable regulatory requirements~~ authorized limits.	Consistency with GSR Part3.	X			
9	7.123/2	Written procedures shall be followed for the handling, collection, processing~~,~~ and storage ~~and disposal~~ of radioactive waste.	Disposal of radioactive waste is generally outside the scope of the activity within research reactor facilities.	X			
10	8.2/1 (p.101)	…~~irradiated~~ activated systems, structures and components	"activated" is appropriate.	X			
11	8.3(a)/2,(b)/2, (c)/1-2	radioactively contaminated → contaminated	Editorial Para 8.2 refers to "contaminated."	X			
12	8.3(b)/	Delete item (b).	Regarding "Entombment", GSR Part6 mentions that *Entombment, in which all or part of the facility is encased in a structurally long lived material, is not considered a decommissioning strategy and is not an option in the case of planned permanent shutdown (para.1.10).*	X			

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. Nuclear Regulatory Commission Country/Organization: USA Date: October 17, 2014				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.8/8	"Such measures include: engineered safety features; on-site procedures established by the operating organization; and possibly also off-site intervention measures…"	Consider adding a footnote that states that the need for off-site intervention is considered on a case-by-case basis and is normally only required for high-powered research reactors.		X		It appears that these comments are based on an earlier version of the document as the cited Para/Line No. does not always match the content mentioned. The text for 2.8 has also been revised to address comments from other MSs as well.
2	2.9/3	2.9. The safety philosophy that is followed to fulfil the objective and principles stated in Ref. [1] relies on the defence in depth concept in the adoption of measures for the management and verification of safety in the design and over the lifetime of the nuclear installation.	The sentence structure for this sentence is awkward and it should be revised to clarify its message. Up through the word "concept" the message is clear – defence in depth. After that it appears that a second point is being made related to "the adoption of measures." The relationship between		X …defence in depth concept and on the adoption of measures for the management and		It appears that these comments are based on an earlier version of the document . The text already includes "and on the adoption…"

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Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			to the first and second parts of the sentence is not clear.				
3	2.14/4	"It includes a systematic critical review of the ways in which the nuclear installation systems, structures and components could fail…"	Since this is a document for research reactors, would saying "research reactor" be more appropriate than "nuclear installation"?	X			See comment 1. Text already includes "..critical review of the ways in which the research reactor systems, structures …"
4	2.18/1	Add the following at the beginning of 2.18: The application of a graded approach means that certain requirements of this document may not apply to a particular research reactor. This needs to be determined on a case-by-case basis by the operating organization. Not applying certain requirements of this document may require justification and agreement of the regulatory body.				X	See comment 1. There is no 2.18. It is not clear to which requirement this comment applies.
5	3.6/9	"The SAR shall include safety analyses of accident sequences and shall describe the safety features incorporated in the design to avoid or to minimize the likelihood of occurrence of accidents, or to mitigate their consequences."	Consider making reference to defence in depth.	X			See comment 1. The text already includes defence in depth.

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Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
6	4.6/5	"..shall be continuously monitored, periodically revised and supported by means of a clearly specified programme with clear objectives and targets."	This may be difficult for a low power reactor with a small staff (1.5 persons).	X			
7	4.11/3	"Any requirements formally agreed with interested parties;"	Suggest clarifying what this means.			X	Suggestion considered but the text appears to be clear.
8	4.13/3	"4.13. The provisions of the integrated management system shall be based on four functional categories:…"	Seems this should be said sooner in the section.	X			
9	4.17/2	"…research reactor or subcritical assembly…"	Is there a reason that subcritical assemblies are specified in this paragraph and not others?	X			See comment 1. Current text does not mention subcritical assemblies. Please also refer to Par 1.9 of the document
10	Requirement 5/opening paragraph/line 5	"A comprehensive deterministic safety assessment…"	This appears to exclude the use of probabilistic tools in the assessment of research reactor (RR) safety. Where the use of probabilistic tools will likely yield very little benefit in the case of smaller RR, they may be beneficial in the case of			X	This requirement does not exclude PSA. 4.23 clarifies that PSA may be used as a complimentary tool.

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Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			larger RRs.				
11	4.27/8	"The list of items that the safety committee is required to review shall also be established."	In some cases, the committee also approves.			X	NS-R-4 recommends the role of the safety committee is to review and recommend, not approve. It is an advisory committee.
12	4.27/17	"(e) the design, including the chemical composition, of the nuclear fuel elements and the reactivity control elements;"	Why are only these components specified, and not all SSCs important to safety?		X		See comment 1. 4.27 (e) does not address design. 4.27 (a) covers SCCs
13	5.3/8	"(c) the population density and population distribution and other characteristics of the site vicinity of relevance to possible emergency measures and the need to evaluate the risks to individuals and the population;"	Not sure what this statement is looking for. Please clarify.		X …in the vicinity of the site…		See comment 1. 5.4 (c) covers site characteristics that affect emergency measures. Text revised to clarify.
14	5.5/1	"5.5. Hazards arising from external events ~~(or from a combination of events)~~ shall be selected ~~to be~~ for consideration~~ed~~ in the design of the reactor.	Editorial. Also, Section 5 deals with site evaluation, yet the first sentence of paragraph 5.5 talks of considering external events in the design of the reactor. That topic may be more appropriate for Section 6 of the		X		See comment 1. Text already revised. 5.6 Refers to external events linked to the site characteristics.

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Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			document.				
15	5.5/2	Add the following after the first sentence in 5.5: This assessment should also consider the hazards associated with a combination external events where the initial external event could credibly initiate additional external events. For example, a seismic event may cause a dam failure that results in flooding of the facility.			X		See comment 1. Text revised. Combination of events is included in 5.6. Other members recommend avoiding examples (guidance) in this Requirements level doc.
16	5.5/5	Suggest reworded last sentence of 5.5 to the following: The anticipated operational occurrences or DBA conditions caused by the external events shall be considered. Consideration shall be given to the potential for long lasting external events (such as flooding) or long post-event recovery times.	The last sentence does not clearly convey its intended message and is somewhat repetitious. Consider its revision. AOOs and DBAs have significant relationship to facility design. Thought should be given to moving section 5.5 to Section 6.		X		See comment 1. AOO and accident conditions are included in 5.6.
17	5.10/2	"5.10. 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."	This has always been a difficult issue. Maybe the answer is that the operator should be made aware of changes in population and nearby facilities that could	X			5.11

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Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			impact safety before they happen instead of after the fact.				
18	5.11/3	"5.11 …the suitability of the site to accommodate a nuclear installation shall be very carefully analysed to avoid undue radiological risk to site personnel."	Shouldn't this be stated as "unacceptable radiological risk"? Also, who makes the decision as to what constitutes "undue" or "unacceptable" radiological risk? It is likely the State that will make that determination. I would recommend revising to read: "…unacceptable radiological risk as determined by the State…" Is the only concern to "site personnel"? Would it be better stated to include on-site (occupational exposure) and off-site (public exposure) personnel?		X		See comment 1. 5.12 text currently includes "to avoid unacceptable radiological risk…"
19	6.1/1	"6.1. The research reactor shall be designed in such a way that the safety objectives (see para. 2.2, 2.3)	It is not clear that terms such as research reactor . are used consistently throughout. There is the	X			Research reactor. See 1.7.

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Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		are achieved."	reactor itself, the systems that directly support the reactor, and the entire reactor facility. Which is meant here - the research reactor facility?				
20	6.28 (p. 30)	Add a new Para at the top to read: In particular, the design shall take into account: (a) Reactor building and facilities including handling of activated materials and users' laboratories. (b) The choice and usages of materials, so that … (c) The access capabilities and the means of handling fuel elements and reactor components, as well as access for dismantlement and decommissioning.	Completeness and accuracy as well as consistency with Requirement #15.			X	The text in 6.28 currently addresses similar topics. The detail suggested is better suited for guidance.
21	6.28 (c) (p. 31)	Modify "waste generated in operation" to "Waste generated during operation"	Language	X			
22	General Comment: Overlap of Requirement #15 and #33	There appears to be some overlap between Requirement #15 (Requirement 15: Features to facilitate radioactive waste management and decommissioning	Minimization of repetition and redundancies in the safety requirements.			X	There is no repetition – Req 15 is one of the principal technical requirements, Req 33 is a specific design

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Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		for a research reactor facility) and #33 (Requirement 33: Design for decommissioning for a research reactor facility. Decommissioning for a research reactor facility shall be considered in the design for the research reactor and its experimental facilities). Therefore we suggest either combining the two requirements, or removing repetitions and redundancies.					requirement.
23	6.34/5	"6.34. All the challenges that the reactor may be expected to face during its operational lifetime shall be taken into consideration in the design process."	This statement seems much more universal than this section. Maybe a general design consideration?			X	6.34 is in the General Requirements for Design section. See comment 1. Text revised.
24	6.51/3	"Consideration shall also be given to earthquake hazards…"	It is not clear why earthquake is called out specifically, as it is one of many external events that should be considered in research reactor safety. Please clarify.				Other NUSSC members requested a separate requirement on earthquakes. It is suggested to retain text to highlight its importance.
25	6.62/5	"…as far as is reasonably practicable."	The concept of "within reason" is very important here. Suggest it be underlined for emphasis.				Not clear – Par 6.62 does not have the referred text

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Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			The State's determination of what are "unacceptable radiological consequences" will be necessary to establish performance criteria for design extension events.				
26	6.63/1	"6.63. The design extension conditions shall be used to define the design basis for safety features…"	This may be acceptable for new research reactors. In the case of existing research reactors, it may be well beyond "reasonable" to retrofit the design of older reactors for design extension conditions. A second option, which is more reasonable for existing research reactors must be provided, such as alternate mitigating strategies. These strategies should be developed and implemented by the facility operator and review for adequacy by the competent authority.			X	The text mentioned is in 6.65. The suggested options were considered. The text is kept to ensure consistency with SSR-2/1.

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Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
27	6.67/7	"Certain events might be consequences of other events, such as a flood following an earthquake. Such consequential effects shall be considered to be part of the original postulated initiating event."	Consider moving the end of this section to the initiating event section.			X	See comment 1. 6.67 does not include the text referenced. 6.70 is appropriately under Combination of events and failures.
28	6.85/2	"6.85. Any environmental and service conditions that could reasonably be anticipated and that could arise in specific operational states shall be included in the qualification programme."	Suggest this be said sooner in this section.	X			6.88
29	6.97/Line 5 (p. 45)	Add: (Reference #9, GSR Part 6 and DS452, Decommissioning of Nuclear Installations).		X			
30	6.97 (p. 45)	Add a new bullet: (d) Allocation of decommissioning funds in consideration of the design of the reactor and associated facilities, using appropriate financial assurance instruments.	Consideration of financial assurance issue concomitant with design and planning for decommissioning.			X	Not relevant to the design section. Decommissioning funding is covered by other GSR documents.
31	Requirement 35 (p. 47)	Rephrase the requirement, as follows: Systematic consideration of human factors and the human-machine interface, which includes the active and iterative involvement of the users (or a user representative) in	The clause addressing research reactors and experimental facilities was removed to eliminate redundancy. The intended application areas have already been			X	The suggested text is more suitable as guidance. Requirements doc state what to do, not how to do it (the active and iterative

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		the design process, shall begin early in the design process and shall continue throughout the entire design process.	addressed in standards Scope. Added a sub clause on user involvement to ensure that the user's needs are adequately considered throughout the design process.				involvement of the users (or a user representative) in the design process).
32	6.113 (new clause) (p. 48)	Verification and validation activities shall be included at the appropriate stages in the design process to confirm that the design a) provides the information and controls necessary to meet operator task requirements, b) conforms to human factors design principles, and c) enables operators to successfully perform their tasks.	Without verification & validation it is impossible to demonstrate that the human factors criteria in clauses 6.108 through 6.112 have been met.			X	Verification and validation is covered in requirement 4.21 and applies to this activity. Redundant.
33	6.118	"6.118. Provision shall be made in the design of the buildings and the layout of the site for the control of access to the reactor facility by operating personnel…"	6.118 is security-related and deals with access control. There are other security concerns beyond access control. A reference to other IAEA research reactor security-related guidance should be included here, as well.			X	6.120 There are adequate references to the security guidance documents in this document.
34	6.119/4	"…other essential systems…"	How is this different from				6.119 does not

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			items important to safety?				contain the referenced text. Not clear what change is required?
35	6.126	"6.126. The applicability of the methods of analysis, the analytical assumptions and the degree of conservatism used in the design of the reactor shall be updated and verified for the current or as built design."	The purpose of this paragraph is not clear.				Assumptions, data and degree of conservatism may change due to changes/modifications during the construction so that verification of validity to the as-built reactor is needed.
36	6.136/1	"6.136. Provisions to enable initial and periodic performance tests to check air leakage rates…"	This depends on the system. Containments have verifiable leakage rates. Confinements have verifiable air paths.				6.139 No clear what change is proposed
37	6.142/2	"6.142. All foreseeable reactor core configurations, including the initial core through to the equilibrium core for various appropriate operating schedules shall be considered in the core design."	This assumes a high powered reactor that will migrate from an initial to an equilibrium core. For lower power reactors, a bounding core and normal operational core are normally evaluated.			X	Covered by all foreseeable core configurations
38	Requirement #59,	Modify Requirement #59 to read: "Requirement 59: Radioactive	Ultimate goal is safety as well as waste		X "waste		Handling of waste is part of "waste

COMMENTS BY REVIEWER Reviewer: U.S. Nuclear Regulatory Commission Country/Organization: USA Date: October 17, 2014				RESOLUTION			
Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	(Page 67)	waste systems for a research reactor facility The design of a research reactor facility and its associated experimental facilities shall include provisions to enhance safety in waste handling, and to minimize generation of radioactive waste. 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.	minimization.		management"		management"
39	6.212/3	"…detection of leakage and the recovery of waste…"	"recovery of waste" is unclear.			X	6.216. recovery of liquid radioactive waste that may have leaked
40	6.214 (p. 67)	Modify Para to read: 6.214. Appropriate means, such as air filters/purifiers to minimize radionuclides in air releases, 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.	Completeness to provide an example on minimization of contamination via air releases pathways.			X	Guidance – other NUSSC Members requested deletion of examples.

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Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
41	6.216/3	"…would not significantly impair the capability…"	How is "significantly" defined?	X			See comment 1. Text in 6.220. Significantly not in current text
42	6.216/4	"…would not endanger persons ~~the operating personnel~~.	Why limit to operating personnel?	X			Current text in 6.220 mentions persons.
43	Requirement 63/3	"Equipment shall be provided for lifting and lowering items important to safety at the research reactor facility, and for lifting and lowering other items in the proximity of items important to safety."	Why are we limiting to these locations? The experimental program could also require lifting. All lifting requirements need to be considered in the design with additional requirements on lifting near items important to safety as discussed here.			X	Technically valid comment, but the Requirements focus is on safety related items, including experimental facilities. .
44	6.220/7	"c. The facility layout permits safe movement of the lifting equipment and of items being transported"	The specification of a minimum safety rating on lifting equipment could be useful.			X	Agree but suitable for guidance
45	Requirement 66/1		This section seems to mix experimental devices and experiments at times				Experiments mentioned as needed for clarity.
46	6.225/1	"6.225. Requirements for the safe utilization of experimental devices and requirements for deciding which devices and experiments shall be referred to the regulatory body…"	This seems more like an operational requirement rather than design				See comment 1. Not clear. 6.225 has nothing to do with experiments.
47	7.3/3	"A system for reporting and	Suggest moving this	X			Not clear – the

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Comment No. / Reviewer	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		reviewing abnormal occurrences shall be established."	sentence to parag. 7.10.				suggested sentence is already in Par 7.10 (f)
48	7.5/3	"…the reactor manager…"	The reactor manager may not need a license if the person does not operate the reactor. Minimum requirements for this position may be in the OL&C.		X as per regulatory requirements		Current text refers to Authorization (licence or certification)
49	7.8/3	"7.8. The operating organization shall prepare and issue specifications and procedures, in particular for the procurement, loading, utilization, unloading, storage, movement and testing of fuel, core components and other fresh or irradiated fissile material."	Why limited to these components? Why not items important to safety?				Not clear- the suggested text – items important to safety - is already in Par 7.8
50	Requirement 69/3	"The reactor manager shall have overall responsibility for…"	This statement is not consistent with the title of the requirement (Operating personnel) or the discussion below, which covers more than the reactor manager.		X Operating Organization Personnel.		Title revised to clarify Operating Organization Personnel
51	7.25/2	7.25. The operating organization shall make provision as needed for additional technical personnel	Small facilities will not have these positions, but may have the functions.	X			

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		such as training officers, safety officers and reactor chemists.					
52	7.28/4	Reactor Safety Committee	Please consider switching the order of paras 7.27 and 7.28.	X			Considered. It is believed that the sequence is logical as is.
53	7.39/5	"…minimal staffing levels…"	Staffing levels are normally discussed in the administrative section.	X			…and also possibly in the LCO
54	7.45/4	"7.45. If a safety limit is not observed, the reactor shall be shut down and maintained in a safe condition. Under such circumstances, the regulatory body shall be promptly notified, an investigation of the cause shall be carried out…"	May want to add that the investigation should include the impact on SSCs important to safety, facility staff and the public.			X	More suited to guidance.
55	7.47/4	"Acceptable margins shall be ensured between normal operating values and the established safety system settings to avoid undesirably frequent actuation of safety systems."	This refers to more than the effects of ionizing radiation, the focus of Req't 72.	X			OLCs are established to ensure safety – so only effects of radiation are considered.
56	7.48/4	"No experiments shall be conducted without adequate review and justification."	This refers to more than the effects of ionizing radiation, the focus of Req't 72.				"Justification" from a safety point of view.
57	7.60/23	"7.60. Operating procedures shall be developed for all safety related	Consider adding shipping of radioactive materials	X			Considered. Point (f) covers it.

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		operations…, including:"	and use of radioactive materials in research if conducted under the reactor facility authorization.				
58	7.99/3	"The operating organization shall specify the records to be retained and their retention periods."	These records and retention periods are sometimes a requirement of the regulator.		X in compliance with regulatory requirements		Note this is paragraph 7.97
59	7.110/3	"…doses due to any planned releases of radioactive material from the facility…"	For a number of our facilities, the reactor is in a campus building. We look not only at releases from the reactor room to the public, but also direct shine from radioactive material that may be held in the reactor room.	X			Note para 7.108 includes dose due to exposure to ionizing radiation (shine)
60	7.119 (p. 96)	Modify Para to read: 7.119. Adequate operating practices shall be implemented to ensure that the generation of radioactive waste is kept to the minimum practicable in terms of both activity and volume; as well as ensuring safe handling and disposition of radioactive waste.	Completeness in addressing safety practices.	X			
61	7.121/Line 3	After "environment" add: are	The requirement should	X			

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	(p. 97)	kept below permissible regulatory limits and as low as reasonable achievable.	emphasize compliance with regulatory limits and ALARA.				
62	Para 7.124 (p. 97)	At the end of Para 7.124 add a new Para: Well trained and qualified staff shall be maintained to ensure safety in handling of radioactive materials and generated waste.	Completeness.			X	Technically valid - but redundant. Staff training and qualifications addressed elsewhere.
63	Requirement 88/3	The operating organization shall establish a programme to learn from events at the reactor facility and events in other research reactors and the nuclear industry worldwide. The program shall be consistent with the graded approach.	As written, this section is a lot to ask of a small, one or two person facility.			X	Redundant – graded approach already covered in 2-15-2.16.
64	Para 8.6, page 101	Modify Para to read: 8.6. The operating organization (e.g.; licensee) shall be responsible for the knowledge preservation of the reactor facility and for the retention of key personnel to facilitate decommissioning. The responsibility of the operating organization shall be terminated only with the approval of the regulatory body. In some cases, the license is temporarily transferred in a transition to	Completeness and flexibility for transitioning to another operator to carry out decommissioning and waste management.			X	Suggested text suitable for guidance

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		another operator to carry out and complete decommissioning and waste management activities. Nevertheless; license termination, after completion of decommissioning and waste management, can only be granted to the owner/operator of the facility.					Not sufficiently precise for Requirements
65	8.7/4	"It should be noted that funding can be a significant safety issue in selecting extended shutdown or transition period."	The idea of ensuring funds to cover the cost of decommissioning in accordance with national regulations should be added.			X	Suggested text suitable for guidance
	Appendix I (1)/2	"Loss of normal electrical power"	Given the footnote, it is not clear whether this is an initiating event.			X	Clear and consistent with SSR-2/1.

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TITLE: DS476 Safety of Research Reactors

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	General comment	the document is not synthetic, not easy readable and the main aspects of research reactors are eclipsed: - in the context of a complete revision of the NS-R-4, it would have been useful if the new document could only focus on the safety specificities of research reactors (for instance requirements related to graded approach, to experimental devices …) 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…). - 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.					DS476 is developed in accordance with the approved DPP
2.	General comment	As a consequence of points detailed in previous comment, several requirements in the document are nearly similar or repeated from one para to another para which generates arduousness in the lecture. This should be rationalize. Furthermore, there are many internal cross references (which is not generally the case in safety requirements). They should be avoided.					Internal cross references deleted or rationalized
3.	General comment	It would be more appropriated to deal with Fukushima Dai-ichi TEPCO NPPs accident experience feedback as it was planned in the DPP of the revision of NSR-4 (see version 2 date 28 june 2013 of the DPP) (see also comment n°5). Notably, most of the design chapter is similar to SSR-2/1. This standard is under revision to take into account this experience feedback. If DS476 is kept without focusing on research reactors, it would be worthwhile to check which SSR-2/1 modifications should be taken into account in DS476.					DS476 is developed in accordance with the DPP, is coherent with the latest revision of SSR-2/1 and considers FD feedback.
4.	General comment	The requirements include example, options (“may…”, “shall consider…”) and, at various occasions, go into a level of detail which would be more appropriate for a guide. The requirements shall focus on what is to be achieved, not how it is achieved.		X			Guidance deleted (may, examples…)
5.	General comment	Increased consistency with SSR-2/1 and 2/2 requirement should be achieved (unless specificities of RR warrant a difference)		X			Consistent with SSR-2/1 & 2/2

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
6.	2.8	~~Measures shall therefore be taken to prevent accidents and~~ emergency arrangements shall <u>therefore</u> be applied to ensure that the consequences of any accident that do occur are mitigated.	Prevention of accident is dealt with in the previous sentence.	X			
7.	2.10	This concept is applied to all safety related activities, whether organizational, behavioural or design related, in any operational states ~~or different shutdown states~~.	Shutdown states are encompassed by operational states.	X			
8.	Req 1		There is no equivalent requirement in SSR-2/1 and 2/2.			X	The SAR requirement is necessary for RRs (important requirements from NS-R-4)
9.	3.7	"The safety analyses in the safety analysis report shall form the basis for the operational limits and conditions for the reactor."	Would be better under requirement 71			X	Relevant and applies to R1
10.	3.9	Delete 3.9	Would be more relevant in a guidance.			X	Relevant and applies to R1
11.	3.10	Needs simplification	No equivalent in SSR-2/1. Not consistent with SSR-2/2 (4.7, 4.45). Already addressed in GSR-Part 4	X			Text simplified. Also comments from Germany addressed.
12.	3.11	Delete 3.11	Would be more relevant in a guidance.			X	Relevant and applies to review & assessment
13.	3.12	Delete 3.12	No equivalent requirement in SSR-2/1			X	Sec 3 is on Regulatory Supervision while SSR-2/1 is NPP Design. Important requirements retained from NS-R-4

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14.	3.16	Delete 3.16	No equivalent in SSR-2/2.			X	3.16 is on Reg Supervision – SSR-2/2 is on NPP Comm & Operation. Important requirements retained from NS-R-4
15.	Rq 2		Improve consistency with SSR-2/1 and 2/2 requirement on responsibilities of the management	X			Requirement 2 covers safety responsibility over lifetime of RR. Consistent with SSR/2/1 in Design and with SSR-2/2 in Oper & Comm
16.	4.1		No equivalent of the bullet list in SSR2/1 and 2/2				This section is on Management Systems and it covers specific requirements for RRs, which many not be the same as those for NPPs

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
17.	4.1 (f)	(f) Shall be committed to safety culture ~~on the basis of a statement of safety policy and safety objectives which is prepared and disseminated and is understood by all staff~~.	Reducing commitment to safety culture to a statement is quite weak…		X Shall be committed to safety culture, including a statement of safety policy and safety objectives which is prepared and disseminated and is understood by all staff		Text strengthened
18.	4.2	~~the operating organization shall demonstrate to the regulatory body that its responsibility for safety at all stages in the lifetime will be discharged~~	There is no need to an additional requirement related to responsibilities of the operating organization. The requirement n°2 is sufficient.	X			
19.	4.3	Delete 4.3	No equivalent in SSR2/1 and 2/2. Would be more relevant in a guidance.		X 6th sentence moved to 3.10		Simplified, 6th sentence moved to 3.10, see comment from Germany
20.	Rq 4	The operating organization for a research reactor facility shall establish, implement, assess and continuously improve an integrated management system ~~for ensuring that all safety requirements are met in all phases of the lifetime of the research reactor~~.	For consistency with SSR2/2. Purpose of IMS is broader than safety.	X			
21.	4.10 to 4.13	Delete 4.10 to 4.13	Too detailed and already covered by GS-R-3 and associated guides.			X	Applies. Also, text revised per comments from CAN, GER and USA

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
22.	4.14	Delete 4.14	Too detailed and already covered by GS-R-3 and associated guides.			X	Applies. Important requirements retained from NS-R-4
23.	4.15	Delete 4.15	Too detailed and already covered by GS-R-3 and associated guides.			X	Applies. Also revised per comments from members.
24.	4.16 to 4.19	Simplify 4.16 to 4.19, even consider deletion	Too detailed and already covered by GS-R-3 and associated guides.			X	Retained for the benefit of the reader.
25.	4.20	Delete 4.20	Too detailed and already covered by GS-R-3 and associated guides.			X	Kept for benefit of small operating organizations without a NPP. Only para on assessments & improvements
26.	Rqt 5	Requirement 5: Safety assessment16~~— and periodic safety reassessments for a research reactor~~	To make title consistent with the one in SSR-2/1.			X	Combined for efficiency. See comment 29.
27.	Rqt 5		Why is the overarching requirement different from the one in SSR-2/1 (Rqt 10) ?				It is largely consistent with SSR-2/1. For RRs

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28.	Rqt 5	The adequacy of the design of the research reactor~~, including design tools and design inputs and outputs,~~ shall be verified according to the management system by means of comprehensive deterministic safety assessment, and probabilistic safety assessment where necessary, and validated by independent verification by individuals or groups independent from those who originally performed the design work. ~~The safety assessment shall be continued throughout all the stages of the reactor lifetime and shall be conducted in accordance with the potential magnitudes and nature of the hazards associated with the particular facility or activity.~~	Too detailed for an overarching requirement PSA should be included, to be consistent with 4.23 and other requirements. Graded approach is dealt with 2.15 to 2.17		X The safety assessment shall be continued throughout all the stages of the reactor lifetime (periodic safety reassessments0 …		Important to keep safety reassessment throughout the lifetime of the RR.
29.	4.25		It is an overarching requirement in SSR-2/2….				It is included as an overarching requirement in Req 5.
30.	4.26	Replace 4.26 by requirements 4.44 to 4.47 of SSR-2/2	Consistency with SSR-2/2.			X	See response above to #28
31.	4.27	The advisory group (or a safety committee) shall advise the operating organization on: (a) the safety assessment of design, commissioning and operational issues and (b) relevant aspects of the safety of the reactor and the safety of its utilization. Members of such a group shall be experts in different fields associated with design and operation of research reactors. ~~It may be advisable to include external experts (i.e. from outside the operating organization) in such committee. The functions, composition and terms of reference of such committee shall be documented and, if required, submitted to the regulatory body.~~ The safety committee shall be fully functioning before starting the design of the research reactor.	Too detailed for a requirement	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
32.		~~Such a list shall include, among other things, the following:~~ ~~(a) The design of structures, systems and components including the design and qualification of nuclear fuel elements20 and the reactivity control elements;~~ ~~(b) Safety documents and their modifications;~~ ~~(c) Proposed new tests, experiments, equipment, systems or procedures that have significance for safety;~~ ~~(d) Proposed modifications to items important to safety and changes in experiments that have implications for safety;~~ ~~(e) Violations of the operational limits and conditions, of the licence and of procedures that are significant to safety;~~ ~~(f) Events that are required to be reported or that have been reported to the regulatory body;~~ ~~(g) Periodic reviews of the operational performance and safety performance of the facility;~~ ~~(h) Reports on routine radioactive releases to the environment;~~ ~~(i) Reports on radiation doses to the personnel at the facility and to the public;~~ ~~(j) Reports to be provided to regulatory body;~~ ~~(k) Reports on regulatory inspections.~~	Too detailed for a requirement.			X	Of benefit to small operating organizations without NPPs
33.	5.1	~~This may constitute the first part of the development of the safety analysis report for the research reactor.~~	Superfluous (and not a requirement)	X			
34.	5.3	Delete 5.3	NS-R-3 is enough.			X	Short text is kept in this section to provide a link to NS-R-3
35.	5.4 5.5	Delete 5.4 and 5.5	NS-R-3 is dealing with site evaluation			X	See above
36.	5.6	5.6 would better be located in the section on Safety Analysis Report or Safety Assessment	It is not a site evaluation aspect but a design aspect…			X	Also applies to site evaluation
37.	5.7 to 5.11	Delete 5.7 to 5.11	NS-R-3 is dealing with site evaluation			X	Kept as appropriate for RR community

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38.	6.4 6.5	Combine 6.4 and 6.4 and focus on the result : 6.4. The ~~reactor~~ designe~~r~~ of the research reactor facility shall cover: - ~~consider~~ not only the reactor itself but also any associated facilities such as experimental devices that may affect safety. ~~In addition, the reactor designer shall also consider the effects of the reactor as designed on the associated facilities and the implications of the design in all the stages of the reactor's lifetime (e.g. in terms of service conditions, electromagnetic fields and other interferences).~~ ~~6.5. The design of the research reactor facility shall consider~~ - the potential different modes of operation (e.g. operation on demand rather than continuous operation, operation at different power levels,… ~~operation with different core configurations and operation with different nuclear fuels~~). In the design of the safety systems due consideration shall be given to the stability of the reactor at different modes of operation.	Too detailed.		X The ~~reactor~~ designe~~r~~ of the research reactor facility shall consider: not only the reactor itself but also any associated facilities such as experimental devices that may affect safety...		"Consider" is appropriate given that the experimental devices may be designed by others. Operation with different fuels is important (e.g conversion from HEU to LEU)
39.	Req 8	The design of a research reactor facility shall such as to ensure that radiation doses to workers and other personnel at the facility and to members of the public do not exceed the ~~established~~ dose limits, and that they are kept as low as reasonably achievable for operational states ~~and for design basis accidents for the entire lifetime of the facility.~~ for the entire lifetime of the facility, and that they remain below acceptable limits and as low as reasonably achievable in, and following, accident conditions	To make it consistent with SSR-2/1 Requirement 5. No reason to exclude DEC…		Modified to be consistent with SSR-2/1, for DBA		For DBA for the lifetime of the facility
40.	6.9	Delete 6.9	Evident and redundant with 6.10. Not specific to radiation issues…	X			
41.	6.15 (a)	Shall provide for successive verifiable physical barriers to the release of radioactive material from the reactor. ~~Examples of such barriers are the fuel matrix, the fuel cladding, the primary heat transport system, the pool and the reactor building.~~	Examples are note relevant for a requirement.	X			
42.	Rqt 11	~~(See also Section 9 on the Interfaces between safety and security and Requirement 12 of Ref. [3].)~~	Superfluous	X			

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43.	Rqt 12	~~Requirement 12: Use of the graded approach for a research reactor Use of the graded approach in application of the safety requirements for a research reactor shall be commensurate with the potential hazard of the facility and shall be based on a safety analysis and regulatory requirements.~~	Delete Requirement 12			X	The graded approach is an important requirement for RR safety. It is also a requirement in GSR-Part 1, 3
44.	6.19	Locate 6.19 with 1.9	It is not really a requirement but an explanation on how to implement the requirements			X	Text revised to address other member comments. Also, see above comment.
45.	Rqt 13	Items important to safety for a research reactor shall be designed in accordance with the relevant national and international codes and standards,~~ with account taken of their relevance to nuclear technology.~~	Consistency with SSR-2/1 (Rqt 9)	X			
46.	6.20	~~(see paras 6.6, 6.24)~~.	Superfluous	X			
47.	6.22	Delete 6.22	No equivalent requirement in SSR-2/1			X	Kept for the benefit of small operating organizations without NPPs
48.	6.23	Delete 6.23	Too detailed. Would better fit in a guidance			X	See above comment
49.	6.25	Locate 6.25 with Rqt 17	For consistency with SSR-2/1		X First 2 sentences moved to Req 17.		Rest applies to proven engineering practices

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50.	6.27		Consider deletion as there is no equivalent in SSR-2/1 or 2/2 and is actually addressed in a Safety Guide for NPP.			X	See above comment 47
51.	6.33	Delete 6.33	Too detailed and redundant with previous requirements. No equivalent requirement in SSR-2/1			X	See above comment 47
52.	6.34	The documentation shall provide the necessary information for the operating organization to operate ~~(see definition in footnote 37)~~ the reactor safely.	Superfluous	X			
53.	6.35	Delete 6.35	The second sentence ("For example,…) should not be in a requirement document. The first sentence, although true, is not in SSR-2/1.		X "For example…." deleted		"For example…." deleted. First sentence kept
54.	6.36	Combine 6.36 with 6.37, starting with 6.37	More logical order		X start with 6.37,		kept separate
55.	6.36	~~Challenges may occur at all levels of defence in depth and will stem from postulated initiating events. This possibility shall be recognized in the design and design measures shall be provided to ensure that the safety functions are achieved and the safety objectives can be met [1].~~ Postulated initiating events shall be selected appropriately for the purpose of analysis (see Appendix I). It shall be shown that the set of postulated initiating events selected covers all credible accidents that may affect the safety of the research reactor.	Not a requirement	X			
56.	Title before 6.47	Internal ~~events~~ <u>hazards</u>	Consistency with overarching requirement	X			
57.	6.47	Delete 6.47 or refocus on internal hazards.	The scope of 6.47 is inconsistent with the scope of the overarching requirement		X refocused on internal hazards		

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58.	6.48	Replace 6.48 by requirement 5.16 of SSR-2/1	Consistency with SSR-2/1		X First two sentences replaced with 5.16 of SSR-2/1,		interrelation of internal and external hazards analysis kept
59.	6.49 to 6.52	Delete 6.49 to 6.52 considering previous comment (insertion of 5.16 of SR-2/1) and requirement 61	Locate fire issue at one location (requirement 61)			X	Fire hazard analysis applies to internal and external hazards sections. Req 61 is focused on fire protection systems
60.	6.53	The design basis for natural and human induced external events shall be determined. The events to be considered shall include those that have been identified in the site evaluation ~~(see Section 5)~~. ~~Consideration shall also be given to earthquake hazards, including the possibility of equipping the research reactor facility with seismic detection systems that actuate the automatic shutdown systems of the reactor if a specified threshold value is exceeded~~.	Superfluous Too weak to be a requirement	X			
61.	6.59	The design shall be such that for design basis accident conditions, key reactor parameters do not exceed the specified design limits ~~(see paras 6.24–6.25).~~	Superfluous	X			
62.	6.60	Locate 6.60 with 6.45			X First sentence of 6.60 moved to 6.45		The remainder is appropriate for External Hazards

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
63.	6.63	The design limits shall be specified for each operational state of the reactor and its experimental devices and for ~~design basis~~ accident~~s~~ conditions and shall be consistent with relevant national and international standards and codes, as well as with relevant regulatory requirements.	No reason to exclude DEC for the definition of design limits.		X Deleted "and for design basis accidents"		Text made consistent with 5.4 of SSR-2/1 (rev.1)
64.	6.64	~~The reactor shall be designed so that the implementation of mitigation actions is facilitated~~.	Although true, it is redundant with 6.65	X			
65.	6.65	~~For existing research reactors complementary safety reassessment shall be performed to determine the need for implementing mitigating measures or modifications of the facility.~~	Superfluous as already established by requirement 5.			X	Further clarify through R5
66.	6.68	The means of confinement shall be able to withstand extreme scenarios that would result, without these means, in unacceptable radiological release. These scenarios shall be selected using ~~a graded approach,~~ engineering judgement and from probabilistic safety assessments as appropriate.	Clarification Superfluous as graded approach is already in Requirement 22.		X graded approach kept		Graded approach is significant here because RRs have a wide variety of confinements
67.	6.70	Where the results of ~~a graded approach,~~ engineering judgement, and deterministic safety assessments, complemented as appropriate by probabilistic safety assessments indicate that combinations of postulated initiating events could lead to accident conditions,…	Superfluous as graded approach is already in Requirement 22.	X			
68.	Rqt 23	Engineered safety features shall be provided for a research reactor to prevent~~, limit, or to mitigate the consequences of~~ anticipated operational occurrences and design basis accidents and to mitigate their consequences, should they occur.	Clarirfication	X			
69.	6.71	Delete 6.71	It is guidance, not a requirement		X First sentence deleted		Text revised to remove guidance

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
70.	6.72	The necessity and capabilities for engineered safety features shall be determined from the safety analysis. ~~The accidents with which these systems are required to be able to cope shall be specified and analyses shall be provided to demonstrate that the systems fulfil the requirements.~~ Their reliability shall take account of the auxiliary or supporting systems they rely on.~~Those systems and subsystems that are essential for the proper operation of the engineered safety features shall be provided (e.g. the emergency electrical power supply for the emergency core cooling system).~~	Simplification Examples are not to be included in requirement		X "and capabilities" added. Examples deleted.		Text revised for simplification,
71.	6.73	Delete 6.73	Design basis is already addressed in Requirement 17		X design basis deleted.		Starts with: The various modes of operation
72.	After 6.74	6.## In the selection of equipment, consideration shall be given to both spurious operation and unsafe failure modes. Preference shall be given in the selection process to equipment that exhibits a predictable and revealed mode of failure and for which the design facilitates repair or replacement.	Requirement 5.38 of SSR-2/1 should be added.	X			
73.	6.75		No equivalent requirement in SSR-2/2. Is it true for each item important for safety or to some of them ?				Valid for all items important to safety
74.	Rqt 25		For NPP, the SFC is applied to a safety group, not a safety system….	X			Revised: safety group
75.	6.77	The design shall take due account of the failure of a passive component, unless it has been justified in the single failure analysis with a high level of confidence that a failure of that component is very unlikely and that its function would remain unaffected by the postulated initiating event.	SSR-2/1 restrict this requirement to passive system.	X			
76.	6.78	Delete 6.78	Redundancy is a mean to address single failure. Furthermore, 6.78 has no added value compared to Requirement 25	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
77.	6.79 6.80	Delete 6.79 and 6.80	Too detailed for a requirement. No equivalent in SSR-2/1		X Merged		Merged and kept
78.	6.81	Delete 6.81	Would be more appropriate in a guide			X	Beneficial for the reader
79.	6.82 6.83	Delete 6.82 and 6.83	Too detailed for a requirement. No equivalent in SSR-2/1		X 6.82 deleted		6.83 modified and kept.
80.	6.84	Delete 6.84	No added value compared to the Requirement 27	X			
81.	Rqt 30	The design for a research reactor facility shall include features as necessary to facilitate the commissioning process for the reactor facility, including experimental facilities. 6.## These design features may include provisions to operate with transition cores of different characteristics.	Only the first sentence should be an overarching requirement.	X			
82.	6.90	~~This is particularly important for passive components and for systems whose ability to function is not normally verified by routine operations.~~	Too detailed, would be more appropriate in a guide.	X			
83.	6.92	~~If it is not practicable to provide adequate accessibility of a component for testing, the possibility of its undetected failure shall be taken into account in the safety analysis.~~	Potential for failure is not only related to ability to test or access to the equipment.			X	It is not about potential failure; related to ability to test or access
84.	6.93	Delete 6.93	Worker exposure issue is already addressed in 6.92. 6.93 describes means to achieve the requirement in 6.92. In addition, it is redundant with Requirements 8 and 34	X			
85.	6.94	Delete 6.94	Redundant with requirement 34.			X	Req 34 is about dose, 6.94 is about maintainability

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
86.	Rqt 32	For emergency preparedness and response purposes, the design for a research reactor facility shall ~~include specific features to facilitate emergency preparedness and response~~ provide with : - a sufficient number of escape routes, clearly and durably marked, with reliable emergency lighting, ventilation and other services essential to the safe use of these escape routes ; - effective means of communication throughout the facility for use following all postulated initiating events and in accident conditions.	Overarching requirement is unclear and, therefore, does not bring much to DS457. Consider replacing by requirement 36 (escape routes) and 37 (communication means) of SSR-2/1 to make overarching requirement consistent with associated requirements	X			
87.	6.95	~~The inclusion of specific design features for facilitating emergency preparedness and response shall be considered, depending on the potential hazard of the reactor. The need for such design features may be determined by means of analyses of design extension conditions. Acceptable measures shall be based where possible on realistic or best estimate assumptions, methods and analytical criteria.~~ 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 international requirements for radiation zoning and fire protection and the relevant national requirements for industrial safety and nuclear security (see also Section 9).	The first sentences are explanations, not requirements	X			
88.	6.96	Suitable alarm systems 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 ~~(see Ref. [10])~~. The availability of reliable and diverse means of communication necessary for safety within the reactor facility shall be ensured at all times with due account of postulated initiating events that may compromise their availability. ~~Means of communication shall be available in the control room and also in the supplementary control room if there is one[28] and any other location from where the accident is managed according to the emergency plan.~~	Superfluous (Supplementary) control room design is addressed later on.	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
89.	6.97	In the design of the research reactor and its experimental facilities and in any modifications of them, consideration shall be given to facilitating decommissioning~~. Attention shall be directed to keeping the radiation exposure of personnel and of the public during decommissioning as low as reasonably achievable and to ensuring adequate protection of the environment from undue radioactive contamination~~. In accomplishing this ~~in the design~~, the following shall be considered:	Radiation safety is dealt with in Rqt 8	X			
90.	6.97 bullet list		Why is the bullet list different from the one of requirement 4.20 of SSR-2/1 ?	X			Lists revised to be consistent with SSR-2/1
91.	6.98	Delete 6.98	Would be more appropriate in a guide. Furthermore, the information listed are not only use for the purpose of decommissioning			X	Kept for the benefit of small operating organizations without NPPs
92.	Rqt 34		What is the interface between requirements 8 and 34				Req 8 is a principal tech req; 34 is general and provides more detail

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93.	Rqt 34 6.99 to 6.102 and 6.104 to 6.107		It would be better to recopy, with slight modification where needed, requirements 6.69 to 6.76 of SSR2-1. If not done, 6.100 should be deleted, last sentence of 6.101 should be deleted, last sentence of 6.104 should be deleted, as the topics would be more relevant to a guide.		X Last sentence of 6.104 deleted		The access to, and more direct interaction with, fuel and experiments in RRs is different from NPPs. Some of the detail provided here is also needed for operators of subcritical assemblies
94.	6.108	~~Because of the flexibility required in operating a research reactor, it may be necessary to rely for safety in certain activities on administrative controls and procedures.~~ Consideration shall be given in design to ensure that, if reliance on administrative controls and procedures is necessary, such controls are feasible and associated procedures are applicable. ~~Administrative procedures may include operating rules in the form of operational limits and conditions, which are derived from the design of the reactor and the safety analysis.~~	The text deleted would better fit a guide.	X			
95.	6.109	Consideration shall be given to human factors and the application of ergonomic principles in the design of the control room and reactor systems ~~as appropriate~~.	Ergonomics aspects have always to be taken into account	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
96.	6.109	~~The operator shall be provided with clear displays and audible signals for those parameters that are important to safety. Safety actions shall be automated so that the need for intervention by the operator on a short time scale shall be kept to a minimum, and it shall be demonstrated that for intervention that needs to be taken, the operator has sufficient time to make a decision and act.~~ The human–machine interface shall be designed to provide the operators with comprehensive but easily manageable information, in accordance with the necessary decision times and action times. The information necessary for the operator to make a decision to act shall be simply and unambiguously presented and enable : (a) To assess the general state of the plant in any condition; (b) To operate the plant within the specified limits on parameters associated with plant systems and equipment (operational limits and conditions); (c) To confirm that safety actions for the actuation of safety systems are automatically initiated when needed and that the relevant systems perform as intended; (d) To determine both the need for and the time for manual initiation of the specified safety actions.	Replace end of 6.109 by requirements 6.56 and 6.57 of SSR-2/1		X		Text retained for RR operators
97.	6.110	Delete 6.110	6.110 is redundant with 6.111 and 6.112	X			
98.	Rqt 36		Requirement is unclear….		X		Clarified. Added: safe utilization…
99.	6.113	~~Research reactors are operationally flexible in nature and they may be in various different states. Precautions shall be taken in the design regarding the utilization and modification of the research reactor to ensure that~~ the configuration of the reactor ~~is~~ shall be known at all times. In particular, consideration shall be given to experimental equipment since:	Not a requirement.		X First sentence clarified, part of 2nd sentence deleted.		Retained link to operational flexibility of research reactors

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
100.	6.114	Every proposed modification to the reactor or to an experiment that may have a ~~major~~ significance for safety shall be designed in accordance with the same principles as apply for the reactor itself ~~(see paras 7.101–7.102)~~.	No reason to limit to major modification			X	Consistent with SSG-24: required for experiments & mods with major safety significance
101.	6.115	A formal commissioning programme shall be established for experiments and modifications with ~~major~~ safety significance.	No reason to limit to major experiment/modification			X	See comment above
102.	6.116	Delete 6.116	Unclear expectation			X	Utilization
103.	6.118	~~At the design stage, an appropriate safety margin shall be adopted to allow for the anticipated properties of materials at the end of their useful lifetime. Where no ageing data are available on materials,~~ a suitable programme of inspection and periodic testing of materials shall be put in place and the results that are obtained in this programme shall be used in reviewing the adequacy of the design at appropriate intervals.	Already addressed by 6.117 Ageing monitoring is required even is ageing process is kwown.	X			
104.	6.121	Delete 6.121	Would be more relevant in a guide.			X	Retained for clarity and for the benefit of the reader
105.	6.123		Make 6.123 wording with requirement 5.70 of SSR-2/1.	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
106.	6.124	A safety analysis shall be conducted of the design of the research reactor. The safety analysis shall include the response of the facility to a range of postulated initiating events (such as malfunctions or failures of equipment and experimental devices, operator errors or external and internal events) that could lead either to anticipated operational occurrences or to accident conditions (see also [11]). These analyses shall be used : - as the design basis for items important to safety, - ~~their links to initiating events and event sequences and~~ for the selection of the operational limits and conditions for the reactor. - ~~The analyses shall also be used as appropriate in~~ for the development of operating procedures, inspection and periodic testing programmes, record keeping practices, maintenance schedules, proposals for modifications and emergency planning [10]. 6.### The safety analysis shall provide assurance that defence in depth has been implemented and uncertainties have been given adequate consideration in the design ~~(see also Requirement 22 for design extension conditions)~~.	Clarification Make sentence on DiD and uncertainties a separate requirement.	X			
107.	6.125 bullet list	(d) Demonstration that the management of anticipated operational occurrences and design basis accidents is possible by means of an automatic response of safety systems in combination with prescribed operator actions; (#) Design extension condition identification and how they are addressed; (e) Determination of the operational limits and conditions for normal operation; (f) The analysis of safety systems and the engineered safety features and the safety features for DEC; (g) The analysis of the means to fulfil the fundamental safety function, ~~of confinement or containment.~~	DEC are part of the safety analysis No reason to exclude the other fundamental safety functions		X Kept means of confinement		For RRs it is important highlight analysis of means of confinement
108.	6.126 Bullet list		Bullets (g), (h) and (i) are related to the same purpose. Only item (i) could be kept.		X g deleted, h & i kept		

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
109.	6.127	For each accident sequence considered, the extent to which the safety systems and any operable process systems are required to function under ~~design basis~~ accident conditions shall be indicated.	DEC are part of the safety analysis	X			
110.	6.130	~~However, these items may constitute engineered safety features, for which specific design requirements are established in paras 6.71–6.72.~~	Superfluous	X			
111.	6.132	Delete 6.132	Does not bring much compared to what is in the overarching requirement			X	Provides further clarity
112.	6.133	Delete 6.133	Superfluous (redundant with 6.68 to 6.71)	X			
113.	6.134	Delete 6.134	Would better fit a guide			X	Provides clarity
114.	6.135	In the design of the means of confinement, the effects of extreme conditions (e.g. pressure waves or explosions within the barrier) and environmental conditions due to accidents, including conditions arising from the external and internal events listed in the Appendix, as relevant (e.g. fire conditions and the associated increases in local pressures) shall be taken into account~~, in accordance with the design basis.~~	Superfluous	X			
115.	6.136	The barriers shall be designed to withstand with suitable margins for the highest calculated pressure and temperature loads expected in design basis accident conditions. The resistance of barriers in design extension conditions shall be analysed for determination of <u>adequacy considering planned</u> ~~necessary~~ mitigation measures.	DEC input in design basis should not be weakened	X			
116.	6.137	Delete 6.137	Would better fit a guide			X	Provides clarification
117.	6.138		Deletion should be considered as it duplicates 6.132			X	leakage control
118.	6.140		Why is the expectation different from the one in requirement 6.63 of SSR-2/1 ?	X			In situ testing

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
119.	6.141	For structures and components performing the function of confinement, coverings and coatings shall be ~~carefully selected and their methods of application shall be specified so as to~~ such as to ensure their safety functions and ~~to~~ minimize interference with other safety functions in the event of their deterioration.	Clarification	X			
120.	6.142	For research reactors that have greater potential hazards associated with them~~, consideration shall be given to the provision of~~ a containment structure ~~to~~ shall ensure that in design basis accident~~s~~ conditions, ~~including both internal and external events~~, any release of radioactive material would be kept below authorized limits and that, in DEC such release would be kept below acceptable limits. ~~Specific procedures shall be put in place for mitigating the consequences of selected design extension conditions.~~	Initial wording is weak. Furthermore, DEC should be considered	X			
121.	6.144	Delete 6.144	Would better fit a guide			X	Conflicts with other MS comments to add text
122.	6.147	Delete 6.147	Would better fit a guide			X	Provides clarity
123.	6.150	~~The exact value of neutron multiplication (Keff) shall be known for all possible core configurations with the nuclear fuel available, including transitory configurations.~~	Too detailed	X			
124.	6.152		Consider deletion as it is quite detailed.			X	clarity
125.	Rqt 46	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, and that the shutdown condition can be maintained with margins even for the most reactive conditions of the reactor core ~~with consideration to the single failure criterion~~.	Application of the SFC is addressed in 6.155	X			
126.	6.153	At least one automatic shutdown system[31] 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~~.	The second sentence is weak. Either delete it or make it stronger (the absence of a second independent shutdown system shall be justified, considering the risks of uncontrolled reactivity…)		X Sentence made stronger		

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
127.	6.155	No single failure in the shutdown system shall be capable of preventing the system from fulfilling its safety function when required ~~(e.g. with the most reactive shutdown rod stuck in the out of core position~~).	Example should not generally appear in a requirement. Furthermore, no requirement is requiring control rods…	X			
128.	6.157	Instrumentation shall be provided and tests shall ~~be specified to~~ be performed to ensure that the means of shutdown are ~~always~~ in the state stipulated for the given condition of the reactor. ~~For computer based digital reactivity control systems, verification and validation of software shall be performed.~~	Clarification Computer systems are already addressed under I&C requirements	X			
129.	6.158	Delete 6.158	Redundant with Rq 46			X	Clarity for function of shutdown system. Conflicts with comment from other MS to add text on DEC
130.	Rqt 47	The coolant systems for a research reactor shall be designed and constructed to provide adequate cooling to the reactor core ~~with an acceptable and demonstrated margin~~.	Superfluous	X			
131.	6.159	Systems containing reactor coolant shall be designed to allow <u>pre-service and in-service</u> tests and inspections ~~to detect possible occurrence of leaks, cracks and brittle fractures~~. Consideration shall be given in the design to obtaining material characteristics that ensure the slow propagation of failures ~~permitting the timely detection of any flaw. A multiple barrier concept may be adopted as appropriate (e.g. the primary cooling system may be fully contained within the pool block or in a special design to cope with possible breaches).~~	Simplification, too many details		X Kept "to detect possible occurrence of leaks, cracks and brittle fractures."		Clarity. Coolant boundary integrity

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
132.	6.160	In the design of water cooled reactors particular attention shall be paid to preventing the uncovering of the core. ~~Special features, such as penetrations over the core, whenever feasible, siphon breaks and suitable isolation devices shall be used. High quality design and fabrication together with the characteristics of ease of inspection and testing and redundancy, where appropriate, shall be ensured~~.	Simplification, too many details	X			
133.	6.161	Delete 6.161	Redundant with 6.159	X			
134.	6.162	Where the primary cooling system is not designed ~~a separate system is required~~ for cooling the core after shutdown, a~~n adequate and~~ reliable separate system~~, in addition to the primary cooling system,~~ shall be provided for the removal of residual heat.	Clarification	X			
135.	6.163	For reactor systems that use flappers[34] or equivalent systems for the transition from forced to natural circulation cooling, or for operation with natural circulation cooling, and for which this mode is part of the safety system ~~(~~or is considered an engineered safety feature), ~~an appropriate number of redundant devices shall be used (in application of~~ the single failure criterion~~)~~ shall be applied, ~~including devices~~ Instrumentation to verify their functioning and to provide signals to the reactor protection system shall be provided.	Clarification of the requirement. Separate the initial requirement and the one on instrumentation.	X			
136.	6.164	Delete 6.164	Redundant with 6.123			X	Clarity for coolant system vs other fluid systems
137.	6.165	~~To ensure adequate cooling of the core and that the design limits are not exceeded~~ provisions shall be made in the design for controlling ~~important parameters such as~~ the volume, temperature and pressure of the reactor coolant…	Clarification	X			
138.	6.167	Delete 6.167	Redundant with 6.74-6.85			X	Reliability for PIEs
139.	Rqt 48	An emergency core cooling system shall be provided for a research reactor[35], as required, to prevent damage to the fuel in the event of a loss of coolant accident. ~~The accidents with which the system is required to be able to cope shall be identified and analyses shall be performed to show that the system fulfils the core cooling requirements.~~	Footnote 35 should in the requirement, not its title. Superfluous.	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
140.	6.168	The emergency core cooling ~~system~~ function shall be capable of preventing significant failure of fuel for ~~the range of~~ design basis 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~~ and limiting such failure in design extension conditions.	Make requirement consistent with overarching requirement. Emergency core cooling in DEC should be possible, eventually with a system different from the one use in DBA.		X selected design extension conditions		Not possible in all DEC
141.	6.169	The emergency core cooling ~~system shall be designed with sufficient reliability to meet the requirements of paras 6.74–6.85. The system~~ shall be designed, for design basis accident, to perform its intended function in the event of any single failure in the system.	Redundant 6.74-6.85 Clarification	X			
142.	Rqt 49	Instrumentation ~~and control systems~~ 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 and for making decisions for accident management purposes ~~and to control the relevant process variables within the specified operational ranges~~. Appropriate and reliable control systems shall be provided at the facility to maintain and limit the relevant process variables within the specified operational ranges.	To increase consistency with Requirements 59 and 60 of SSR-2/1	X			
143.	6.173	Delete 6.173	First sentence is redundant with Requirement 35. Second sentence is redundant with requirement 53. Last sentence already addressed in 6.192.	X			
144.	6.174	Delete 6.174	Redundant with requirement 52	X			
145.	6.178	~~The possible malfunction (single failure) of parts of the system shall be taken into account in providing this capability.~~	Redundant with 6.181	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
146.	6.181	The design of the reactor protection system shall ~~employ redundancy and independence sufficient to ensure~~ be such that no single failure could result in the loss of automatic protective actions. ~~Design techniques such as the use of fail-safe behaviour and diversity shall be used to the extent practicable to prevent the loss of the reactor protection function~~.	Means should be avoided. Redundant with requirements 24, 26 and 28.	X			
147.	6.182	The reactor protection ~~system~~ 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 common cause failure ~~(e.g. hardware failure or failure due to ageing or human factors)~~.	Clarification (make it more consistent with 6.186) Superfluous.	X			
148.	6.185	Delete 6.185	The bullet list does not bring any additional requirement compared to 6.181			X	Clarity & beneficial for operating organizations changing to digital systems
149.	6.186	Where the necessary integrity of a computer based system that is intended for use in a reactor protection system cannot be demonstrated with a high level of confidence, diverse means of ensuring fulfilment of the protection functions ~~(e.g. hard wired systems)~~ shall be provided.	Superfluous	X			
150.	6.187		It seems that 6.187 is not appropriately located (not directed at the protection system)			X	Related to protection systems
151.	6.188	Delete 6.188	Would be more appropriate in a guide			X	Provides clarification of reliability and testing.
152.	6.189	Delete 6.189	An equivalent requirement is not applicable to NPP (not in SSR-2/1)	X			
153.	6.191	~~(g) Appropriate verification and validation and testing of the software systems shall be performed.~~	To make it consistent with SSR-2/1			X	Not consistent with comment 128

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154.	6.192	~~See also para. 6.96 for means of communications between control room and supplementary control room and emergency centre.~~	Redundant with 6.192			X	Refers to supplementary control room. conflicts with F88 F88 and F154 would delete link to sup control room and emerg centre
155.	6.194		Consider deletion. This requirement seems to be related to the feedback from the accident at the Fukushima Dai-ichi TEPCO NPPs. It may be more appropriated to deal with this topic in an integrated manner (and not only to focus on one safety item) as it was planned in the DPP of the revision of NSR-4 (see version 2 date 28 june 2013 of the DPP)	X			The comment was thoroughly considered. The document is developed in accordance with the DPP and is consistent with strategy of SSR-2/1
156.	Rqt 54		It is a weak requirement…				
157.	Rqt 56	The design for a research reactor facility shall include reliable normal electrical power supply systems and~~, when required for safety,~~ shall ~~consider~~ include reliable emergency electrical power supply systems.	It is a weak requirement…			X	Small low hazard RRs and subcritical assemblies may not require emerg elec power supply for safety

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
158.	6.197	~~The basis for the design of normal and emergency electrical power systems shall be specified. The availability of~~ reliable electrical power supplies for essential safety functions ~~(e.g. the reactor protection system, cooling systems, radiation protection systems, communications, physical protection, instrumentation, emergency lighting and emergency ventilation)~~ shall be available in normal operational states and in ~~design basis~~ accident~~s~~ conditions ~~shall be included in the design basis. Considerations shall be given for provision of electrical power under design extension conditions~~.	The requirement should focus on the goal. See also comment on 6.200 DBA and DEC should be addressed.	X			
159.	6.198	The design shall ~~consider the provision of~~ provide uninterruptible power supplies for those safety systems that require a continuous energy supply ~~such as the reactor protection system, radiation monitoring etc~~ in operational states and in accident conditions.	It is a weak requirement… Examples are not needed. DBA and DEC should be addressed.		X consider DEC DBA		
160.	6.199	Delete 6.199	Redundant with 6.197	X			
161.	6.200 to 6.202	Replace 6.200 to 6.202 by : In the design basis for the emergency power supplyt, due account shall be taken of the postulated initiating events and the associated safety functions to be performed, to determine the requirements for capability, availability, duration of the required power supply, capacity and continuity.	For consistency with SSR-2/1 requirement 6.43	X			SSR-2/1 R6.43 revised
162.	6.203	Delete 6.203	Redundant with Requirement 26, 27 as well as 6.49, 6.52, 6.73. No equivalent requirement in SSR-2/1	X			
163.	6.204 to 6.207		Why are requirements different from the ones in SSR-2/1 (6.77 to 6.84) ?				More specific to the nature of RRs and subcritical assemblies
164.	6.204 (b)	Stationary dose rate meters to indicate the general radiation levels at suitable locations of the facility in anticipated operation occurrences, accident conditions ~~and as practicable, design extension conditions~~.	DEC are in accident conditions.	X			
165.	6.205	Delete 6.205	Redundant with 6.204 (b)	X			

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166.	6.206	Delete 6.206	Redundant with 6.204 (c), (f), (g) and (h)	X			
167.	6.207		Partially redundant with 6.204			X	requirement for off-site impact monitoring
168.	6.208	The design shall include provisions for <u>safely</u> storing a sufficient number of spent fuel elements and irradiated core components. These provisions shall be in accordance with the programmes for core management and for removing or replacing fuel elements and core components, ~~and shall be in compliance with the requirements established in para. 6.211 and the documented limiting conditions for safe operation and requirements for periodic testing as specified in the operational limits and conditions and outlined in the safety analysis report (see para. 7.39).~~	Clarification Redundant with requirements 6.211 and 7.39	X			
169.	6.210	Delete 6.210	Unclear (“extended period of time”) and weak (“where applicable”) requirement		X long term		Extended period of time changed to long term
170.	Rqt 59	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 <u>on discharges</u>.	Clarification	X			
171.	6.214	Delete 6.214	Redundant with Requirement 8 and 6.103		X such as decay systems kept		Clarification
172.	6.215	Delete 6.215	Redundant with 6.204	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
173.	Rqt 66	Experimental devices for a research reactor shall be designed so that they will not adversely affect the safety of the reactor in any operational states or accident condition. 6.### In particular, experimental devices shall be designed so that neither its operation nor their failure will result in an unacceptable change in reactivity for the reactor, will not affect operation of the reactor protection system, will not reduce the cooling capacity, will not compromise confinement or will not lead to an unacceptable radiation exposure.	Accident conditions are to be considered. An associated requirement would be better. All fundamental safety functions should be addressed.	X	X Accident conditions added		Combined to emphasise the importance of experimental devices in RRs
174.	6.277	Delete 6.277	Redundant with Requirement 66	X			
175.	6.228	Where necessary for the safety of the reactor and the safety of the experiment, the design shall provide appropriate monitoring of the parameters for experiments in the reactor control room ~~and shall include specific safety features, if necessary, for the reactor systems, for the experimental devices and for any other related facility, such as for bunkers that contain experimental devices with stored energy.~~	Unclear expectation ("specific safety features"). Examples would be more appropriate in a guide.	X			
176.	7.2	Delete 7.2	Too detailed			X	Beneficial for small OO
177.	7.3	Delete 7.3	Too detailed, requirement 67 and 7.1 are enough.			X	Clarifies reactor Mgr responsible for safety of RR
178.	7.4	Delete 7.4	Redundant with requirement 68			X	Clarity…
179.	7.5	Delete 7.5	Too detailed			X	Of benefit to the reader
180.	7.6	Delete 7.6	Redundant with requirement 84 and associated requirements	X			
181.	7.7	Transfer 7.7 to 7.53	Commissioning is addressed in 7.53	X			
182.	7.8		The purpose of the requirement should be lade explicit…			X	Part of the management system

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183.	7.9	Delete7.9	Obvious. The licensee should comply with regulations…			X	Not addressing compliance of licence
184.	7.10		This is a quite long list. Shortening it would be useful so that high level expectations are made clear.			X	The long list is unavoidable. Consistent with SSR-2/1
185.	7.13	Delete 7.13	Redundant with 7.10			X	Clarity
186.	Rqt 69	Delete Requirement 69	The requirement should not interfere with operating organization choices on who is responsible of what…			X	For RR it is important to define position of reactor manager – person directly responsible for safety
187.	7.14 to 7.26	Delete 7.14 to 7.26	No more overarching requirement. Furthermore, lots of redundancies with other requirements….			X	Detail appropriate for RR. Beneficial for small OOs without a NPP
188.	7.27	Delete 7.27	As written, it is not a requirement but a guidance…		X An advisory group shall be established...		Modified as requirement
189.	7.28	Delete 7.28	Redundant with requirement 67			X	Clarity. Beneficial for small OOs without a NPP
190.	7.30	Delete 7.30	Redundant with requirement 70			X	Clarity, Beneficial for small OOs without a NPP
191.	7.35	Delete 7.35	Redundant with Requirement 71	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
192.	7.36	Delete 7.36	Would be more appropriate in a guide. No equivalent requirement in SSR-2/2			X	Based on feedback from INSARR missions
193.	7.37	~~For many research reactors, the first and principal physical barrier is the cladding of the fuel material. For others, the principal physical barrier is the primary coolant boundary.~~	Explanation (not a requirement)	X			
194.	7.38	~~For each parameter for which a safety limit is required and for other important safety related parameters, there shall be a system that monitors the parameter and provides a signal that can be utilized in an automatic mode to prevent that parameter from exceeding the set limit. The point for this protective action that will provide the minimal acceptable safety margin is the safety system setting. This safety margin will allow for, among other things, behaviour in system transients, the equipment response time and inaccuracy of the measuring devices.~~ Safety system settings shall be defined so that safety limits are not exceeded.	7.38 is a design requirement, not an operationg requirement	X			
195.	7.39	Limiting conditions for safe operation ~~are conditions~~ shall be established to ensure that there are acceptable margins between normal operating values and the safety system settings. ~~The setting of limiting conditions for safe operations is aimed at avoiding the undesirably frequent actuation of safety systems.~~ 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.	Clarification	X			
196.	7.40	Requirements shall be established for the frequency and scope of inspection, periodic testing and maintenance, operability checks and calibrations of all items important to safety to ensure compliance with safety analysis report ~~system settings and limiting conditions for safe operation~~.	Current wording is recursive..	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
197.	7.41	Delete 7.41	Would be more appropriate for a guide as does not add much compared to 7.40			X	Acceptable deviation. Text from CAN added.
198.	7.43	In the event that the operation of the reactor deviates from one or more operational limits and conditions, corrective actions shall be taken ~~and the regulatory body shall be notified~~.	Event having to be notified to the regulator are defined by the regulator.	X			
199.	7.44 7.45	Replace 7.44 to 7.45 by SSR-2/2 4.13 to 4.15	No reason to have requirements different from SSR-2/2		X		Revised to be consistent with SSR-2/2 and comment from Germany. Plant replaced by research reactor.
200.	7.51	Delete 7.51	This is one mean to achieve requirement 7.49.			X	Review by safety committee
201.	7.55	Procedures shall be prepared, reviewed and approved for each commissioning ~~stage~~ test prior to the commencement of the test~~s~~ ~~for that stage~~. Commissioning activities shall be performed in accordance with approved written procedures. If necessary, the procedures shall include hold points for the notification and involvement of the safety committee, outside agencies, manufacturers and the regulatory body.	The requirement is mixing stages in commissioning and individual tests.	X			
202.	7.56	Delete 7.56	Redundant with management system requirements			X	Useful for small O.O.
203.	7.57	Delete 7.57	In principle, redundant with 7.55 and too much detailed (no equivalent in SSR-2/2)			X	Useful for small O.O.

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
204.	7.58	Delete 7.58	First part is obvious as operating organization is responsible for safety. Second part is dealt with by management system requirements on record keeping.			X	Useful for small O.O.
205.	Rqt 74	Operating procedures for research reactors shall be developed that apply comprehensively (for the reactor and its associated facilities) for normal operation, anticipated operational occurrences and accident conditions, ~~in accordance with the policy of the operating organization and the requirements of the regulatory body~~.	Supefluous.	X			
206.	7.60	Operating procedures shall be developed for all safety related operations that may be conducted over the entire lifetime of the facility, including: (a) Commissioning; (b) Operation in normal[42] operational states ~~and, where appropriate, the loading, unloading and movement within the reactor of fuel elements and assemblies or other core and reflector components, including experimental devices~~; ~~(c) The maintenance of major components or systems that could affect reactor safety;~~ ~~(d) Periodic inspections, calibrations and tests of systems, structures and components that are essential for the safe operation of the reactor;~~ ~~(e) Radiation protection activities;~~ ~~(f) The review and approval process for operation and maintenance and the conduct of irradiations and experiments that could affect reactor safety or the reactivity of the core;~~ (g) The reactor operator's response to anticipated operational occurrences and design basis accidents, and, to the extent feasible, to design extension conditions; ~~(h) Emergencies;~~[43] (i) Handling of radioactive waste and monitoring and control of radioactive releases; ~~(j) Maintenance, periodic testing and inspection, as required, of the reactor and its auxiliary systems during extended periods of shutdown of the reactor;~~ ~~(k) Utilization;~~ ~~(l) Modifications;~~ ~~(m) Activities of an administrative nature with a possible effect on safety (e.g. the control of visitors);~~ (n) The management system.	Simplification is needed as somehow redundant with requirement 72 and the ones on the management system		X retained Maintenance, periodic inspections and tests, utilization, modifications		Simplification, maintaining benefits for small OOs without a NPP

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
207.	7.61	Operating procedures shall be developed by the reactor operating personnel, in cooperation whenever possible with the designer and manufacturer and with other staff of the operating organization, including radiation protection staff. Operating procedures shall be consistent with and useful in the observance of the operational limits and conditions ~~and shall be prepared in accordance with a general quality assurance procedure that governs the format, development, review and control of such procedures. They shall be reviewed independently (e.g. by the safety committee) and they shall be subject to the approval of the reactor manager.~~	Obvious Review process is to be defined by the management system	X			
208.	Rqt 75		The design requirement don't require an "*operation* control room"		X operation deleted		
209.	7.65	The habitability and good condition of control rooms shall be maintained ~~as appropriate~~. Where the design of the research reactor foresees additional or local control rooms that are dedicated to the control of experiments that could affect the reactor conditions, clear communication lines shall be developed for ensuring an adequate transfer of information to the operators in the main control room.	Superfluous	X			
210.	7.67	Delete 7.67	This is a design requirement, not an operation requirement	X	X moved to design chapter		
211.	7.70	Maintenance <u>(both preventive and corrective)</u>, periodic testing and inspection, shall be conducted to ensure that systems, structures and components are able to function in accordance with the design intent ~~and with requirements,~~ in compliance with the operational limits and conditions ~~and in accordance with the long term safety of the reactor. In this context, the term 'maintenance' includes both preventive and corrective actions~~.	Clarification Superfluous. Long term safety should be addressed both by the design intent and OLC.	X			
212.	7.71	~~There shall be documented programmes based on the safety analysis report for the maintenance, periodic testing and inspection of the reactor equipment, especially of all items important to safety.~~	Already addressed in OLC (7.33 and 7.34)	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
213.	7.71	~~It shall be ensured by means of these programmes that the level of safety is not reduced during their execution.~~	Level of safety is reduced during preventive maintenance as it implies to put off-line equipment still available. However, work control should ensure that, by complying to OLC availability requirement, an adequate level of safety is still maintained.	X			
214.	7.71	7.## A system of work permits in accordance with the requirements of the integrated management system shall be used for maintenance, periodic testing and inspection, including appropriate checking off procedures before and after the conduct of the work. ~~These procedures shall include acceptance criteria. There shall be a clearly defined structure of review and approval for the performance of the work.~~	Make this a separate requirement Already addressed by requirement 72		X Not completely	 X	Acceptance criteria and review & approval are required. Clarity
215.	7.72	Delete 7.72	7.71 is not only addressing routine maintenance.			X	Elevates non-routine
216.	7.73	Delete 7.73	Work control is dealt with in 7.71. How responsibilities are discharged within a licencee is to be defined in the management system/OLC.			X	Need to be kept
217.	7.74	Delete 7.74	Redundant with 6.74-6.75. It may not be appropriate to reduce maintenance only on the basis of experience at the research reactor.			X	Not redundant. 624 & 25 address reliability, 7.74 address frequency
218.	7.76	Delete 7.76	Design change is not maintenance….			X	Kept for clarity
219.	7.77	Delete 7.77	Already addressed by requirement 72			X	Kept for clarity
220.	7.78	Delete 7.78	Too detailed for a requirement.			X	Kept for clarity

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
221.	7.79	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.~~	Content of OLC is defined in requirement 7.33			X	Need to highlight as fuel management is an important topic for RRs and subcritical assemblies
222.	7.80	Delete 7.80	Superfluous as the requirements of the management system applies…	X			
223.	7.81	~~Core management activities shall~~ To ensure safe operational cores, including by demonstrating conformance with the safety analysis report and OLC the operating organization shall~~. The basic activities for core management are the following~~:	Clarification	X			
224.	7.81 bullet list	(a) To determine, using validated methods and codes, the locations for fuel, reflectors, the appropriate positions of experimental devices and moderators in the core, the effectiveness of the safety devices (such as neutron absorbing rods, valves for dumping the moderator and burnable poisons), as well as the relevant thermal hydraulic and neutronic parameters ~~(normally validated by measurements) to show compliance with the operational limits and conditions~~. (#) ~~Additionally~~ the possible interaction between core components and with experimental devices (chemical or physical) shall be analysed;	Already addressed by suggested previous comment Make this requirement a separate bullet	X X			
225.	7.81 bullet list	Delete (c)	Redundant with 7.83			X	7-83 included scope 7-81 clarifies loading ??
226.	7.81 bullet list	Delete (d)	Redundant with requirements 78 and 83			X	Clarity for small O.O.
227.	7.82 (b)		It is unclear whether the requirement is about *a priori* analysis or *a posteriori* analysis…				a postereriori

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
228.	7.83	7.83. Procedures shall be prepared for the handling of fuel assemblies and core components to ensure their quality and safety and to avoid damage or degradation. In addition, operational limits and conditions shall be established and procedures shall be prepared for dealing with failures of fuel elements, control rods, reflectors/moderators, experimental devices or any other core components so as to minimize the amounts of radioactive products released. 7.## The integrity of the reactor core and the fuel shall be continuously monitored by a cladding failure detection system, not necessarily on-line. ~~If a failure of fuel or unusual contamination is detected, the reactor shall be shut down and the failed fuel or the origin of the contamination shall be identified, unloaded from the core and isolated.~~ Failed fuel shall be stored in a manner that prevents release of radioactive material while still maintaining the requisite of residual heat removal, shielding and subcriticality conditions.	Split 7.83 into 2 requirements Actions to be taken has to be defined in the OLC as shutting down the reactor may not be necessary depending on the level of unusual contamination….	X X			
229.	7.84	Delete 7.84	Superfluous as requirements on the transport of radioactive material apply.			X	Useful for small O.O with no NPPs.
230.	7.85		Consider transferring this paragraph in a guide…			X	See above

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
231.	7.86	The arrangements for ensuring fire safety made by the operating organization shall cover the following: adequate management for fire safety; preventing fires from starting; detecting and extinguishing quickly any fires that do start; preventing the spread of those fires that have not been extinguished ~~(e.g. fire zoning of the reactor facility, with adequate fire barriers between zones)~~; and providing protection from fire for structures, systems and components that are necessary to shut down the reactor safely. Such arrangements shall include, but are not limited to: (a) Application of the principle of defence in depth; (b) Control of combustible materials and ignition sources; (c) Maintenance, testing and inspection of fire protection measures; (d) Establishment of a manual firefighting capability at the reactor facility; ~~(e) Establishment of a site firefighting capability and associated response arrangements commensurate with the size, complexity and diversity of the site and the hazard potential of the reactor facility~~; (f) Assignment of responsibilities, and training and exercising of personnel; (g) Assessment of the impact of modifications on fire safety measures.	To make it consistent with requirement 5.21 of SSR-2/2	X			
232.	7.88	Replace 7.88 by <u>A comprehensive fire hazard analysis shall be developed for the research reactor and associated facilities and shall be periodically reviewed and, if necessary, updated.</u>	To make it consistent with requirement 5.22 of SSR-2/2	X			
233.	Rqt 81	The operating organization for a research reactor facility shall prepare emergency arrangements for ~~on site~~ preparedness for, and response to, a nuclear or radiological emergency.	To make it consistent with requirement 18 of SSR-2/	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
234.	7.90	~~Emergency arrangements shall be made for preparedness and response for a nuclear or radiological emergency in relation to the research reactor in accordance with Ref. [10].~~ The emergency arrangements shall be commensurate with the hazards assessed and the potential consequences of an emergency should it occur in relation to the research reactor. Emergency arrangements shall cover the capability of maintaining protection and safety in the event of an emergency, mitigating the consequences of ~~emergencies~~ accidents if they do occur; ~~maintaining protection and safety in the event of an emergency to include~~ protection of site personnel~~, emergency workers and~~ the public and protection~~, to the extent possible,~~ of ~~property and~~ the environment; and communicating with the public in a timely manner. Emergency arrangements shall include arrangements for the prompt declaration and notification of an emergency, timely initiation of coordinated and pre-planned response, assessment of the progress of the emergency, its consequences and any actions that need to be taken on the site and the necessary provision of information to the off-site authorities. Appropriate emergency arrangements shall be established by the time that nuclear fuel is first brought to the site, and the emergency arrangements shall be completed before the commencement of fuel loading.	To make it more consistent with requirement 5.2 of SSR-2/2	X			
235.	7.91	The operating organization shall develop emergency arrangements that include emergency plans and procedures for ~~on site~~ preparedness and response to an emergency in relation to the research reactor under its responsibility ~~and shall demonstrate to, and provide, the regulatory body with an assurance that emergency arrangements provide for an effective response on the site.~~ The on-site emergency arrangements shall be coordinated with those of off-site response organizations with responsibilities in emergency preparedness and response, as relevant (see Ref. [10]). ~~Emergency plans and procedures shall be based on the accidents analysed in the safety analysis report as well as those additionally postulated for the purposes of emergency preparedness and response on the basis of the hazard assessment.~~	Obvious This raises a question on why accident considered for EPR or not addressed in the safey assessment.			X on-site retained	O.O. may only be responsible for on-site preparedness. Off site may be others

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
236.	7.93	Exercises to test emergency arrangements shall be conducted at suitable intervals. ~~Exercises shall involve those positions and organizations relevant for responding to the emergency, as appropriate. The exercises shall be evaluated and the results shall be documented. The feedback obtained from the exercises shall be considered into any review and, as appropriate, revision of the emergency arrangements.~~ The emergency plan and procedures shall be periodically reviewed and shall be revised as necessary to ensure that feedback experience and other changes (e.g. contact details of emergency personnel) are incorporated.	Already addressed in DS456…	X			
237.	7.95	~~Such information includes site data and environmental data, design specifications, details of the equipment and material supplied, as built drawings, information on the cumulative effects of modifications, logbooks, operating and maintenance manuals and quality assurance documents.~~	Would better fit a guide	X			
238.	7.96	Delete 7.96	Already addressed in the management system requirements			X	Useful for small O.O.
239.	7.97	~~Records of non-compliance and the measures taken to return the research reactor to compliance shall be prepared and retained and shall be made available to the regulatory body.~~ The operating organization shall specify the records to be retained and their retention periods.	Already addressed in the management system requirements			X	Useful clarity for small O.O.
240.	7.98	The arrangements made for storing and maintaining records and reports shall be in accordance with the <u>management system</u> ~~quality assurance programme~~. The document management system shall be designed to ensure that obsolete documents are archived and that personnel use only the latest approved version of each document. ~~The off site storage (e.g. in the emergency control centre) of documents for access in an emergency shall be considered~~.	Clarification Already addressed in the previous sentence (and weak requirement).	X			
241.	Rqt 83		Why mixing in a single requirement utilization of the RR and modification to the RR ?			X	Consistent with SSG.24

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
242.	7.99	The operating organization shall have the overall responsibility for all safety aspects of the preparation and performance of a modification or experiment. It may assign or subcontract the execution of certain tasks to other organizations but it shall not delegate its responsibilities. ~~In particular, the operating organization shall be responsible for the management of the proposed utilization or modification project, in which the reactor manager shall participate according to established procedures and para. 7.104 of this document. For major projects this shall include the setting of the objectives and the structure of the project, the appointment of a project manager, the specification of responsibilities and the allocation of adequate resources. In addition, before the project commences, it shall establish and follow approved procedures for controlling utilization and modification projects.~~	Too detailed and redundant (7.104)	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
243.	7.100	The operating organization shall be responsible for ensuring the following: (a) Safety analyses of the proposed utilization or modification are conducted to ascertain whether all applicable safety requirements, and provisions have been satisfied; ~~(b) The approved categorization criteria are applied (see para. 7.101));~~ ~~(c) The relevant safety documentation (e.g. safety analysis report including the operational limits and conditions) of the reactor facility is followed;~~ (d) The relevant safety documentation for the experiment or modification are prepared and presented (submitted) to the appropriate approval authority; ~~(e) The associated requirements for review and approval are met. These may include the requirement to obtain the approval of the regulatory body before proceeding or the establishment of a formal licensing process;~~ (f) The disposition path of any materials irradiated in the experiment is defined and approved; ~~(g) 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~~; ~~(h) 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;~~ (i) 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 ~~and, if necessary, trained in advance in the effect of this modification or utilization on reactor operation and the safety characteristics of the reactor~~; (j) All documents affected by the experiment or modification that relate to the safety characteristics of the reactor, such as the safety analysis reports, the operational limits and conditions and the relevant procedures for operation, maintenance and emergencies, ~~shall be promptly~~ are updated as necessary, prior to the new utilization or to the commissioning of the modification.	Consider simplification so that key aspects are covered but not with the current level of detail	X			
244.	7.101		What is the purpose of categorization ?			X	Safety categorization of utilization and modifications
245.	7.102	Delete 7.102	Redundant with previous requirements			X	Consistentency with SSG-24

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
246.	7.103	Delete 7.103	Redundant with requirement 84			X	See above
247.	7.104	Delete 7.104	Too detailed and implicitly covered by 7.99	X			
248.	7.110	Delete 7.110	Already established in GSR part 3 Redundant with 7.116	X			
249.	7.111	Delete 7.111	Redundant with Requirement 8	X			
250.	7.112	Delete 7.112	Redundant with requirements from management system	X			
251.	7.113	Delete 7.113	Redundant with Requirement 8 and GSR part 3			X	For small O.O. without NPP
252.	7.117	Delete 7.117	Already established in GSR part 3			X	For small O.O. without NPP
253.	7.118	Delete 7.118	Already established in GSR part 3			X	For small O.O. without NPP
254.	7.119	Delete 7.119	Redundant with 7.121	X			
255.	7.120	The operating organization shall establish and implement a programme for the management of radioactive waste. 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 waste46. ~~Processing and storage of radioactive waste shall be strictly controlled in a manner consistent with the requirements for the predisposal management of radioactive waste [16].~~ Records shall be maintained for waste generation and waste classification, as well as for the processing, storage, and disposal of waste.	Redundant with already established requirements	X			
256.	7.121	The reactor and its experimental devices shall be operated to minimize the production of radioactive waste of all kinds, to ensure that releases of radioactive material to the environment are kept as low as reasonably achievable and to facilitate the handling and disposal of waste. ~~All activities concerning radioactive effluents and waste shall be conducted in accordance with the management system (see Footnote 14). Further requirements on the subject are established in Ref. [16].~~	Redundant with already established requirements	X			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
257.	7.123	Delete 7.123	Redundant with requirement 72			X	7.122 refers to gaseous effluents 7.123 reffers to liquid and solid radwaste
258.	7.126	Delete 7.126	Superfluous	X			
259.	Rqt 87	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.	Clarification	X			
260.	7.129	A research reactor facility may have a period of extended shutdown pending decisions on its future. ~~This period could be due to budgetary considerations or lack of utilization or equipment failure. While an extended shutdown may be planned, more often it will be unanticipated~~…	Superfluous	X			
261.	7.129	~~The following measures shall be considered:~~ ~~(a) Unloading the fuel elements from the reactor core to appropriate and safe storage conditions;~~ ~~(b) Changing the operational limits and conditions in accordance with the requirements for the shutdown reactor;~~ ~~(c) Removing components for protective storage;~~ ~~(d) Taking measures to prevent accelerated corrosion and ageing;~~ ~~(e) Retaining adequate staff in the facility for the purposes of performing the necessary maintenance, periodic testing and inspection.~~	A weak requirement ("shall consider") but quite detailed and addressed in a borader manner in 7.130			X	This is one of the most important RR safety issues worldwide
262.	7.131	Delete 7.131	No justification for such requirement (reducing the shutdown period) as safety is ensured. The second sentence is covered by requirement 87 and other requirements in DS476…			X	See above

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
263.	8.1	~~All operational activities at research reactors, including maintenance, periodic testing and inspection, modification and experiments, shall be conducted in a way that will facilitate their ultimate decommissioning.~~	Unrealistic requirement	X			
264.	8.1	~~Occurrences at the reactor over the transition period, if any, between operation and decommissioning (or over the extended shutdown periods, as applicable) shall be taken into account in updating the decommissioning plan.~~	Unclear requirement	X			
265.	8.2	~~The plan shall be submitted for review and approval by the safety committee and the regulatory body as appropriate before decommissioning activities are commenced.~~	Adressed in other Safety Standards establishing decommissioning requirements and guides			X	Special role of safety committee of RR
266.	8.2	8.# Documentation of the reactor shall be kept up to date and information on experience with the handling of contaminated or irradiated systems, structures and components in the maintenance or modification of the reactor shall be recorded to facilitate the planning of decommissioning.	Make it a separate requirement for clairity	X			
267.	8.3	Delete 8.3	Too detailed and addressed in other Safety Standards on decommissioning			X	Needed for small O.O. without NPP
268.	8.4	~~In developing the decommissioning plan, aspects of the reactor's design including those ones that are particularly challenging to facilitate decommissioning shall be reviewed. In addition, all aspects of the facility's operation that are important in relation to decommissioning shall be reviewed. These include any unintentional contamination whose cleanup has been deferred until the reactor's decommissioning, and any modifications that may not have been fully documented.~~	Would be more appropriate in a guide.	X			
269.	8.6	~~The responsibility of the operating organization shall be terminated only with the approval of the regulatory body.~~	Superfluous	X			
270.	/						

DS476 Safety of Research Reactors

COMMENTS BY REVIEWER Reviewer: Country/Organization: Republic of Korea / Korea Institute of Nuclear Safety Date: October 17, 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	5	5.13 The research reactor should be located in such a site that all the site characteristics important to the safety can be clearly evaluated. Inherent uncertainties of the data, methods, and results related with the site safety evaluation shall be clearly described.	Site characteristics should be clearly demonstrated in order to define the site suitability and to provide design parameters. Some sites may fail to provide a clear decision because of its inherent limitations, for example, lack of data, complex site phenomena, etc.			X	Agree site character import to safety shall be evaluated. But requirements should state what is to be evaluated. Redundant with 5.1 and 5.2. More suitable as guidance.
2	5	5.14 Records and activities related with the survey, experiments, safety evaluations, foundation excavation and monitoring for the research reactor site shall be managed in accordance with Quality assurance program.	Quality of the data, methods, and results related with the site feasibility analysis and site characterization should be guaranteed.			X	Records already covered by Management System and Req. 5.7
3	6.156/2	(Original text) This manual reactor trip signal shall be provided as an input to the reactor protection system. (Proposed new text) This manual reactor trip actuation shall minimize the number of discrete operator manipulations and	The manual reactor trip signal should bypass the path of automatic reactor trip signal, as far as possible.		X The manual reactor trip shall be able to shut down the reactor directly.		A sentence was added and the text was modified for further clarity.

		shall depend on the operation of a minimum of equipment. .					
4	6.182	(Original text) The reactor protection system 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 common cause failure (e.g. hardware failure or failure due to aging or human factors). (Proposed new text) The reactor protection system shall consider the potential for common cause failures. Sufficient independence and diversity shall be incorporated in I&C system to provide reasonable assurance that safety functions can be performed in the event of common cause failures of reactor protection system.	The requirement of 6.182 is too strict to apply in the design of reactor protection system. .			X	The proposed new text "reasonable assurance" is qualitative and not defined. This would lead to a weak requirement. Redundant common cause failures are covered in Requirement 26.
5	6.183	(Original text) All component of reactor protection system shall be capable of being functionally tested. (Proposed new text) The reactor protection system shall be designed to permit periodic	The function of reactor protection system should be tested periodically	X			

		testing of their functionality.					
6	§7.108	…for all operational states and design basis accident conditions…	In requirement 8, the design is for operational states and for design basis accident. So, to be consistent with requirement 8 and separate design basis accidents from all accidents including severe accidents.			X	Accident conditions include design basis
7	§7.111	For design basis accident conditions…	In requirement 8, the design is for operational states and for design basis accident. So, to be consistent with requirement 8 and separate design basis accidents from all accidents including severe accidents.			X	See above
8	§7.120	…Records shall be maintained for waste generation and waste classification, as well as for the processing, transport, storage, and disposal of radioactive waste.	Because the programme for the management of radioactive waste includes the transport, records shall also be maintained for transport of radioactive waste. The term 'radioactive waste' rather than 'waste' seems to be more appropriate.	X			
9	§7.123	… Written procedures shall be followed for the handling, collection, processing, transport, storage and disposal of radioactive waste. …	Because the programme for the management of radioactive waste includes the transport, procedure shall also be followed for transport of radioactive waste and it is consistent with the description in para. 7.120.	X			
10	§7.124	An appropriate record shall be kept of the quantities, types and characteristics of the radioactive waste stored and disposed of or removed from the reactor site. They shall also be reported periodically to the regulatory body or another competent authority in	The record for the quantities, types and characteristics of the radioactive waste stored and disposed of or removed from the reactor site as well as effluents released shall be reported to the regulatory			X	Valid comment; however, 7.123 covers requirements of regulatory body or competent authority

		accordance with its requirements.	body or another competent authority because it is important data and it should be also managed as part of a government-wide.				

DS476 **Safety Requirements: Safety of Research Reactors - Deadline for comments: 17 October 2014**

COMMENTS BY REVIEWER Reviewer: Finland all Committees …… Page.... of.... Country/Organization: STUK Date:16th October 2014				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	General	All the aspects of the research reactor have been collected into on document which makes it easier to get the overview. However this may diminish the role of thematic requirements documents in respect to the application to the research reactors.					
	General	The design section includes also requirements related to the operational life cycle phase. Design requirements related to operation should be clearly presented as design requirements.	clarity, Examples …..				
	General	The requirements document is expressed to deal with all life cycle phase of the research reactor the construction phase should be added to the document.				X	Out of scope of DPP
	General		clarity it is not clear what is meant by facility states or states of the facility in different contexts	X			Made consistent throughout the document.

			the use of the life cycle phase and facility state varies in the document examples, 6.6, 6.7, 6.8, 6.9, 6.171….	 X			clarified
	Req. 1.	**Safety analysis report for a research reactor facility** **<u>For the licensing of the research reactor facility the regulatory body shall require the operating organization to prepare a safety analysis report to provide a justification of the site and the design and a basis for the safe operation of the research reactor.</u>** **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.** **The safety analysis report shall be periodically updated over the reactor facility's operating lifetime to reflect modifications made to the facility and on the basis of the experience and in accordance with regulatory requirements.**	There is need for clarification. The Req. is a requirement for the operating organization. However the requirement is below the chapter Regulatory supervision for research reactor. The regulator should require a safety analysis report for the licensing process.			 X X	 It is clear in the current text that the RB shall require the O.O. to prepare a SAR and justify the safety of the reactor. Redundant. Technicall valid but it is clear in the current text that licensing is normally conducted in stages. Each stage shall be reviewed and authorized
	Para. 4.20	The effectiveness of the integrated management system shall be periodically <u>assessed through audits</u>[15] <u>and self-assessment.</u> Weaknesses in processes shall be identified and	The element of self-assessment should be included.	X			

		corrected. The operating organization shall evaluate the results of such audits and shall determine and implement the necessary actions for continuous improvements.					
	footnote 15	Independent assessments such as audits or surveillances are carried out to determine the extent to which the requirements for the management system are fulfilled, to evaluate the effectiveness of the management system and to identify opportunities for improvement. They can be conducted by or on behalf of the organization itself.	Delete the end of the sentence . for internal purposes., by interested parties such as customers and regulators (or by other persons on their behalf), or by independent external independent organizations. The internal auditing program should be self sufficient.			X	The current text is consistent with the glossary definition.
	Reg. 8	**Radiation protection for a research reactor facility21** **The design of a research reactor facility shall ensure that radiation doses to workers and other personnel at the <u>research reactor</u> facility and to members of the public do not exceed the established dose limits, and that they are kept as low as reasonably achievable for operational states and for <u>design basis conditions</u> for the entire lifetime of the <u>research reactor facility</u>.**	Clarity. The radiation dose to the workers and the public should be in separate requirements. The design conditions should be considered as appropriate.	X		X	**Facility changed to research reactor facility as suggested for clarity.** **Not clear – design basis conditions.**

	Par. 6.8		Clarity. The radiation dose to the workers and the public should be in separate requirements.			X	The text is clear as written.
	Req. 20, 21 and 23		The order of the requirements should be DBA, DEC and design limits			X	Not clear – Req. 23 is engineered safety features. If the intent is Req. 22, it is felt that the current sequence remains appropriate.
	Req. 23	**Engineered safety features for a research reactor** **Engineered safety features shall be provided for a research reactor to prevent, limit, or to mitigate the consequences of anticipated operational occurrences and design basis accidents and design expEngineered safety features for a research reactor** **Engineered safety features shall be provided for a research reactor to prevent, limit, or to mitigate the consequences of anticipated operational occurrences and design basis accidents <u>and extension conditions as appropriate.</u>**	add Also design features for DEC could be needed … **<u>and extension conditions as appropriate</u>**		X or to mitigate the consequences of accidents.		Text revised for further clarity.

	Req. 25	**Single failure criterion for a research reactor** **The single failure criterion for a research reactor shall be applied to each safety system incorporated in the design of the research reactor <u>and as appropriate to the provisions the design extension conditions</u>.**	Depending on the reactor size and type there might be need for the DEC features that fulfill single failure criteria..			X	Not consistent with SSR-2/1
	Req. 27	**Physical separation and independence of safety systems for a research reactor facility** **Interference between safety systems or between redundant elements of a system 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.**	The requirement needs to be clarified. interference between safety systems? redundant elements for a system ?			X	The current text is clear
	Req. 37	**Ageing management for a research reactor facility** **The design life of items important to safety at a research reactor facility shall be determined. 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 throughout their design life. <u>The life cycles of the</u>**	The replace ability of the systems and components due to obsolescence of the technology should be considered in the design.	X			Text revised.

		utilized technology and possible obsolesces of the technology shall be considered.					
	Req. 40	**Prevention of disruptive or adverse interactions between systems important to safety at a research reactor facility** **The potential for disruptive or adverse interactions between systems important to safety at a research reactor facility that might be required to operate simultaneously shall be evaluated, and effects of any disruptive or adverse interactions shall be prevented.**	req. 27			X	The comment and given reason given (Req 27) do not provide sufficient information on what change is required.
	Req. 42	**Buildings and structures for a research reactor facility** **The buildings and structures important to safety for a research reactor facility shall be designed to keep radiation levels and radioactive releases on and off the site as low as reasonably achievable and below authorized limits for all operational states, design basis accidents and, as far as practicable for design extension conditions.**	add: **as far as practicable for design extension conditions** **see Req. 25**		X		
	Req. 86	**Ageing management for a research reactor** **The operating organization for a research reactor facility shall ensure that an effective ageing management programme is implemented to manage the ageing of items important to safety so that the required safety functions of**	add **The obsolesce of the technology shall be considered.** Also the obsolescence should be considered.			X	Redundant with text added to Req. 37 See comment for Req 37 above

		systems, structures and components are fulfilled over the entire operating lifetime of the research reactor. The obsolesces of the technology shall be considered.					

Draft Specific Safety Requirements DS476 "Safety of Research Reactors" – Version September 2014
Status: STEP 7 – First review of the draft safety standard by the SSC(s)

	COMMENTS BY REVIEWER Reviewer: **Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)** (with comments of GRS and BfS) Page 1 of 67 Country/Organization: **Germany** Date: 2014-10-14				RESOLUTION			
Relevance	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1	General	There is still a large overlap in the following chapters of DS476 with other IAEA Safety Requirements publications: Chapter 3: GSR Part 1 Chapter 4: GS-R-3 / DS456 Chapter 5: NS-R-3 It is strongly recommended to avoid repletion of requirements formulated in other IAEA Safety Requirements for the following reasons: • DS476 becomes an unnecessary broad document by repeating requirements formulated elsewhere. A reference to the specific requirements is considered to be sufficient. • In case of revision of other IAEA requirements, inconsistencies within the IAEA Safety Standards Series publications will be unnecessarily introduced. • In most cases, no specific requirements dedicated to research reactors were identified.					There are no duplications in the requirements – specific requirements were included as needed. The text was developed to provide a link to the relevant GSRs
3	2	General	Citation of the references should be uniform in the whole text: Ref. […]. (Currently also ref. […] and […] are used.)		X			Citations will be unified
1	3	General	There are many definitions in this publication and some of them are newly implemented. However, their meaning may be confusing. Many definitions are very similar to each other and their differentiation is hardly possible. There are		X			Definitions will be added

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			also terms that differ from the definitions in the IAEA Safety Glossary (2007 Edition) and should be properly defined or referenced. The necessity for implementation of new terms should be reviewed and their definitions should be made clear and transparent. This concerns especially the following terms: 1. – Initiated events – Postulated initiated events – Internal and external hazards – Design basis accidents 2. – Long shutdown periods – Extended shutdown 3. – Safety analysis reports (their updates) – Periodic safety review					
3	4	1.3	2nd sentence: "… the potential hazards associated with the reactor by means of a graded approach (see paras 2.15–2.17~~18~~ and Ref. [2]), …"	Wrong paragraph is cited. Para 2.18 does not exist.	X			
2	5	1.4 / line 5	"… operation, utilization and modification, ~~and~~ decommissioning~~,~~ and management of radioactive waste."	Amendment for completeness.		X …and planning for decommissioning.		Decommissioning is out of scope for this document
3	6	1.12		It its appreciated that DS476 deals explicitly with the interfaces between safety and security.	X			
2	7	2.2	~~The fundamental safety objective is to protect people and the environment from harmful effects of~~	The fundamental safety objective is already cited in Para 2.1 and a			X	Retained for clarity

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			~~ionizing radiation.~~	reference is made to SF-1.				
1	8	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, as well as decommissioning ~~and closure~~.	Closure is term related to the disposal of radioactive waste. This requirement is specific for research reactors. It is proposed to delete the term "closure", because it is not linked to a research reactor and out of the scope of this Safety Guide.			X	This text describes the fundamental safety objective which applies to all facilities including RRs. The text is kept to maintain consistency with the SF-1
2	9	2.4	~~Fundamental Safety Principles (para. 2.3 of Ref. [1]) states that: "Ten safety principles have been formulated, on the basis of which safety requirements are developed and safety measures are to be implemented in order to achieve the fundamental safety objective. The safety principles form a set that is applicable in its entirety; although in practice different principles may be more or less important in relation to particular circumstances, the appropriate application of all relevant principles is required."~~	This is cited from the Safety Fundamentals SF-1 which are fully applicable to research reactors. This paragraph does not contain a specific requirement for research reactors. Avoiding citations and doubling of information will help to ensure consistency within the IAEA Safety Standards.			X	The text is retained as it is useful for readers, in particular small OO with no NPP
2	10	2.5	The requirements presented in this publication are derived from the fundamental safety objective of protecting people and the environment, and the related safety	This is cited from the Safety Fundamentals SF-1 which are fully applicable to research reactors. This para-			X	See above

			principles [1].: ~~Principle 1: Responsibility for safety~~ ~~The prime responsibility for safety must rest with the person or organization5 responsible for facilities and activities that give rise to radiation risks.~~ ~~Principle 2: Role of government~~ ~~An effective legal and governmental framework for safety, including an independent regulatory body, must be established and sustained.~~ ~~Principle 3: Leadership and management for safety~~ ~~Effective leadership and management for safety must be established and sustained in organizations concerned with, and facilities and activities that give rise to, radiation risks.~~ ~~5~~ ~~For research reactor facilities, this is the operating organization.~~ ~~6~~ ~~Principle 4: Justification of facilities and activities~~ ~~Facilities and activities that give rise to radiation risks must yield an overall benefit.~~ ~~Principle 5: Optimization of protection~~ ~~Protection must be optimized to provide the highest level of safety~~	graph does not contain a specific requirement for research reactors. Avoiding citations and doubling of information will help to ensure consistency within the IAEA Safety Standards.				

			~~that can reasonably be achieved.~~ ~~Principle 6: Limitation of risks to individuals~~ ~~Measures for controlling radiation risks must ensure that no individual bears an unacceptable risk of harm.~~ ~~Principle 7: Protection of present and future generations~~ ~~People and the environment, present and future, must be protected against radiation risks.~~ ~~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 existing or unregulated radiation risks~~ ~~Protective actions to reduce existing or unregulated radiation risks must be justified and optimized.~~ ~~The requirements derived from these~~ <u>These</u> principles must be applied to minimize and control the radiation risks to workers and other personnel, the public and the environment.					

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3	11	Before paragraph 2.6	RADIATION PROTECTION	Add a subheading here, because the following paragraphs deal with radiation protection principles.	X			
1	12	2.9	The safety philosophy that is followed to fulfil the objectives according to the principles stated in Ref. [1] relies on the defence in depth concept and on the adoption of measures for the management and verification of safety over the entire lifetime of the nuclear installation. The safety philosophy shall provide the means with which the organization supports individuals and groups to perform their tasks safely and successfully taking the interactions between man, technology and organizational aspects into account.	Completeness.		X the safety philosophy shall address the means .		Revised to "address" as a philosophy cannot "provide" the means. Comments from USA and Canada also addressed.
2	13	2.10, 2nd sentence	~~This concept is applied to all safety related activities, whether organizational, behavioural or design related, in any operational states or different shutdown states.~~ This concept is applied to all safety related activities in any operational states or different shutdown states. Technical means shall be implemented by design and supported by organizational and behavioural measures.	It is important, that defence in depth has to be implemented already in the design and technical means need to be implemented. Those means need to be supported by administrative, organizational measures, as well as by the behaviour of the staff.			X	Agree that DiD has to be implemented in Design, but it is applied equally in all activities, not initially in Design then supported by organizational & behavioural measures. (also, text on different shutdown states

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								deleted per comments from France)
2	14	2.11	Application of the concept of defence in depth throughout design and operation provides ~~a graded~~ protection against ~~a wide variety of~~ transients, anticipated operational occurrences and accidents, including those resulting from equipment failure or human action within the installation and events ~~that originate outside the installation~~induced by external hazards.	"graded" is not needed here, a more detailed explanation of the defence in depth follows in para 2.12. This will also avoid misinterpretation with the graded approach discussed later on. The phrase "a wide variety of" should be deleted. This formulation could imply that the concept needs not to be applied thoroughly.	X X			
2	15	2.12	Application of the concept of defence in depth in the design of the research reactor provides a series of five levels of defence (based on inherent features, equipment and procedures) that are aimed at preventing accidents, and ensuring adequate protection of people and the environment against harmful effects of radiation and mitigation of the consequences in the event that prevention of accidents fails. ~~The independent effectiveness of the different levels of defence is a nec-~~	Independence between levels of defence in depth is considered to be very important. Thus, it is proposed to put this requirement into an own paragraph (see e.g. addendum to SSR-2/1, Para 2.13a). Taking a graded approach into account is not a requirement. It is up to the designer/operator if a graded ap-			X	The graded approach is essential for RRs given the significant diversity and potential hazards. It is also a requirement in other GSR documents, including GSR-Part 1 and Part 3. Requirements doc. avoid "should" statements.

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			~~essary element of defence in depth (see para. 3.31 of Ref. [1]). However, the concept of defence in depth shall be applied with account taken of the graded approach.~~ A graded approach could be applied to the implementation of concept of defence in depth.	proach will be applied. Thus, it is proposed to avoid the "shall" formulation and use a "could" formulation instead.				
1	16	2.12, item (1)	The objective of the first level of defence is to prevent deviations from normal operation and the failure of items important to safety. This leads to the requirement that the nuclear installation shall be soundly and conservatively sited, designed, constructed, maintained and operated, in accordance with the management system and proven engineering practices, such as the application of redundancy, independence and diversity. To meet this objective, careful attention is paid to the selection of appropriate design codes and materials, and to control of the fabrication of components and control of the construction, commissioning, operation and maintenance of the research reactor. Protection measure against internal and external hazards shall be implemented as design provisions.	It is proposed to add a sentence to address, that measures to protect the plant shall be implemented as design provisions, which are usually assigned to the first level of defence in depth.			X	Redundant. Design Provisions are addressed in Sec 6, Req. 19. Internal and External Hazards
1	17	2.12, item	The radiological objective is to	Add one sentence with	X			

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		(3)	have no off-site radiological impact or only minor radiological impact.	a radiological objective for level 3 of defence in depth:				
	18	2.12, item (4)	The aim of the fourth level of defence is to mitigate the consequences of accidents that result from failure of the third level of defence in depth. Level four is aimed at preventing the escalation of the accident to a severe accident and mitigating the consequences of a severe accident. The radiological objective for prevention of severe accidents is to have no off-site radiological impact or only minor radiological impact. In case of a severe accident, the~~The~~ most important objective for this level is to ensure the confinement function to limit~~, thus ensuring that~~ radioactive releases ~~are kept as low as reasonably achievable~~so that the protection of people and environment is ensured by implementing protective measures limited in time and areas. Level four includes additional features which are necessary for the practical elimination of sequences possibly leading to significant radioactive release.	For research reactors, the same radiological objectives as for NPPs shall be applied. It is important to distinguish between preventive measures, e.g. by additional safety features, to prevent the escalation to severe accidents and measures to mitigate severe accidents. In the preventive area, the same radiological objectives as for level 3 of defence in depth shall be applied.			X	Agree on the aims of level four; however, the proposed text is too detailed for a requirements document and better suited to guidance.
1	19	New paragraph between 2.12 and 2.13	The independent effectiveness of the different levels of defence is an essential element of defence in depth at the plant and is achieved	It is proposed to emphasize independence of levels of defence in depth by adding a new			X	Redundant. Independent effectiveness covered in 2nd sentence of

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			by incorporating measures to avoid the failure of one level of defence causing the failure of other levels. Independence shall be implemented as far as practicable with a particular attention for levels three and four because of the enhanced severity of overall consequences if failures of these two levels occur simultaneously.	paragraph. Proposed wording taken from the addendum to SSR-2/1 (DS462).				2.12
2	20	2.15	Research reactors are used for special and varied purposes, such as research, training, education, radioisotope production, neutron radiography and material testing. These purposes call for different design features and different operational regimes. Design and operating characteristics of research reactors may vary significantly, since the use of experimental devices may affect the performance of reactors. In addition, research reactors have a need for flexibility in their use ~~requires a different approach to achieving and managing safety,~~ which could challenge nuclear safety.	For clarification: This paragraph is under the subheading "GRADED APPROACH". This approach is, for sure, not suitable to allow for flexibility. Moreover, flexibility is a kind of boundary condition challenging nuclear safety.			X	Flexibility in utilization, e.g., removing loops after test programs are no longer needed, requires a graded approach to account for lower hazard, and does not compromise safety or security.
1	21	New para between 2.16 and 2.25	Qualitative categorization of the facility should be performed on the basis of the potential risk of the research reactor. A more detailed description of the graded	It is proposed to add a new paragraph to insert the idea, that the risk potential should be taken into account		Qualitative categorization of the facility should be performed on the basis of the po-		Categorization added to 2.16 but references to lower level guidance Docs not recom-

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			approach can be found in Ref. [2].	for applying grading. A reference to SSG-22 should be inserted.		tential risk of the research reactor.		mend.
1	22	3.1	~~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 provides for the regulation of nuclear activities and for the clear assignment of responsibilities for safety in all stages in the lifetime of the facility. 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. The regulatory body is responsible for the establishment of regulations that results in a system of authorization8 for the regulatory control of nuclear activities and for the enforcement of the regulations. These principles are established in Section 3 (Principles 1, 2) of Ref. [1].~~	It is proposed to delete this sentence, because it is not specific for research reactors. The Reference in Para 3.2 to GSR Part 1 is considered to be sufficient for countries with small nuclear programmes. The content of this paragraph is fully covered by the following requirements in GSR Part 1: • **Requirement 2: Establishment of a framework for safety** The government shall establish and maintain an appropriate governmental, legal and regulatory framework for safety within which responsibilities are clearly allocated. • **Requirement 3: Establishment of a regulatory body** The government,			X	It is agreed that the requirements in GSR Part 1 apply. However it is important to include text in this section for MS with small nuclear programmes and no NPP

				through the legal system, shall establish and maintain a regulatory body, and shall confer on it the legal authority and provide it with the competence and the resources necessary to fulfil its statutory obligation for the regulatory control of facilities and activities. • **Requirement 5: Prime responsibility for safety** The government shall expressly assign the prime responsibility for safety to the person or organization responsible for a facility or an activity, and shall confer on the regulatory body the authority to require such persons or organizations to comply with stipulated regulatory requirements, as well as to demonstrate such compliance.				

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				• **Requirement 6: Compliance with regulations and responsibility for safety** The government shall stipulate that compliance with regulations and requirements established or adopted by the regulatory body does not relieve the person or organization responsible for a facility or an activity of its prime responsibility for safety. • **Requirement 23: Authorization of facilities and activities by the regulatory body** Authorization by the regulatory body, including specification of the conditions necessary for safety, shall be a prerequisite for all those facilities and activities that are not either explicitly				

				exempted or approved by means of a notification process. • **Requirement 30: Establishment of an enforcement policy** The regulatory body shall establish and implement an enforcement policy within the legal framework for responding to non-compliance by authorized parties with regulatory requirements or with any conditions specified in the authorization. • **Requirement 31: Requiring of corrective action by authorized parties** In the event that risks are identified, including risks unforeseen in the authorization process, the regulatory body shall require corrective actions to be taken by authorized				

				parties. • **Requirement 32: Regulations and guides** The regulatory body shall establish or adopt regulations and guides to specify the principles, requirements and associated criteria for safety upon which its regulatory judgements, decisions and actions are based.				
3	23	3.2	Last sentence: "… shall be used in the determination and implementation of adequate safety requirements (see paras 2.15–2.17~~18~~)."	Wrong paragraph is cited. Para 2.18 does not exist.	X			
1	24	3.3	~~The State shall establish and maintain an effectively independent regulatory body for the regulatory control of facilities and activities (Requirement 3 of Ref. [3]). To be effective, the regulatory body shall be provided with the statutory legal authority and resources necessary to ensure that it can discharge its responsibilities and fulfil its functions. This includes the authority to review and assess safety related infor-~~	It is proposed to delete this sentence, because it is not specific for research reactors. The Reference in Para 3.2 to GSR Part 1 is considered to be sufficient for countries with small nuclear programmes. The content of this paragraph is fully covered by the following require-			X	See above re comment 22.

			~~mation submitted by the operating organization during the authorization process and to apply the relevant regulations (e.g. by issuing, amending or revoking authorizations or their conditions), including carrying out compliance inspections and audits, taking enforcement action and providing other competent authorities and the public with information, as appropriate.~~	ments in GSR Part 1: • **Requirement 3: Establishment of a regulatory body** The government, through the legal system, shall establish and maintain a regulatory body, and shall confer on it the legal authority and provide it with the competence and the resources necessary to fulfil its statutory obligation for the regulatory control of facilities and activities. • **Requirement 4: Independence of the regulatory body** The government shall ensure that the regulatory body is effectively independent in its safety related decision making and that it has functional separation from entities having responsibilities or interests that				

				could unduly influence its decision making. • **Requirement 25: Review and assessment of information relevant to safety** The regulatory body shall review and assess relevant information -whether submitted by the authorized party or the vendor, compiled by the regulatory body, or obtained from elsewhere- to determine whether facilities and activities comply with regulatory requirements and the conditions specified in the authorization. This review and assessment of information shall be performed prior to authorization and again over the lifetime of the facility or the duration of the activity, as specified in regulations promulgated				

				by the regulatory body or in the authorization. • **Requirement 27: Inspection of facilities and activities** The regulatory body shall carry out inspections of facilities and activities to verify that the authorized party is in compliance with the regulatory requirements and with the conditions specified in the authorization.				
1	25	3.4	The authorization process is ongoing, starting at the site evaluation stage and continuing up to and including the decommissioning of the nuclear facility [3]. Details on the licensing process for nuclear installations can be found in [Reference to SSG-12] ~~The authorization process may vary among States but the major stages of the authorization process for nuclear research reactors shall include the:~~ ~~(a) Site evaluation;~~ ~~(b) Design;~~ ~~(c) Construction;~~ ~~(d) Commissioning;~~ ~~(e) Operation, including utiliza-~~	The first sentence is sufficient together with a reference to GSR Part 1 and a sentence referring to the Safety Guide SSG-12. Completeness.			X	See above Comment 22

			~~tion and modification[10];~~ ~~(f) Decommissioning;~~ ~~(g) Release from regulatory control.~~ A primary task of the regulatory body is to decide whether or not to approve the application for a licence within the framework of a licensing process on the basis of its review and assessment of the proposals submitted by the operating organization.					
1	26	3.5	~~In some cases, several stages may be authorized by a single licence, but conditions are attached to it to control the subsequent stages. Despite these differences between national practices, a detailed demonstration of safety in the form of safety analysis report which includes an adequate safety analysis shall be submitted by the operating organization to the regulatory body for review and assessment as part of the authorization process.~~	Notwithstanding the importance of the SAR during the authorization process is seen, this paragraph can be deleted, because it is required in detail in Requirement 1 and subsequent paragraphs.			X	Para is related to combining stages of a project authorized by a single license and clarifying the associated SAR requirements.
2	27	3.8	The safety analysis report shall include information to demonstrate compliance with ~~prescribe~~d in national legislation and requirements issued by the regulatory body. The level of detail of the information to be presented in the safety analysis report shall be determined using a graded approach considering the type,	Clarification: The safety analysis report shall document compliance with national regulations.	X			

			characteristics (its design, power and level of usage) and site of the reactor. For reactors with high power levels, the safety analysis report will usually require more detail in discussions such as those of reactor design and accident scenarios. For some reactors (e.g. low power reactors, critical or subcritical assemblies) the requirements for the safety analysis report content may be much less extensive. However, in all cases, the safety analysis report shall cover every topic in paras 3.6–3.7.					
2	28	3.10	A review and assessment of the information (usually in the form of a safety analysis report) submitted by the operating organization in support of its application for authorization shall be performed by the regulatory body. ~~The review and assessment shall determine whether the proposed research reactor facility can be sited, constructed, commissioned, operated, utilized, modified and decommissioned in compliance with the relevant regulations, objectives, principles and associated criteria for safety, and whether the radiological risks are as low as reasonably achievable to the personnel at the site, the~~	This paragraph is completely covered in more detail by Requirements 25 and 26 and subsequent paragraphs. A reference to GSR Part 1 seems to be adequate. The last sentence is added because it is directly linked to retrieve additional information for regulatory decision making. If adding the last sentence here, it could be deleted in Para 4.3.		<u>If required, the regulatory body may request additional information, depending on national practices.</u>		Further clarity and simplification.

			~~public and or environment. This review and assessment of the safety analysis report (and any supporting documents) shall be performed prior to authorization and again over the lifetime of the reactor facility in accordance with national requirements.~~ The specific objectives of the regulatory review and assessment are provided in Ref. [3]. The review and assessment shall be commensurate with the magnitude of the potential radiation risk associated with the reactor facility in accordance with a graded approach. Depending on the completeness and comprehensiveness of the submitted documents the regulatory body may request additional information, depending on the regulatory practices of the particular State.					
1	29	New paragraph before 3.11	The designated operating organization shall proactively exchange information with the regulatory body in an early phase of the research reactor project. Such pre-licensing discussions shall foster a mutual understanding of the regulatory requirements and its implications for the planned research reactor project.	Most research reactors are operated by universities or research institutes. Those organizations usually have no permanent licensing as available in operating organizations of NPPs. Thus, an early contact and exchange of information between appli-			X	Agree that early proactive communication is a good practice. However not appropriate to elevate this to a requirement for all RRs, better suited as guidance.

				cant and regulatory body will help to increase a mutual understanding of the project and expectations of the regulatory body. This will contribute to high level of nuclear safety.				
2	30	3.12	States shall develop their own approach to acceptance criteria depending upon their particular legal and regulatory infrastructures. Acceptance criteria based on principles for safe design and operation shall be made available to the operating organizations. In some states acceptance criteria are pre-scribed in national regulations for light water reactors. Such acceptance criteria need to be transposed to a specific research reactor project without losing the intentional safety objective.	It could be necessary, that acceptance criteria for NPPs (e.g. emergency core cooling criteria) have to be modified to be applicable to a specific research reactor project. It is important, that the intended safety objective is recognized and maintained by the adaption of such NPP specific acceptance criteria.			X	Current text meets this intent without referencing specific NPP technology, to remain technology neutral.
2	31	3.13, 3.14, and 3.15	3.13. The regulatory body shall inspect the research reactor to confirm compliance with regulatory requirements and with any conditions specified in the authorization as required in Ref. [3].	This paragraphs does not provide specific requirements for regulating research reactors, but repeating requirements from GSR Part 1. To ensure future consistency within the IAEA Safety Standards, the following paragraph is proposed			X	Text kept for the benefit of the reader and to provide a link to GSR-Part 1. The suggested text is similar to 3.14

				to replace Paras 3.13 to 3.15.				
2	32	Footnote No. 14 to Req. 4	"An integrated management system is a single coherent management system in which all ~~component parts~~ constituents of an organization are integrated to enable the organization's objectives to be achieved. Such constituents include the organizational structure, resources and organizational processes. This system integrates all elements of management including safety, health, environmental, security, quality and economic elements so that safety is not compromised."	Essential amendment taken from Para 1.5 of the Draft Safety Requirements DS456 "Leadership and Management for Safety" (revision of GS-R-3, version dated 13 July 2013) for the sake of clarification and completeness.	X			Remainder too
2	33	4.3	The operating organization shall submit to the regulatory body in a timely manner any information that it has requested. The operating organization shall be responsible for making arrangements with the vendors and suppliers to ensure the availability of any information that has been requested by the regulatory body. The operating organization shall also be responsible for informing the regulatory body of any additional new information on the research reactor and of any changes to information submitted previously. All information provided by the operating organization to the reg-	It is proposed to delete the sentence "The regulatory body may request …", because this sentence is more linked to the review of documents, specifically the SAR, and fits much better in Para 3.10.	X			

			ulatory body shall be complete and accurate. The format and content of documents submitted to the regulatory body by the operating organization in support of the authorization shall be based on the requirements presented in paras 3.6–3.9. ~~The regulatory body may request additional information, depending on the regulatory practices of the particular State.~~ The functions and responsibilities of the operating organization for ensuring safety in each of the above phases and activities are presented in Section 3 (see Requirement 1) and here in Section 4 as well as in the relevant paragraphs of Sections 5 through 9 of this publication.					
2	34	4.7 Last sentence	The extent of the detailed integrated management system that is required for a particular research reactor or experiment shall be governed by the potential hazard of the reactor and the experiment (see paras 2.15–2. 17~~18~~ on graded approach and Ref. [2]).	Add a reference to the Safety Guide SSG-22 in the brackets, because within SSG-22 the graded approach is elaborated in much more detail. Wrong paragraph is cited. Para 2.18 does not exist.	X X			
2	35	4.13	"The provisions of the integrated management system shall be based on four functional categories: management responsibility;	The functional categories mentioned in this paragraph reflect the present structure of	X			

			resource management; process implementation; and measurement, assessment, evaluation and improvement."	GS-R-3. Please note that the structuring of sections in the Draft Safety Requirements DS456 "Leadership and Management for Safety" (revision of GS-R-3, version dated 13 July 2013) deviates from the one established in GS-R-3. For ensuring consistency with Requirement 9 of DS456, the term 'evaluation' has to be added to the fourth functional category.				
1	36	Page 20 / Requirement 5	The adequacy of the design of the research reactor, including design tools and design inputs and outputs, shall be verified according to the management system by means of comprehensive deterministic safety assessment and complementary probabilistic analysis as appropriate and validated by independent verification by individuals or groups independent from those who originally performed the design work. The safety assessment shall be continued throughout all the stages of the reactor lifetime and shall be conducted in accordance with the potential magnitudes and na-	Completeness.	X			

			ture of the hazards associated with the particular facility or activity.					
1	37	4.26	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 national and international safety standards ~~regulatory requirements~~; or, if necessary, to update or make improvements. In such reviews, changes in the site characteristics, changes in the utilization programme, cumulative effects of ageing and modifications, changes to procedures, the use of feedback from operating experience and technical developments shall be considered. It shall be verified that selected systems, structures and components, and software comply with the design requirements and ensure safety until the next periodic safety review, or, where appropriate, until the end of planned operation. It shall be assessed to which extent the safety documentation, includ-	It is not only the objective of e.g. periodic safety review to demonstrate compliance with current national regulations, a PSR is usually much more comprehensive. Thus, the following objectives are stated in the Safety Guide SSG-25 and are in principle applicable to research reactors: • The adequacy and effectiveness of the arrangements and the structures, systems and components (equipment) that are in place to ensure plant safety until the next PSR or, where appropriate, until the end of planned operation (that is, if the nuclear power plant will cease operation before the next PSR is due);			X	Agree that a PSR is usually more comprehensive. However the proposed text is more suitable as Guidance.

			ing the licensing basis, remains valid. Specific requirements on these topics for research reactors are established in Section 7 (paras. 7.126 to 7.128). For further guidance on periodic safety reviews Ref. [add Ref. to SSG-25] shall be consulted and appropriately applied using a graded approach.	• The extent to which the plant conforms to current national and/or international safety standards and operating practices; • Safety improvements and timescales for their implementation; • The extent to which the safety documentation, including the licensing basis, remains valid. It is proposed to make a reference to the Safety Guide SSG-25, because currently no specific safety standard for PSR at research reactors exists.				
1	38	5.4	5.4. In the evaluation of the suitability of a site for a research reactor, the following aspects shall be considered: (…) (e) The capability for an ultimate heat sink at the site as appropriate.	Completeness.	X			
1	39	5.4	(f) The on-site and off-site emer-	Completeness.	X			

			gency plans aimed at mitigating the consequences for the public and the environment in the event of a substantial release of radioactive effluents to the environment.					
2	40	6.3	The achievement of a safe design requires that a close liaison be maintained between the reactor designer and the operating organization. The designer shall arrange for the orderly preparation, presentation and submission of design documents to the operating organization. ~~for use in~~ The operating organization shall be actively involved in the preparation of the safety analysis report to be familiarized with the technical details of research reactor or experimental facility.	To emphasize that the operating organisation is responsible for nuclear safety, including preparation of all necessary documents to be submitted for licence application. To clarify, that preparing the SAR will support the process of familiarization of the future operator with the technical details of the design to ensure a safe operation later on.			X	Agree that this is technically valid but this is more suitable as guidance.
1	41	6.5	The design of the research reactor facility shall consider the different modes of operation (e.g. operation on demand rather than continuous operation, pulsed operation of the research reactor, operation at different power levels, operation with different core configurations and operation with different nuclear fuels). In the design of the safety systems due consideration shall be given to the stability of the reactor at dif-	Pulsed operation is added, because it is an important mode of operation of a research reactor by sudden an rappid insertion of excess reactivity with an resulting power excursion, usually only controlled by an inherent design of the reactor core.		X Rather than continuous operation, pulsed operation, operation at different power levels...		Text also revised to be consistent with comments from other members to combine 6.4 and 6.5.

			ferent modes of operation.					
1,3	42	Requirement 7	~~Fundamental~~Main safety functions for a research reactor The design for a research reactor facility shall ensure the fulfilment of the following main ~~fundamental~~ safety functions for the research reactor for all states of the facility: (i) control of reactivity, (ii) removal of heat from the reactor, experimental facilities 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.	The term "fundamental safety functions" is deprecated and "main safety functions" is used instead, according to the IAEA Safety Glossary (2007 Edition). In research reactors, heat is not only produced in the reactor core and spent fuel, but also in experimental facility (e.g. beam converter, experimental loops containing test fuel elements, etc.). Therefore it is proposed to add experimental facilities in the heat removal function.		X Main safety functions for a research reactor The design for a research reactor facility shall ensure the fulfilment of the following main ~~fundamental~~ safety functions for the research reactor...		For consistency with other IAEA publications. Experimental facilities already covered.
3	43	6.6	A systematic approach shall be taken to identifying those items important to safety that are necessary to fulfil the main ~~fundamental~~ safety functions and defining the conditions and inherent features that contribute to or affect fulfilling, the main ~~fundamental~~ safety functions for all states of the facility.	The term "fundamental safety functions" is deprecated and "main safety functions" is used instead according to the IAEA Safety Glossary (2007 Edition).	X			
3	44	6.7	Means of monitoring the status of	The term "fundamen-	X			

			the reactor facility shall be provided for ensuring that the main ~~fundamental~~ safety functions are fulfilled for all states of the facility.	tal safety functions" is deprecated and "main safety functions" is used instead according to the IAEA Safety Glossary (2007 Edition).				
1	45	after 6.7	For research reactors, especially open pool type reactors, the accessibility and habitability of areas from which accident management measures have to be performed shall be ensured by design. Those places shall be well shielded or protected from high contamination levels to prevent excess of dose limits of workers performing accident management measures.	It is proposed to add a new paragraph to consider in the design, that dose rates in areas from which accident management measures have to be performed shall be sufficiently shielded or protected against contamination. This is especially important for open pool type reactors.			X	Redundant Design requirement 8 covers this, as well as 6.9
2	46	6.12	The design shall take due account of the results of deterministic safety analyses and as appropriate complementary probabilistic safety analyses ~~(if available)~~, to ensure that due consideration has been given to the prevention of accidents and to mitigation of the consequences of any accidents that do occur.	We are aware, that PSA for research reactors are not trivial and not performed in all states. However, same states already require PSA for research reactors and it has been demonstrated, that PSA is in principle possible for research reactors. For the above reasons, it is proposed to skip the bracket in order to promote PSA	X			

				for research reactors as a complementary safety analysis.				
2	47	6.13	6.13. 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. Especially samples and equipment exposed to high neutron flux densities shall be carefully taken into account. This includes also activation of air by intense neutron beams.	To add specific issues raising problems at research reactors. Sample containing isopotes easy to activate, or e.g. neutron mirrors containing a high Cobalt content.			X	Conflicts with other review comments to avoid examples. This is more suitable as guidance for utilization.
1	48	Add new paragraph after 6.13	The design shall take due account of the fact that the existence of multiple levels of defence is not a basis for continued operation in the absence of one level of defence. All levels of defence in depth shall be kept available at all times and any relaxations shall be justified for specific modes of operation.	It is important to address, that operation without all levels of defence in depth in proper conditions shall be prohibited or specific precautions shall be inplace. The proposed wording is taken from SSR-2/1, Para 4.10.			X	Not germane to all RRs.
3	49	Page 26 / 6.14 / line 1	The defence in depth concept (see paras 2.10 – 2.14) shall be applied to provide several levels of defence that are aimed at preventing consequences of accidents that could lead to harmful effects on people and the environment, and ensuring that appropriate measures are taken for the protec-	Corresponding reference will be helpful.	X			

			tion of people and the environment and for the mitigation of consequences in the event that prevention fails.					
2	50	6.15 (a)	Shall provide for successive verifiable physical barriers to prevent the release of radioactive material from the reactor. Examples of such barriers are ~~the fuel matrix,~~ the fuel cladding, the primary heat transport system~~, the pool~~ and the reactor building.	Barriers aim for the prevention of releases. Fuel cladding, primary heat transport system and reactor building (containment) are typically metallic barriers ensuring the containment of radioactive materials. In contrast, the fuel matrix and pool can only be considered as retention functions. Gaseous fissions products are usually leaking out of the fuel matrix. Also possible crack in the fuel matrix occurring during operation will further reduce the retention function.			X	Many RR fuels have a metal matrix which acts as a barrier to FP release.
3	51	6.15 (f)	Shall provide multiple means for ensuring that each of the main ~~fundamental~~ safety functions is performed, thereby ensuring the effectiveness of the barriers and mitigating the consequences of any failure or deviation from normal operation.	The term "fundamental safety functions" is deprecated and "main safety functions" is used instead according to the IAEA Safety Glossary (2007 Edition).	X			

3	52	6.17	"… preventing an escalation to accident conditions for all failures or deviations from normal operation that are likely to occur over the operating lifetime of the ~~nuclear~~ research reactor."	Wording. This Safety Requirements publication specifically deals with research reactors.	X			
3	53	6.18	To be deleted, see comment.	If the new paragraph proposed between 2.12 and 2.13 is inserted, Para 6.18 could be deleted. It is proposed to address the important issue of independence between levels of defence in depth at a more prominent place in DS476.			X	Overarching requirement 10 is DiD and it is appropriate to address associated DiD requirements in this section.
1	54	Page 28 / Requirement 11	To be deleted, see comment.	Requirement 11 and Requirement 90 are very similar. The only difference is, that in Requirement 90 safegurads are not addressed. It is proposed to modify Requirement 90 and add a new paragraph in Section 9 addressing the design issue (see our related comment on Para 9.7).			X	DPP calls for the interface between safety and security in Sec. 9. Design items for the interface with safeguards are in Sec. 6 to be consistent with the DPP.
2	55	6.19	The use of a graded approach (see paras 2.15 – 2.17) in the application of the safety requirements shall balance the stringency of	Corresponding reference will be helpful. If a certain require-		X Grading of requirements shall be justified and		Text also revised to address comments from other members

			requirements with the associated risk potential of the research reactor. Grading of requirements shall be justified and supported by safety analysis or engineering judgement. ~~not be considered as a means for waiving safety requirements and shall not result in compromising safety~~.	ment is not applicable due to the specific design or risk potential of a research reactor, it could be the case, that a requirement might be waived, i.e. graded to zero. In those cases a justification is necessary. It is proposed to rephrase Para 6.19 to clarify the idea of the graded approach to balance the stringency of requirements with the risk potential of the facility.		supported by analysis or engineering judgement.		
1	56	6.25	Acceptance criteria shall be established for operational states and for accident conditions ~~design basis accidents~~. 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. For the design of systems, structures and components, acceptance criteria may be used in the form of engineering design rules. These rules may include requirements in relevant codes and standards established in the State or internationally. The acceptance criteria shall	As for new research reactors it is expected to consider design extention conditions in the design, acceptance criteria are needed for all accident conditions (DBA + DEC) and should not be restricted to DBA.	X			

			be reviewed by the regulatory body.					
1	57	6.27	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 ~~agreed~~ granted an authorization (e.g. construction license). The responsibility for ensuring that the construction is in accordance with the design lies with the operating organization.	Only an agreement from the regulatory body is to weak. An authorization in form of a construction licence is necessary. At this point in time, the SAR shall demonstrate that the research reactor can be constructed and safe operation is ensured by the design.	X			
2	58	Requirement 16	Safety classification of systems structures and components for a research reactor facility[23] All items important to safety for a research reactor facility shall be identified and shall be classified on the basis of their safety function and their safety significance.	To clarify that safety functions are used for the classification. This will also increase consistency with the following Para 6.30 a) and also with the Safety Guide SSG-30.	X			
3	59	6.30	Add a footnote after "The method for classifying the safety significance of items important to safety…": Despite the Safety Guide SSG-30 "Classification of SSC for NPPs" is developed for NPPs, this document provides a guidance on safety classification method and is fully applicable to research reactors.	SSG-30 provides a very nice description of the method to classify SSCs. This method is in principle directly applicable to research reactors, too. It would be worthwhile to refer to this guide as no specific guidance for research			X	SSG-30 is NPP specific – (it is not fully applicable to RRs)

				reactors exists.				
2	60	6.32	Equipment that performs multiple functions shall be classified in a safety class that ~~is consistent with the most important function performed by the equipment~~ assigned to those function performed by the equipment having the highest safety significance..	To make clear, that in such cases the highest safety class shall be used based on the safety significance. It seems not to be clear, that the most important function is the function with the highest safety significance.	X			
1	61	Page 32 / Requirement 18	Postulated initiating events for a research reactor	Postulated initiating events should be clearly defined or referenced. See also our general remarks (comment No. 3).	X			
1	62	6.37	The postulated initiating events shall be identified on the basis of engineering judgement, operational experiences feedback and deterministic assessment complemented, where appropriate and available, by probabilistic methods.	Operational experiences feedback is a very powerful tool to identify PIEs. It shall be taken into account, e.g. analyzing events reported in the IRSRR database (Incident Reporting System for Research Reactors).	X			
2	63	6.40, item (3)	Following a postulated initiating event, the reactor would be rendered safe by the actuation of active items important to safety ~~safety systems~~ that need to be brought into operation in re-	In Para 6.40, a list of different means to cope with PIEs is formulated, in short: • Inherent safety features	X			

			sponse to the postulated initiating event.	• Passive features • Active features • Procedures. Safety systems are dedicated engineered safety features assigned on level 3 of defence in depth to control DBAs and prevent escalation to accident conditions on level 4 of defence in depth. This should not be mixed up.				
2	64	6.49 (c)	Prevent the spread of those fires that are not extinguished, and of fire induced explosions, thus minimizing their effects on the safety of the facility. Internal fires and explosion shall not challenge redundant trains of safety systems.	To clarify and emphasize that it is important, that redundant trains of safety systems are not affected by fires and explosions to ensure fundamental safety functions. The impact shall be limited to the affected redundancy.	X			
2	65	Footnote 24 in 6.50	This aspect is important in particular for critical and subcritical assemblies and dry fuel storage facilities.	To clarify, that water ingress in dry fuel storage challenges criticality safety. Criticality in wet storage is usually not an issue because in most research reactors wet storage is done stored	X			

				in pools (mostly directly in the reactor pool) without soluble neutron absorbers.				
3	66	6.53	The design basis for natural and human induced external events shall be determined. The events to be considered shall include those that have been identified in the site evaluation (see Section 5). ~~Consideration shall also be given to earthquake hazards, including the possibility of equipping the research reactor facility with seismic detection systems that actuate the automatic shutdown systems of the reactor if a specified threshold value is exceeded.~~	It is proposed to delete the last sentence because it is a very specific requirement for earthquake, whereas 6.53 is a more general requirement addressing all external events. A new paragraph after 6.54 is proposed to address the idea of the last sentence.	X			
3	67	New paragraph after 6.54	<u>The research reactor facility shall be equipped with seismic detection systems. In case of earthquakes exceeding specified thresholds, automatic reactor shutdown systems shall be actuated.</u>	Not to lose the idea of the last sentence of 6.53. First, a seismic detection system provides the operator with information on the earthquake in such a way, that specified measures can be initiated. Second, in case of an eathquake exceeding specified thresholds, a automatic reactor shutdown shall be triggered.	X			

2	68	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. ~~It may be necessary following design basis accidents for the operator to place the reactor in a stable long term state and to take actions to limit the release of radioactive material.~~ The design shall reduce demands on the operator as far as practicable, in particular during and following a design basis accident.	It is proposed to delete the second sentence, because it is in contradiction to Para 6.59 where it is stated, that no or only minor radiological impact is expected on site. Furthermore, in Para 6.58 it is required, that a safe state shall be achieved. According to the definition of the term 'safe state' (see page 114), subcriticality and fundamental safety functions have to be ensured for a long time.	X			Also, first sentence moved to 6.45 to address comment from France
2	69	6.61	The design basis accidents shall be analysed in a conservative manner. This approach involves ~~postulating certain failures in~~ the application of the single failure criterion (see Requirement 25) on safety systems, specifying design criteria and using conservative assumptions, models and input parameters in the analysis.	To clarify, that by applying the deterministic approach of the single failure criterion, the reliability of safety systems can be ensured.	X			
1	70	Page 37 / Requirement 22	Design extension conditions for a research reactor	Design extension conditions should be clearly defined or referenced. See also our general remarks (comment No. 3).	X			

2	71	Page 37 / Requirement 22	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, operational experience feedback, ~~and by using a graded approach,~~ deterministic assessments and complementary probabilistic assessments, if available. The design extension conditions shall be used to identify the additional accident scenarios to be addressed in the design and to plan practicable provisions for the prevention of such accidents or mitigation of their consequences if they do occur.	Operational experience feedback shall be taken into account, too. The necessity to refer the graded approach is not seen. A graded approach could be used in most cases. Exception are described in the Safety Guide SSG-22.		X Operation experience feedback is added.		The graded approach is an important concept and is retained for the benefit of readers.
2	72	Add new paragraph before 6.64	Design extension conditions comprises accident conditions with and without core melt. The main objective of design extension conditions without core melt	It seems to be important, that DEC comprises accidents conditions without (requiring preventive			X	Already covered – to keep consistency with SSR2/1

			is to prevent escalation to core melt conditions. In such cases no, or only minor, radiological consequences, on or off the site, shall be permissible and off-site emergency response actions shall not be necessary. Design extension conditions with core melt shall mitigate the consequence. The main objective is to practically eliminate large or early releases.	measures) and with (requiring mitigation measures) core melt. The main objectives of DECs without and with core melt are given.				
1	73	6.62	The design of subcritical assemblies shall include technical provisions to prevent inadvertent criticality conditions ~~(see para. 6.66.)~~.	See our related comment on Para 6.66.			X	See related comment on 6.66 below.
2	74	6.64	An analysis of design extension conditions shall be performed~~25 on the basis of a graded approach [2]~~ by means of a best estimate approach. More stringent approaches may be used according to States' requirements. 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	The analysis of DEC can be distinguished from those of analysing design basis accidents by applying best estimate methods with realistic boundary conditions. A graded approach is not an analysis method. The proposed text includes the text of footnote 25 to clarify on this point and addresses also concerns of those states, requiring more stringent analysis methods.		X An analysis of design extension conditions shall be performed[25] ~~on the basis of a graded approach [2]~~		Footnote retained.

			capability of safety systems to maintain the fundamental safety functions, especially the confinement function26. These additional safety features for design extension conditions, or this extension of the capability of safety systems, shall be such as to ensure the capability for managing accident conditions in which there is a significant amount of radioactive material confined in the facility (including radioactive material resulting from degradation of the reactor core). The reactor shall be designed so that the implementation of mitigation actions is facilitated.					
1	75	6.66	~~For subcritical facilities, criticality shall be considered as a design extension condition. To ensure subcriticality the design shall include inherent safety provisions such as usage of natural uranium or limited amounts of fissile materials, fixed fuel/moderator ratio. If no inherent safety provisions can be provided, mitigatory measures shall be determined and implemented on the basis of safety analysis.~~	It is proposed to delete Para 6.66 (see also our comments on Para 6.151) because it is not comprehensible why criticality is considered as a design extension conditions. Control of criticality is a fundamental safety function and as always to be ensured. In case of reactors (NPPs as well as RRs) events with an increase of reactivity are considered as DBAs. It much			X	It is agreed that control of criticality is a fundamental safety function. Since the assembly is subcritical by design, it seems reasonable to consider criticality as a credible DEC.

				more reasonable to provide sufficient reactivity control systems which can reliably bring the reactor in a safe state. If criticality has to be postulated, first safety systems have to be provided to bring the subcritical assembly into a safe state. If those shutdown system will not be functional in case of demand, cricticality can be considered as DEC. Furthermore, Para 6.66 is in contradiction to 6.62, where technical provisions are required in the requirement related to DBAs.				
2	76	6.68	The means of confinement shall be able to withstand extreme scenarios that result in unacceptable radiological release. These scenarios shall be selected using ~~a graded approach,~~ engineering judgement, deterministic analysis and from probabilistic safety assessments as appropriate.	A graded approach cannot be used to determine such scenarios. If such scenarios are identified, accident management measures have to be provided. Deterministic analysis is missing.		X These scenarios shall be selected using engineering judgement and input from probabilistic safety assessments as appropriate.		Text revised to be consistent with SSR-2/1 Req 5.30 and to address comments from Canada and France
2	77	6.69	The design shall be such that ~~the possibility of~~ conditions ~~arising~~	It is proposed to improve the wording of			X	The existing text is consistent with

			~~that could lead~~ leading to early or large radioactive releases[footnote] are practically eliminated.~~,~~ ~~if not protective~~ Protective measures ~~that are of~~ limited in terms of times and areas ~~of application shall be~~ shall be established for protection of the public, and sufficient time shall be made available to implement these measures in case of severe accidents which are not practically eliminated. [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 measures limited in terms of times and areas of application are insufficient to protect people and the environment."	Para 6.69 because it is difficult to understand in the way it is written. Accident conditions leading to early or large releases have to be practically eliminated. 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).				the latest revision of SSR-2/1 Para 5.31.
2	78	6.70	Where the results of ~~a graded approach,~~ engineering judgement, and deterministic safety assessments, complemented as appropriate by probabilistic safety assessments indicate that combinations of postulated initiating events could lead to accident conditions, such combinations of events shall be considered to be	A graded approach is not a safety analysis. Thus, a graded approach cannot lead to results indicating combinations of PIEs leading to accident conditions (DBA or DEC).	X			

			design basis accidents or shall be included as part of design extension conditions, depending mainly on their likelihood of occurrence. Certain events might be consequences of other events, such as a flood following an earthquake. Such consequential effects shall be considered to be part of the original postulated initiating event.					
3	79	6.71	2nd sentence: "Specific requirements on these systems and their supplementary features are established in paras 6.132–6.142~~143~~, 6.168–6.170."	Wrong paragraph is cited.	X			
1	80	6.73 (a)	Component reliability (including auxiliary and supporting systems necessary for operating the engineered safety features, see Requirement 60), system independence, redundancy, fail-safe characteristics, diversity and physical separation of redundant systems, preference of passive systems of active systems, functional separation of redundant safety systems.	Support systems and auxiliary systems necessary for operating the engineered safety features in case of demand shall have the same reliability as the engineered safety features itself. Passive systems shall have a preference over active systems. Functional separation (or segregration) is important to prevent negative impacts of one redundant train on other trains of the engineered safety fea-	X			

				tures.				
2	81	6.75	Maximum authorized unavailability limits for operation of the research reactor shall be established for items important to safety to ensure reliable performance of safety functions. <u>The unavailability limits shall be documented in the OLCs.</u>	It is important, that the authorized unavailability times have to be documented in the OLCs.	X			
1	82	Requirement 25	Single failure criterion for a research reactor The single failure criterion for a research reactor shall be applied to each <u>safety group</u> ~~safety system~~ incorporated in the design of the research reactor.	Despite the fact, that safety systems shall have the highest reliability, the application of the single failure criterion should not be limited to safety systems. It is proposed to use the term safety group instead. Consistency with SSR-2/1 would be ensured and the term is defined in the IAEA Safety Glossary (2007 Edition).	X	X .		Revised: safety group Also revised to account for comments from France
1	83	6.76	Spurious action shall be considered to be one mode of failure when applying the single failure criterion to a <u>safety group or</u> safety system.	Despite the fact, that safety systems shall have the highest reliability, the application of the single failure criterion should not be limited to safety systems. It is proposed to use the term safety group instead. Con-	X			

				sistency with SSR-2/1 would be ensured and the term is defined in the IAEA Safety Glossary (2007 Edition).				
1	84	6.77	The design shall take due account of the failure of a passive component, unless it has been justified in the single failure analysis with a high level of confidence that a failure of that component is very unlikely and that its function would remain unaffected by the postulated initiating event.	This paragraph is based on Para 5.40 in SSR-2/1 and is related to passive components. For active components, a single failure shall always be postulated, in accordance with the safety significance of the component.	X			
1	85	6.80	~~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.	X			

				According to the argument above it is proposed to delete this paragraph.				
2	86	6.97 (c)	"The predisposal management of radioactive waste, i.e. pretreatment, treatment, conditioning and storage of waste arising from operation and decommissioning of the reactor."	Clarification.	X			
2	87	Page 49 / Requirement 37	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. 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.		X			
2	88	Page 49 / 6.115 / line 1	6.115 Modifications and experimental devices shall be designed preserving the means of confinement and shielding of the reactor.	It is not clear, which kind of modifications are meant here: experimental devices or	X			This covers both modifications to the reactor and experimental de-

			Protection systems for experimental devices shall be designed to protect both the device and the reactor. A formal commissioning programme shall be established for experiments and modifications with major safety significance.	research reactors in general?				vices . Consistent with SSG-24
2	89	6.117	The design for a research reactor shall take due account of ageing and the effects of wear and tear in all operational states for which a component is credited, including testing, maintenance, operational states and accident conditions during and following a postulated initiating event.	To clarify, that items important to safety have to perform their intended function during not only in operational states, but also in accident conditions if designed to be actuated to control accident conditions.		X		
1	90	Page 49 / Requirement 38	Provision for long shutdown periods for a research reactor	Long shutdown periods should be clearly defined or referenced. See also our general remarks (comment No. 3).	X			Add definition or reference on pg 114
2	91	Page 50 / Requirement 41	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.	Clarification. Do critical assemblies also require probabilistic analysis?			X	PSA is not typically required for critical assemblies Text mentions “as appropriate”
2	92	Page 51 /	The scope of the safety analysis	Safety analysis should	X			

		6.125 / line 1	shall include: …	be clearly defined. See also our general remarks (comment No. 3).				
1	93	Page 51 / 6.125 (g)	(g) The analysis of the means of confinement ~~or containment~~.	According to the definition in the IAEA Safety Glossary: *Confinement* is closely related in meaning to *containment*, but *confinement* is typically used to refer to the *safety function* of preventing the 'escape' of *radioactive material*, whereas *containment* refers to the means for achieving that function.	X			
1	94	Add new paragraph between 6.130 and 6.131	<u>The buildings and structures important to protect items important to safety shall be designed to withstand the loads induced by internal and external hazards established for the design basis. Sufficient margins to withstand hazards exceeding the design basis shall be provided to prevent large and early releases.</u>	It is worthwhile to add a paragraph, that buidlings and structures shall withstand hazards. It is mandatory to withstand design basis hazards, but also to have a certain capability to withstand hazard exceeding the design basis, i.e. to prevent "cliff edge effects".			X	This is covered by 6.130, research reactor "facility" Redundant
2	95	6.132	Means of confinement shall be designed to ensure that a release	To emphasize, that-physical barriers are		Potential hazards	X	Not appropriate to change may to

			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~~ shall include physical barriers[FN] 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 design extension conditions. The barriers for confinement usually comprise the reactor building together with other items. The other items may be sumps and tanks for collecting and containing spills; an emergency ventilation system, usually with filtration; isolation devices on barrier penetrations; and a point of release which is usually elevated. [FN] Physical barriers are preferable metallic barriers. By applying a graded approach the number and type of barriers should be commensurate with the hazard potential of the research reactor.	an important element of the barrier concept, which is considered as part of the defence in depth concept. Thus, "may" should be replaced by "shall". A footnote is proposed to address research reactor specific issues.				shall as many small potential hazard (low power) reactors do not have metal barriers.
3	96	6.133	"The means of confinement shall	Editorial.	X			

			be designed for sufficient reliability to meet the requirements established in paras 6.68~~, 6.69 –~~ 6.71."					
3	97	6.135	"… including conditions arising from the external and internal events listed in ~~the~~ Appendix I, as relevant …"	Specification of the relevant Appendix A lists of selected postulated initiating events for research reactors is provided in Appendix I.	X			
2	98	6.136	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 hazards. The resistance of barriers in design extension conditions shall be analysed for determination of necessary mitigation measures.	Internal hazards considered in the design should not challenge the integrity of the barriers.	X			
1	99	6.144	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 or disposal."	Clarification. 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			X	More suited to guidance.

				also consider the requirements relating to the final step in the management of irradiated elements.				
3	100	6.149	"Wherever possible, the design of the reactor core shall make use of inherent safety characteristics to minimize the consequences of accident conditions ~~(those~~ that are produced by transients and instabilities~~)~~."	Wording.	X			
1	101	Add new paragraph after Para 6.150	Research reactors can be designed to be operated in pulsed mode. This can be achieved by rotating reflectors/moderators or by fast extraction of control elements. In case of mechanical moved reflectors/moderators the design it shall be practically eliminated, that the movable parts will stay in a position with a supercritical core. If fast extraction of control elements is used to create a short power excursion, adequate feedback mechanisms have to implemented in the design to prevent an uncontrolled power excursion.	Specific issues of pulsed reactors are not addressed in the design requirements for the reactor core. This can be done by quick extraction of control elements (e.g. pulsed TRIGA reactors) or mechanically moved parts (e.g. research reactor BR-2 in Dubna).			X	Suitable for guidance level and is technology specific.
1	102	Page 56 / Requirement 45 / Add new paragraph	It shall be demonstrated in the design that the reactivity control system will function properly under all operational states of the reactor and will maintain its reac-	Completeness. Additional request should be implemented focussing on the system itself.	X			

		before Para 6.151	tor shutdown capability under all design basis accidents also, including failures of the control system itself.					
2	103	6.152	The maximum rate of addition of positive reactivity allowed by the reactivity control system or 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.	This has to be documented in the OLCs, too.	X			
2	104	Page 56 / 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, and that the shutdown condition can be maintained for a long time even for the most reactive conditions of the reactor core with consideration to the single failure criterion.	The shutdown system has to ensure a safe state, i.e. to keep the reactor subcritical for a long time.	X			
1	105	6.158	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	Also in design extension conditions without core melt the reactor has to be reliably shut down and maintained subcritical.			X	Not consistent with SSR 2/1

			core melt, including failures of the control system itself.					
1	106	Page 58 / 6.167 / line 4	Design features (such as leak detection systems, appropriate interconnections and capabilities for isolation) and suitable redundancy and diversity shall be provided to fulfil the requirements of paras 6.74–6.85 with adequate reliability for each postulated initiating event. ~~Such measures also apply to subcritical assemblies~~.	Critical assemblies do not require cooling system. See also footnote 33 to the Requirement 47.			X	This conflicts with other members comments that some subcritical assemblies require cooling.
1	107	Add new paragraph after 6.176	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.	Interconnections of the I&C system of the reactor with I&C systems of experiments shall be strictly limited to the unavoidable amount.	X			
3	108	Page 60 / Requirement 50	Reactor protection system for a research reactor A protection system shall be provided for a research reactor to initiate automatic actions to actuate the safety systems necessary for achieving and maintaining a safe state ~~conditions~~.	The objective of the reactor protection system is to achieve and maintain a safe state. This term is defined in the glossary of this draft (see page 114).	X			
2	109	Page 60 / 6.179 / lines 2-5	6.179. The reactor protection system shall be designed in such a way that necessary protective	Completeness / Clarification.	X			

			actions, once initiated automatically by the reactor protection system proceed to completion ~~automatic actions, once initiated, cannot be impeded or prevented by manual actions~~ and that no manual actions are necessary within a short period of time following a protective action. ~~Protective actions, once initiated automatically by the reactor protection system, shall proceed to completion.~~ Such automatic actions by the reactor protection system shall not be self-resetting and a return to operation shall require deliberate operator action.					
1	110	Add new paragraph after 6.186	Interconnections between the reactor protection system and system to control experimental devices shall in general be prohibited. Exceptions shall only be permitted, if specific parameters of experimental devices are mandatory for the reactor protection system to.	Interconnections of reactor protection system with I&C systems of experiments shall be strictly limited to the unavoidable amount.			X	Redundant with 6.227 already addressed.
2	111	6.212	Handling and storage systems for irradiated fuel shall be designed to permit adequate heat removal and shielding in operational states, ~~and~~ accident conditions and in case of internal or external hazards.	Internal and external hazards (e.g. earthquakes) shall be considered, too.			X	Redundant accident conditions covers internal events and external hazards.
2	112	6.215 / line	"Suitable means of measuring	Clarification.	X			

		1	and monitoring <u>liquid and/or gaseous</u> discharges of radioactive effluents to the environment shall be provided in the design."					
2	113	6.216	1st sentence: "Means shall be provided in the design for the handling, ~~collecting,~~ processing, storage, removal from the site and disposal of radioactive waste."	According to the definitions provided in the IAEA Safety Glossary (2007 Edition), the term 'processing' includes 'pretreatment', 'treatment' and 'conditioning'. The term 'pretreatment' includes, inter alia, 'collection' (see also Para 6.34 of the Draft Safety Guide DS448 "Predisposal Management of Radioactive Waste from Nuclear Reactors", version September 2014).	X			
1	114	Page 69 / 6.223 / line 3	Non-combustible or fire retardant and heat resistant materials shall be used wherever practicable throughout the facility, in particular in locations such as the means of confinement ~~or containment~~ and the control rooms.	According to the definition in the IAEA Safety Glossary (2007 Edition): *Confinement* is closely related in meaning to *containment*, but *confinement* is typically used to refer to the *safety function* of preventing the 'escape' of *radioactive material*,	X			

				whereas *containment* refers to the means for achieving that function.				
3	115	Page 70 / Requirement 66	Experimental devices for a research reactor	Editorial. Experimental devices belong neither to supporting systems nor to auxiliary systems. Separate subtitle is required.	X			Subtitles will be added on the DPP
2	116	Page 73 / 7.9 (f)	(f) A system for reporting and reviewing ~~abnormal occurrences~~ events is established and operated;	Clarification. What is meant by abnormal occurrences? Are these the anticipated operational occurrences according to the plant states? Definition is required.	X			
2	117	7.10 (m)	An ~~appropriate~~ integrated management system (see footnote ~~13~~14) is established and implemented taking benefit from a graded approach (see paras 4.7–4.13);	To achieve consistency with Requirement 4, where an integrated management system is required. According to the hazard potential a graded approach will lead to an appropriate integrated management system. Footnote 13 deals with the meaning of senior management etc. Footnote 14 is on the	X			

				integrated management system. So it is assumed that footnote 14 should be cited.				
2	118	7.12	~~Documentation of the~~The organizational structure and ~~of~~ the arrangements for discharging responsibilities shall be documented in the safety analysis report and made available to the staff and~~, if required,~~ to the regulatory body. The structure of the operating organization shall be specified so that all roles that are critical for safe operation are specified and described. Proposed organizational changes to the structure and associated arrangements, which might be of importance to safety, shall be analysed in advance by the operating organization and submitted to the regulatory body for approval.	As the organizational structure is considered as part of the safety documentation. According to SSG20 it is part of the safety analysis report and should be described in Chapter 13 "Conduct of operation". As the safety analysis report has to be submitted to the regulatory body ", if required," can be deleted. Completeness.		X Text revised. "if required" is kept as some states may not require this.		
2	119	7.13	If a safety limit is exceeded~~not observed~~, the reactor shall be shut down and maintained in a safe condition and inspections on challenged items important to safety shall be performed. Under such circumstances, the regulatory body shall be promptly notified, an investigation of the cause shall be carried out by the operating organization and a report shall be submitted to the regulato-	To clarify it is proposed to exchange "not observed" by "exceeded". According to Para 7.37, safety limits are set to protect the integrity of the physical barriers. Consequently, when exceeding this safety limits, inspections have to be	X			

			ry body for assessment before the reactor is returned to operation.	performed to ensure the integrity of the barriers.				
3	120	7.21	1st sentence: "The operating personnel shall operate the facility in accordance with the approved operational limits and conditions and operating procedures (see paras 7.33~~29~~ – 7.36~~33~~ and 7.59–7.64)."	Wrong paragraphs are cited. Requirements on operational limits and conditions are established in Paras 7.33–7.36.	X			
1	121	Page 76 / 7.27	The safety committee advising the reactor manager (see para. 4.27) shall provide judgments on the safety issues submitted by the reactor manager. In particular, the safety committee shall review the adequacy and safety of proposed experiments and modifications and shall provide the reactor manager with recommendations for action. (See also paras 4.27 and 7.20.)	It should be formulated as a request not only as an information.			X	Redundant to Req 6 and per 7.27 – 7.28
1	122	7.55	Procedures shall be prepared, reviewed and approved for each commissioning stage prior to the commencement of tests for that stage. Commissioning activities shall be performed in accordance with approved written procedures. If necessary, the procedures shall include hold points for the notification and involvement of the safety committee, outside agencies~~,~~ and manufacturers ~~and~~	Commissioning is an important part of validating and verifying that the reactor as built is in compliance with the design documents submitted to the regulatory body to apply for a licence. Thus, it is in important task of the regulatory body to perform inspections		X …shall include hold points, in agreement with the regulatory body.		

			~~the regulatory body~~.The regulatory body shall determine hold points and witness points during the commissioning of a research reactor and define those as license conditions.	during the commissioning phase in order to verify that the research reactor is in accordance with the issued licence.				
2	123	7.60 (n)	The integrated management system.	To be consistent with Requirement 4.	X			
1	124	Add a new paragraph after 7.63	The operating procedures shall be made available to regulatory body. Safety relevant procedures shall be approved by the regulatory body.	At least parts of the content in the operating procedures are relevant for safety. Those should be approved by the regulatory body.			X	Req 74 clarifies that procedures are developed in accordance with the requirements of the regulatory body.
2	125	Page 84 / Requirement 75	Requirement 75: ~~Operation~~ Main control rooms, supplementary control room and control equipment for a research reactor facility The operating organization for a research reactor facility shall ensure that the operation control rooms and control equipment are maintained in a suitable condition.	To be consistent within IAEA Safety Standards Series publications, the term 'main control room' is proposed. For clarification, the supplementary control room is added to Requirement 75. The supplementary control room is also explicitly addressed in the following paragraph 7.66.	X			
1	126	7.66	The supplementary control room or a shutdown panel and all other safety related local control rooms or operational panels outside the control room shall be kept opera-	The supplementary control need to be provided with sufficient power supply to ensure accident instru-	X			

			ble and free from obstructions, as well as from non-essential material that would prevent their operation. The operating organization shall periodically confirm that the supplementary control room or shutdown panel and all other safety related operational panels are in the proper state of operational readiness, including proper documentation, communications and alarm systems as well as sufficient power supply.	mentation as well as the actuation of accident management measures.				
2	127	7.80	Core components and fuel loaded into the core shall comply with the quality requirements established by the integrated management system.	To achieve consistency with Requirement 4.	X			
2	128	7.85	A comprehensive record system shall be maintained in compliance with the integrated management system to cover core management and the handling and storage of fuel, and core components.	To achieve consistency with Requirement 4.	X			
2	129	Page 90 / 7.90 / lines 2-4	*"The emergency arrangements shall be commensurate with the hazards assessed and the potential consequences of an emergency should it occur in relation to the research reactor."* (…)	This sentence needs clarification.		X		Delete "*in relation to the research reactor."*
3	130	7.102	"Utilization and modification (including temporary modifications, see para. 7.105~~108~~) projects having major safety signifi-	Wrong paragraphs are cited. Temporary modifications are addressed in Para 7.105.	X			

			cance (see paras 3.13–3.20~~19~~ of Ref. [14]) shall be subject to safety analyses and to procedures for design, construction and commissioning that are equivalent to those described in paras 6.124~~121~~ and 6.125 for the reactor itself."	The objectives for the safety analysis of the research reactor design are elaborated in Para 6.124.				
3	131	7.121	1st sentence: "The reactor and its experimental devices shall be operated to minimize the generation ~~production~~ of radioactive waste of all kinds, …"	Modify wording for ensuring consistency with the terminology used in the Safety Requirements GSR Part 5 "Predisposal Management of Radioactive Waste".	X			
2	132	7.122 / line 1	"Releases of liquid and/or gaseous radioactive effluents to the environment shall be monitored …"	Clarification.	X			
2	133	7.123	1st sentence: "Written procedures shall be followed for the handling, ~~collection,~~ processing, storage and disposal of radioactive waste."	According to the definitions provided in the IAEA Safety Glossary (2007 Edition), the term 'processing' includes 'pretreatment', 'treatment' and 'conditioning'. The term 'pretreatment' includes, inter alia, 'collection' (see also Para 6.34 of the Draft Safety Guide DS448 "Predisposal Management of Radioactive Waste	X			

				from Nuclear Reactors", version September 2014).				
1	134	7.123 / line 3	"… requirements of the regulatory body or other competent authority of radioactive waste. <u>If radioactive waste is removed from the reactor site for disposal, waste acceptance criteria or requirements of the disposal facility shall be fulfilled.</u>"	The fulfillment of waste acceptance criteria or requirements is an essential prerequisite for the acceptance and emplacement of radioactive waste in a disposal facility.			X	Not clear – out of scope
2	135	Periodic safety review paras. 7.126, 7.127 and 7.128		The three paragraphs are not only related to ageing management. For sure, ageing management will be addressed in periodic safety reviews, but the scope is much broader. For that reason, it is proposed to delete paragraph 7.126 and move paragraphs 7.127 and 7.128 to Requirement 5 between paragraphs 4.26 and 4.27.			X	It is true that PSR is not only ageing management as stated in Par 7.126 (and for underlying requirements Req 5). Kept as an activity conducted during the operational life time of the RR. Inconsistent with the DPP.
3	136	Footnote No. 48 to Req. 87	"Research reactors in extended shutdown are those that are <u>no</u> ~~not~~ longer operating, …"	Editorial (orthography).	X			
2	137	8.1 / line 4	"The decommissioning plan shall <u>be considered in the design phase and</u> ~~be~~ updated in accordance with … changes in national poli-	Completeness.	X			

			cies for decommissioning and/or the management of radioactive waste (Ref. [9]). All operational activities …"	Clarification.				
2	138	Page 101 / 8.4 / line 2	8.4. In developing the decommissioning plan, aspects of the reactor's design including those ones that are particularly challenging to facilitate decommissioning shall be reviewed, e.g. the selection of materials to reduce activation and to facilitate decontamination, the installation of remote handling capabilities for the removal of activated or contaminated components and the incorporation of facilities for the processing of radioactive waste. In addition, all aspects of the facility's operation that are important in relation to decommissioning shall be reviewed.	Clarification.			X	Conflicts with other NUSSC members comments to avoid examples. More suitable as guidance.
3	139	8.5 / line 2	"Procedures for the handling, dismantling and disposal of experimental devices and other irradiated equipment that require storage and ~~eventual~~ subsequent disposal shall be established …"	Wording.			X	Eventual implies that the timing element shall be considered.
1	140	Page 103 / 9.7 / line 1	9.7. During the construction phase and major modifications of a research reactor, a large number and diversity of workers and other personnel entering the site is normal. In this regard, measures	Completeness.	X			

Relevanz: 1 – Essentials 2 – Clarification 3 – Wording/Editorial

			shall be implemented to prevent inadvertent or intentional introduction of weaknesses that could lead to a security breach or radiological releases during operation and utilization of the reactor.					
3	141	Ref. [17]	"… Objective and Essential Elements of a State's Nuclear Security Regime, Nuclear Security Fundamentals, IAEA Nuclear Security Series No. 20, IAEA, Vienna (2013)."	Citation of the correct title of NSS-20.	X			
3	142	Ref. [18]	"… Nuclear Security Recommendations on Physical Protection ~~on~~ of Nuclear Material and Nuclear Facilities (INFCIRC/225/REVISION 5), IAEA Nuclear Security Series No. 13, IAEA, Vienna (2011)."	Citation of the correct title of NSS-13.	X			
1	143	Appendix 1, I.1, item (5)	~~- Loss or reduction of proper shielding;~~	PIEs have the objective to analyse impacts on nuclear safety to identify and implement adequate safety features and to demonstrate that the research reactor can be brought to a safe state in case of accident conditions. This PIE does not show any relation to nuclear safety. It is more an issue to be addressed in the radia-			X	PIEs also cover radiation safety, which is the overall safety objective

				tion protection program. Monitoring the dose level at specific locations and equipping workers with dosimeters preferable with alarm function would be much more efficient.				
2	144	Appendix 1, I.1, items (6) and (7)		It is not clear whether internal and external hazards should be listed as postulated initiating events. The idea should be to protect the research reactor against such hazards. In a hazard assessment, possible PIEs induced by those hazards should be identified and later on analysed.			X	Not clear – it is not understood "later on analysed" in which time frame?

TITLE Japan Comments on DS476 "Safety of Research Reactors"

COMMENTS BY REVIEWER Reviewer: Country/Organization: Japan/NRA			Page 1 of Date: 17 Oct. 2014	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./reject.
1	General	All of aspects from site evaluation to decommission for research reactors are stated in one document. It may be very convenient for only users to read one document for research reactors. However, some of them are already written in general safety requirements such as in GS-R-3 and NS-R-3. There are many requirements and seems to be too overwritten. In addition to this, these general requirements are being revised as DS456, DS462 and DS484. Therefore, it will be difficult to revise several documents simultaneously, and it sometimes may cause some confliction or confusion among them. There are no description for regulatory body and management system in SSR-2/1. They are already stated in GSR part 1 and GS-R-3 (DS456) for general requirements. Again, although we discussed about this matter on the last CSS meeting, we recommend to state only essential items as referred to the above requirements, in particular, in chapter 2, 4 and 5.					The document was developed in accordance with the approved DPP and consistent with revisions of SSR2/1 8-2/2 Only essential items for RRs included in Chaps 2,4 & 5.
2	General	There are some duplication in chapter 4 and 7. It should be checked carefully for	Complicated and				

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	Chapter 4 and 7	such duplications sentence by sentence. For instance, requirement 2 and 67 seems to require the same for operating organizations.	superfluous.				Req. 2 covers responsibility for safety in all aspects over the lifetime of RR Req 26 is relevant for safety in operations only.
3	1.3	In view of the important differences between power reactors and research reactors and between the different types of research reactors including critical assemblies and subcritical assemblies, these requirements are to be applied in accordance with the potential hazards associated with the reactor by means of a graded approach (see paras 2.15–2.1718 and Ref. [2]), thereby ensuring safety in the design and operation of research reactors.	Be consisted with other paras. such as para. 1.6, "…, including critical and subcritical assemblies.".	X			
4	1.7, 2.6 and 2.16	Could be better to use the same terminologies such as "nuclear reactor" in para. 1.7, "research reactor facility" in para.2.6 and "power reactors" in para. 2.16. In addition to this, "plant", "nuclear installations" and also "research reactors" are used.	Clarification of terminologies.		X 1.7 "facility" deleted		The terminology use in 1.7, 2.6 and 2.16 is explained in the text. 1.7 clarifies that a research reactor is a nuclear reactor used for research. 2.16 contrasts hazards from a research reactor against those

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		Should be better to use "research reactors" here unless there are no specific differences.					from power reactors.
5	1.8 Last sentence.	Homogeneous reactors ~~and accelerator driven system are~~ is out of the scope of this publication.	Be consisted with SSG-22 para. 2.7(a).			X	The approved DPP does not include ADS.
6	2.10 – 2.14 CONCEPT OF DEFENCE IN DEPTH	All of the para. 2.10 through 2.14 should be the same as SSR-2/1 rev.1 except for related to research reactors. For instance; Para. 2.10 : … ~~in any operational states or different shutdown states~~ plant states. 2.12 (5) ~~emergency centre~~ emergency response facility	Be consisted with SSR-2/1 rev.1 as DS 462.		X Different shutdown states deleted Different operational states covers shutdown states		
7	2.12. (5)/L2	This requires the provision of an adequately equipped emergency centre and emergency plans and emergency procedures for on-site and ~~if needed,~~ off-site emergency response.	Superfluous. Already introduced "graded approach" in para. 2.12 1st para.			X	"if needed, off-site emergency response" kept, because depending on the level of hazards and design of the research reactor, off-site response may not be needed.
9	2.16.	…… ~~power reactors~~ nuclear power plants…	Better wording.	X			

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10	2.17.	(a) to (j) should be replaced to SSG-22 para. 2.7(a) to (k).	Be consisted with SSG-22 para. 2.7.			X	Covers same items. Text in Requirements doc not necessarily identical to text in guidance doc.
11	4.1.	Add "leadership" factor should be stated here.	Clarification. "Leadership" has already stated in para. 4.5 and 4.10.				Not clear where to add Leadership in 4.1?
12	4.4.	The safety policy established and implemented by the operating organization shall give safety the ~~utmost~~ highest priority, overriding all requirements or demands, including those of production and reactor users. The safety policy shall promote a strong safety culture, including a questioning attitude and a commitment to excellent performance in all activities important to safety	Better wording and be consisted with SF-1 para.312, stated as "This system has to integrate all elements of management so that requirements for safety are established and applied coherently with other requirements, including those for human performance, quality and security, and so that safety is not compromised by other requirements or demands.		X text revised to add highest priority But "overriding all requirements" is not included; it conflicts with "safety established and applied coherently with other requirements" in SF-1		

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No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./reject.
13	4.8.	The operating organization shall ensure through the establishment and use of an integrated management system that the research reactor is sited, designed, constructed, commissioned, operated and utilized (including the associated activities such as those mentioned in Appendix II), and modified and decommissioned, in a safe manner and within the limits and conditions that are specified in the operational limits and conditions and established in the authorization.	Clarification.			X	Redundant. Appendix II already includes modifications.
14	4.15 (b)	(b) …… as the ~~rector~~reactor personnel;	Editorial.	X			
15	4.19.	The integrated management system shall ensure that items and services under procurement meet established requirements and perform as specified. Suppliers shall be evaluated and selected on the basis of specified criteria. Requirements for reporting deviations from procurement specifications shall be specified in the procurement documents. Evidence that purchased items and services meet procurement specifications shall be made available for verification before the items are used or the services are provided.	Question. What does “on the basis of specified criteria” mean?	X			Criteria for supplier selection is specified as part of the bid process. (specified criteria, e.g., qualification, quality, etc). The successful supplier is selected on the basis of the specified criteria.
16	P.20	Safety assessment and periodic safety	Superfluous.	X			

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No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./reject.
	Requirement 5	~~re~~assessments for a research reactor					
17	4.24.	The safety assessments (and periodic ~~re~~assessments) shall be documented to facilitate evaluation.	Superfluous.			X	Clarifies requirement for documented periodic reassessment.
18	7.5	The staff positions that require a licence or certificate shall be determined according to the legal framework of the state. These positions shall receive adequate training as required by the regulatory body (see also paras 7.14–7.23). ~~In particular, the reactor manager, the shift supervisors and the reactor operators~~ Such positions shall hold an authorization (licence or certification) issued by the regulatory body or other competent authority.	Some member states have its own competent organization to approve licence or certification for the reactor manager etc.			X	This requirement does not restrict MS with its own competent organization to approve lic or cert. For research reactors it is important to clarify the authorization for the reactor manager, shift supervisor and reactor operator.
19	7.54	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. No test sequence shall proceed unless the required previous steps have been successfully completed. The commissioning programme shall therefore be divided into stages. ~~which are usually arranged according to the~~	Too detail and should be stated in safety guides.			X	Text retained for the benefit of small Operating Organizations without a NPP.

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No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./reject.
		~~following sequences:~~ ~~(a) Stage A: tests prior to fuel loading;~~ ~~(b) Stage B: fuel loading tests, initial criticality tests and low power tests;~~ ~~(c) Stage C: power ascension tests and power tests.~~					
20	7.67	~~A hierarchy of precedence shall be established between the supplementary and the main control rooms to prevent conflicting inputs (e.g. by interlocks) being given from different control rooms or panels.~~	Too detail and should be stated in safety guides.			X	It is important to highlight this at a requirements level.

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COMMENTS BY REVIEWER Reviewer: NNR Page..1.. of.... Country/Organization: SOUTH AFRICA Date:				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.10	End of paragraph should read: "…in any operational state or different shutdown states".	Grammar	X			
2	2.12 (1)	Last sentence should read: "….design codes and materials and to control the fabrication of components and construction,…".	Grammar	X			
3	2.12. (5)	Last sentence should read: "…adequately equipped emergency control centre and…."	Grammar	X			
4	2.13	First sentence should read: "…for a research reactor is to include in the design….."	Grammar	X			
5	2.17	Age of the reactor should also be considered as a factor.	There are many research reactors operating for many years.			X	This is correct but it is beneficial tto keep the list consistent with SSG-22
6	Section 4	Propose to add a section on Configuration Management	Configuration management has a critical role to play in the design and operational stages, as well as when any modifications, etc. are performed.			X	Configuration Management is a useful managenet tool, but it is not appropriate to add a specific section as a Requirement (better as guidance)

7	4.15	The first sentence should read: …”essential to the implementation of the organizational strategy and the achievement of…..”	Grammar	X			
8	4.15 (b)	Second last word must be: ….”reactor”	Spelling	X			
9	4.23	The first sentence should read: ….”Safety assessments for the facility shall be initiated at an early stage in the design process”	Grammar		X Text revised to meet intent		
10	5.4 (c)	This sentence should read:…”…characteristics in the vicinity of the site having relevance…	Grammar	X			
11	6.13	“…. and are categorized.”	The design shall also ensure that the waste generated can be categorised.	X			

Comments on IAEA document

DS476 Safety of Research Reactors DRAFT SPECIFIC SAFETY REQUIREMENTS (Draft September 2014)

COMMENTS BY REVIEWER Reviewer: Country/Organization: Ukraine/ State Scientific and Technical Centre for Nuclear and Radiation Safety Date: October 10.2014				**RESOLUTION**			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	**APPENDIX I** I.1. The following are selected postulated initiating events for research reactors: (2) Insertion of excess reactivity:	To modify the text: "Criticality during fuel handling and <u>loading</u> (caused by a mistake in fuel insertion)"	Bringing into compliance with the requirements of SSG-20 "Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report" for protecting people and the environment. Specific Safety Guide	X			
2	**APPENDIX I** I.1. The following are selected postulated initiating events for research reactors: (6) Special internal	To modify the text "Internal fires or explosions, <u>including internally generated missiles</u>" and add a new special internal event "Drop of heavy loads"	Bringing into compliance with the requirements of SSG-20 "Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report" for protecting people and the environment. Specific Safety Guide	X			

	events:						
3.	7.118.	All personnel who may be occupationally exposed to radiation at significant levels shall have their doses measured, assessed and recorded, as required by the regulatory body or other competent authorities, and these records shall be made available to the supervisor of the health surveillance programme, the reactor manager and the regulatory body and other competent authorities as designated in the national regulations [*updated reference*]	It is necessary to check the reference to [15], because the reference [15] was developed in accordance with the BSS-97, but now BSS-2011 is in force.	X			