Member States Comments on DS407

Criticality Safety

CONTENTS

TITLE: CRITICALITY SAFETY, DRAFT SAFETY GUIDE DS407

COMMENTS BY REVIEWER Reviewer: D. MERROUCHE Page 1 of 1 Country/Organization: CRNB/ ALGERIA Date: 2010- 03- 13				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.5 / page 5	Add a definition to **"criticality safety regime"**	This term is not defined both in the guide and in the IAEA safety glossary		Reference to regime deleted. Text now refers to exemption from complying with the criticality safety requirements.		
2	1.13 / page 9	Safety criteria based on the **critical value** of controlled parameters…	It is a safety criteria, so it should be clearly defined	Y			

TITLE: Draft Safety Guide Criticality Safety (DPP DS407)

COMMENTS BY REVIEWER Reviewer: R. M. Waldman Page 1 of 1 Country/Organization: Argentina / Nuclear Regulatory Authority Date: 2009-04-28				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1		Page 13 3.17 3rd Bullet "... *the safe geometry is sometimes derived by multiplying the critical* ***dimension*** *determined ...*"	In the text "... *the safe geometry is sometimes derived by multiplying the critical* ***geometry*** *determined ...*" the word ***geometry*** should be replaced by ***dimension*** or similar.	Y			
2		Page 18 3.40 2nd line 3.1 instead of "para. 3.1"		Y			
3		Add a new bullet Page 18 3.38 • Written operating procedures should be in the language spoken at the facility.	For the sake of easily understanding,		Written operating procedures should be in the language ~~spoken~~ **understood** at the facility.		
4		Page 29: last bullet at the end		Y			

COMMENTS BY REVIEWER Reviewer: R. M. Waldman Page 1 of 1 Country/Organization: Argentina / Nuclear Regulatory Authority Date: 2009-04-28				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		4.26 instead of “para. 4.26.”					

DS407: Criticality Safety

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: N. Hollasky and B. De Boeck			Page 1 of 2				
Country/Organization: Belgium/Bel V			Date:04/05/2010				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	5	Add a section on "Fresh fuel operation" or include fresh fuel in the section on spent fuel operation.	Operations with fresh fuel can also pose criticality concerns and should be explicitly covered.		Text addressing the handling and storage of fresh fuel added to the end of the section on fuel fabrication.		
2	5.26	Add the following sentence: "In line with the defense-in-depth concept, the presence of a soluble neutron absorber in the storage pond water should not be taken into account in the criticality safety demonstration".	As far as we know, this is the best practice of today.	Y			

ENISS COMMENTS on DS 407 (Draft 1)

COMMENTS BY REVIEWER Reviewer: Dr. Werner Zaiss Page 1 of 7 Country/Organization: ENISS Date: 21 April, 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
General comments		The guide is not in the new format, which links the guidance to relevant requirements (see SPESS chapter 3) – this editorial issue should be cleared before going into the state "comments from member states" (i.e. Safety Criteria's given in para 2.11-2.16 shall be linked to relevant requirements, like NS-R-5 para 6.43 to 6.51 and 9.52-9.53)			The philosophy in the approved version of SPESS (Version 1, Rev 1, 7 April 2010) applies to the future format of Safety Requirement documents, where each requirement will be allocated a specific requirement number. NS-R-5 does not conform to this new format; consequently, it is currently not possible for this safety guide to fully comply directly with		

COMMENTS BY REVIEWER Reviewer: Dr. Werner Zaiss Page 1 of 7 Country/Organization: ENISS Date: 21 April, 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
					SPESS.		
1	1.2	~~This Safety Guide establishes recommendations on how to ensure subcriticality in systems involving fissionable materials. It is intended to encompass all types of facilities and activities, except facilities that are designed to be critical, e.g. a nuclear reactor or a critical assembly.~~	Repetition, see 1.5, sentence 1 and 2	Y			
2	1.5	……and systems that have been exempted from the criticality safety regime. If applicable the recommendations of this guide should be applied for storage and transportation of fresh and spent fuel in NPPs. Recommendations encompass…..	For instance in section 5 CRITICALITY SAFETY SPECIFIC PRACTICES the paras 5.2 and 5.22 – 34 include recommendations to be applied in NPPs		Accepted. Text added as recommended. For completeness, reference to IAEA NS-G-2.5 "Core Management and Fuel handling for Nuclear Power Plants" has been added to section on spent fuel storage.		

COMMENTS BY REVIEWER Reviewer: Dr. Werner Zaiss Page 1 of 7 Country/Organization: ENISS Date: 21 April, 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
3	2.3	The processes which affect the neutron multiplication factor are often complex, nonlinear and contain competing effects. Also criticality safety is generally achieved through control of a limited set of macroscopic parameters, ~~which are~~ ~~such as~~ mass, volume, enrichment, concentration, moderation ~~moderator~~, geometry, reflection, interaction and neutron absorption ~~etc~~. A description of the neutron multiplication properties of a system based on these parameters alone is incomplete, and a full description would require the use of microscopic properties such as fission, capture, scatter, etc. For these reasons there are many examples of apparently 'anomalous' behaviour in fissionable systems where the neutron multiplication factor changes in ways that seem counter-intuitive.	The list of macroscopic parameter should be complete, as this is a safety guide.	Y			
4	2.4	~~It is recommended that criticality safety staff should be familiar with~~	Recommendations for staff to be familiar with		Accepted. Text added as		

COMMENTS BY REVIEWER Reviewer: Dr. Werner Zaiss Page 1 of 7 Country/Organization: ENISS Date: 21 April, 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		~~the contents of Ref. [9], which contains a~~ A detailed description of many of the most important 'anomalies' that have been observed in criticality safety is stated in Ref. [9]. Situations where criticality safety assessments may need to consider specific practices are given in Section 5.	certain non IAEA-Documents - like given here - seem not appropriate for a safety guide. Either include the relevant information here or change wording like suggested. Further remark: check, if this not IAEA-document is available for public, as via Google there is only Rev. 5 from 1979 available through a third party (not DOE!). The DOE webside does not provide a copy or a hint where to order it.		recommended. Reference to the "Anomalies of Criticality" document in the reference section has been amended and now refers to Rev 5 of the document which is publicly available. Reference to Rev 6 will be added when it is made publicly available.		
5	2.12	2.12. In ensuring criticality safety two types of criteria should be considered: • Safety criteria based on the value of keff (the neutron multiplication factor) for the system under analysis; • Safety criteria could be based on	In a safety guide "etc." should not be used, as a guide gives guidance and should be complete therefore (also see comment to para 2.3).	Y			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		controlled parameters such as mass, volume, enrichment, concentration, geometry, reflection, interaction, moderation and neutron absorption ~~etc~~.					
6	2.16.	In justifying the adequacy of a safety margin, a criticality safety assessment should demonstrate that sufficient and appropriate safety measures are in place to detect and intercept deviations from operational states and in design basis accidents before any critical value is breached or that design features are in place which effectively avoids any criticality. ~~As part of that demonstration, o~~Operational limits ~~set~~ at values sufficiently below the critical values should be applied, so that the safety measures can act in time to terminate the fault sequence and prevent a criticality accident.	In fuel pools or storage casks for used fuel criticality safety is designed into the layout. There is no detection and interception for criticality values. This should be mentioned here	Y			
7	3.1	The criticality safety measures important for ensuring sufficient subcriticality of systems processing,	The features of passive safety and fault tolerance are applied to achieve	Y			

COMMENTS BY REVIEWER Reviewer: Dr. Werner Zaiss Page 1 of 7 Country/Organization: ENISS Date: 21 April, 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		handling, transporting or storing fissionable materials should be based on the ~~following hierarchy: •~~ Defence in depth concept. Two vital parts of this concept are the features of ~~;•~~ Passive safety and ~~;•~~ Fault tolerance.	reliability and availability and are part of defence in depth. and are therefore part of this concept.				
8	3.4, Table "Overview of Defence in Depth", level 4	Address accidents in which the design basis of the system may be exceeded and to ensure that the radiological consequences of a criticality accident are kept as low as reasonably practicable.	To be in line with terms in other IAEA Safety Standards	Y			
9	3.5	The design of the facility or activity is such that the system will remain subcritical without the need for active engineered or operator based safety measures. This can be achieved by taking into account the following passive criticality factors: - mass, - volume, - enrichment, - concentration, - geometry,	Guidance should be given, what passive factors can be taken into account to ensure subciriticallity.			Y	Para 3.5 provides examples of passive safety.

COMMENTS BY REVIEWER Reviewer: Dr. Werner Zaiss Page 1 of 7 Country/Organization: ENISS Date: 21 April, 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		- moderation - reflection, - interaction with other materials and - neutron absorption ~~might be achieved for example, by using only very low enriched or natural uranium~~. ~~Alternatively, the facility or activity might be designed such that fissionable material is always restricted to containers which are geometrically safe.~~					
10	3.15, third bullet	the system's characteristics meet the recommendations of para 2.16~~6~~ so that each event can be detected (e.g. monitored) with suitable and reliable means within a timeframe that allows the necessary countermeasures to be taken.	Typing error	Y			
11	§3.16 – p.13 last bullet	~~**Shielding**~~ **Absorbing** between separate…	More appropriate term for criticality		Last bullet deleted as presence of neutron absorbers covered by 8th bullet		

COMMENTS BY REVIEWER Reviewer: Dr. Werner Zaiss Page 1 of 7 Country/Organization: ENISS Date: 21 April, 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
12	3.16	The safety measures used should ~~can~~ be related to the application of controlled parameters. Examples of the ~~These~~ controlled parameters are given below. ~~may be based on safe mass, safe geometry, safe concentration or controlled moderation, etc~~.	The safety measure "should" be related to controlled parameters and not only "can". For clarification and to avoid the use of etc.	Y			
13	3.35	3.35. The responsibilities of the criticality-safety staff should be at least~~, but are not limited:~~ • to provide documented safety assessments for fissionable material systems; • ...	For clarification	Y			
14	§4.25 – p.25 last bullet	…should be checked~~,~~ (i.e. elimination…..	Typographic mistake	Y			
15	5.65	To account for criticality safety during Decommissioning a graded approach should be applied to consider the type of facility and therefore the fissile inventory present. Generally this Guide shall be applied as long as fissile material in relevant amounts is handled, so	The fissile inventory as well as the risk potential are very different depending on the nuclear facility. Applying a graded approach respects that fact.		Text added as suggested. However, retaining original first para as one possible approach to		

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		that criticality safety needs to be considered (i.e. for NPPs as long as nuclear fuel is on site). In line with general requirements on decommissioning of facilities established in Ref. [5], the initial decommissioning plan for a facility should be developed and maintained throughout the lifetime of the facility. …. looking ahead to ensure that practices during the operating lifetime of the facility do not create avoidable problems during ~~the~~ decommissioning ~~phase~~.	To be in line with other directions under preparation DS 402, DS 403 and DS 404 Not necessary	Y Y	decommissioning.		
16	§5.73 – p.40 last bullet	*Delete* : ~~**temperature change**~~	Temperature hasn't direct effect on criticality, but is taken account in accidental tests define damages to the package.	Y			
17	**6**	PLANNED RESPONSE TO NUCLEAR CRITICALITY ACCIDENTS This section manly deals with	Insert the sentence between the headline and the first subchapter, as most of the recommendations are not		Comment accepted, following text added: "This section mainly		

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		emergency response in stationary nuclear installations. Guidance of transport safety can be found in Ref. [25].	made for transport:		deals with emergency response in stationary nuclear installations. Guidance on planning and preparing for an emergency response to a transport accident involving fissionable material can be found in Ref. [26]."		
18	7	Glossary	We recommend to include all needed Glossaries in the IAEA Safety Glossary and to only use these definitions in IAEA Safety Standards.		Noted. See footnote 3 for the strategy for dealing with definitions during the development of the document.		

DS407 Criticality Safety

COMMENTS BY REVIEWER **Reviewer: Mr. Moustafa Aziz** **Page.... of....** **Country/Organization: Atomic Energy Authority of Egypt** Date:				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	**Para 3.12 Page 12**	**The amount of neutron moderating , absorbing and reflecting material associated with the fissionable material present in the system**	**Present should be replaced by present**	Y			
2	**Para 3.15 page 13 First line**	**The system 's characteristics meet the recommendations of para 2.16**	**2.166 should be replaced by 2.16 (there is no para 2.166)**	Y			

DS407 CRITICALITY SAFETY, Draft 1

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.		Criticality Safety of Activities and Facilities Handling Fissionable Material	The nuclear reactors are outside the scope of the guide. That should be visible in the title.	Y			
2.	2.2	A criticality safety assessment should determine whether adequate defence in depth is provided, bearing in mind that the consequences of an unshielded criticality accident can be severe and often fatal for those in the immediate vicinity. Using the general usage of defence in depth, it should be noted that the application of the 4th level of defence in depth, which deals with beyond design basis accidents and the protection of the confinement system to limit radiological releases, may not be fully applicable to criticality safety. Therefore the probability of the 4th level accident should be extremely unlikely. However, mitigation of the radiological consequences of a	add Therefore the probability of the 4th level accident should be extremely unlikely. The protection at the 3th level should be efficient to prevent the accidents. due to the fact that there may not be additional barriers at the 4th level.	Y			

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		criticality accident, the 5th level of defence in depth, should be applied with consideration of the need for criticality detection and alarm systems and emergency arrangements.					
3.	2.8	Most criticality accidents have had multiple causes and there is therefore often a window of opportunity for faults to be identified by operators and supervisors and for unsafe conditions to be corrected before a criticality occurs. This highlights the importance of analysis, transferring and sharing the operation experience, operator training and of independent inspections.	add analysis, transferring and sharing the operation experience delete as part of a controlled management system. the importance of operating experience should be clearly presented. deletion of the end of the sentence makes the message stronger.	Y			
4.	2.9	Deviation from operational procedures and unforeseen changes in operations or conditions should be reported to management and promptly	add analysis of the operation of the organization and human error	Y			

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		investigated. The investigation should be performed to analyze the causes of the deviation and to identify corrective actions to prevent re-occurrences. The investigation should include analysis of the operation of the organization and human error, a review of the safety assessment and analyses that were previously performed including the safety measures that were established.	Human error has been the most common cause of the previous criticality accidents. The operation of the organization is important.				
5.	2.10	Useful information on the causes and consequences of previous criticality accidents is provided by Ref. [11]. The management system should include a means of incorporating lessons learned from operation experience, incidents and accidents to ensure the continuous improvement of operational practices and assessment methodology.	add operation experience, operation experience includes more than just incidents and accident	Y			
6.	3.4	reference 12 should be made to the new version of the NS-R-1	the new version of the requirements document is		Noted. Once the new version of		

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		O1. Normal operation, abnormal events and prevention of accidents - reducing the frequencies of abnormal events by enhancing plant capability to stay within normal operation. - reducing the potential for escalation to accident situations by enhancing plant capability to control abnormal events. O2. Accidents without core melt - ensuring that accidents without core melt15 induce16 no off-site radiological impact or only minor radiological impact (in particular, no necessity of iodine prophylaxis, sheltering nor evacuation17). - reducing, as far as reasonably achievable, o the core damage frequency taking into account all types of hazards and failures and combinations of events; o the releases of radioactive material from all sources.	going to CCS this year and will be published well before this safety guide The defence in depth concept should follow the WENRA design objectives of new reactors		NS-R-1 (DS414) has been approved by the CSS, this safety guide will be reviewed to ensure consistency.		

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
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		providing due consideration to siting and design to reduce the impact of all external hazards18 and malevolent acts. O3. Accidents with core melt reducing potential radioactive releases to the environment from accidents with core melt, also in the long term19, by following the qualitative criteria below: o accidents with core melt which would lead to early20 or large21 releases have to be practically eliminated22 ; o for accidents with core melt that have not been practically eliminated, design provisions have to be taken so that only limited protective measures in area and time are needed for the public (no permanent relocation, no need for emergency evacuation outside the immediate vicinity of the plant, limited sheltering, no long term restrictions in food consumption) and that sufficient					

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		time is available to implement these measures. O4. Independence between all levels of defence-in-depth - enhancing the effectiveness of the independence between all levels of defence-in-depth, in particular through diversity provisions (in addition to the strengthening of each of these levels separately as addressed in the previous three objectives) to provide, as far as reasonably achievable, an overall reinforcement of defence-in-depth. O5. Safety and security interfaces - ensuring that safety measures and security measures are designed and implemented in an integrated manner. Synergies between safety and security enhancements should be sought. O6. Radiation protection and waste management - reducing as far as reasonably achievable by design provisions, for all operating states,					

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		decommissioning and dismantling activities : o individual and collective doses for workers; o radioactive and non radioactive discharges to the environment; o quantity and activity of radioactive waste. O7. Management of safety ensuring effective management of safety from the design stage. This implies that the licensee: o establishes effective leadership and management of safety over the entire new plant project and has sufficient in house technical and financial resources to fulfil its prime responsibility in safety; o ensures that all other organizations involved in siting, design, construction, commissioning, operation and decommissioning of new reactors demonstrate awareness among the staff of the nuclear safety issues associated with					

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		their work and their role in ensuring safety.					
7.	3.7	The system design should follow the fail safe principle and the systems important to safety shall fulfil single failure criteria.	clear design requirement		Suggested text added to the end of para 3.7		
8.	3.9	The safety measures important for ensuring sufficient subcriticality should be identified and their required safety functions defined. The identification of safety functions should be based on an analysis of all fault sequences relevant to criticality safety arising from incidents and accidents. The analysis, includes initiating events, internal and external hazards, human errors or failure of structures, systems and components needed for safety in operational states and design basis accidents.	divide the last sentence into two sentences. add human errors to be analyzed		Reference to human error added, but retained current para structure.		
9.	3.10	Taking the physical and chemical characteristics of the fissionable material and the system into account, sufficient	the use of solely administrative safety measures is not acceptable	Y			

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		subcriticality can be ensured by technical, including engineered safety measures and administrative safety measures. Taking note of the lessons learned from incidents and criticality accidents, the safety measures should generally observe the following hierarchy: • Passive safety measures which do not rely on control systems, active engineered safety measures or human intervention; • Automatically initiated active engineered safety measures; • Active engineered safety measures that need to be manually brought into action in response to the fault; • Administrative safety measures; • Mitigation safety measures.					
10.	3.13	The design features and characteristics of the system should fulfill the single failure criterion. Any single failure or fault such as a component failure; a function control failure; a human error (e.g. instruction not	change observe to fulfill observing is not adequate move to be after 3.7		Reference to "Fulfill" added, however, para 3.13 deleted and text incorporated into para 3.7.		

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
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		followed); should not result in a criticality accident.					
11.	3.27	The use of administrative safety measures should include consideration of: • Specification and control of isotopic composition, fissionable content, mass, density, concentration, chemical composition, degree of moderation and spacing of fissionable material. • Determination and posting of criticality controlled areas and identification of the controlled parameters assigned to these areas: Identification, specification and, where applicable, labelling of materials (fissionable materials, moderating materials, neutron absorbing materials and neutron reflecting materials), specification and, where applicable, labelling of the controlled parameters and their associated limits on which	add: Quality assurance, periodical inspection (e.g. checks on continued safe geometries), maintenance collection, analysis and disseminating operating experience. collection, analysis and disseminating operating experience. ref. European clearinghouse on nuclear power plant operational experience feedback report Bruynooghe Ch: Report on incidents related to reactivity management. Example of the Shika-1 event on June 18th 1999 and Countries' Responses to the Event. EC JRC, IE Petten,	Y			

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		criticality safety depend. • Control of access to criticality controlled areas where fissionable materials are handled, processed or stored. • Separation between criticality controlled areas and separation of material positions within these controlled areas. • Movement of materials within and between criticality controlled areas, separation of moved materials to criticality controlled areas, spacing between moved and stored materials. • Transfer and control of fissionable materials between criticality controlled areas using different controlled parameters. Transfer and control of materials from areas without criticality safety control (e.g. waste water processing). • Usage of neutron absorbers: Control of continued presence, distribution and	REport posted at the IAEA/IRA web site, 2008. Procedures for managing and analysis of the design changes • Procedures for safety assessment and analysis • Ensuring the procedures are understood by the personnel and contractors working at the facility Managing the safety analysis and the design changes is important. A study of safety critical organizations has shown that the procedures may not be understood by the personnel or the contractors because their are written by the safety experts				

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		effectiveness. • Procedures for usage and control of ancillary systems and equipment (e.g. vacuum cleaners in criticality controlled areas, control of filter systems in waste air and off-gas systems). • Quality assurance, periodical inspection (e.g. checks on continued safe geometries), maintenance collection, analysis and disseminating operating experience. • Procedures in case of anticipated operational occurrences (e.g. deviations from operating procedures, unforeseen alterations in process or system conditions) relevant to criticality safety. • Procedures for preventing, detecting, stopping and containing leakages and removing leaked materials. • Procedures for fire fighting (e.g. use of hydrogen-free fire	• Classification of the systems, structures and components important to safety. Safety classification gives basis for the design, operation and management of the SSCs.				

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		extinguishing materials). • Procedures for managing and analysis of the design changes • Procedures for safety assessment and analysis • Ensuring the procedures are understood by the personnel and contractors working at the facility. • Identification of the safety functions and §Classification of the systems, structures and components important to safety					
12.	3.42	Implementation of the safety measures includes inspections, periodic surveillances, continuous or quasi-continuous measurement. Accordingly, quality assurance measures should be developed and implemented to maintain the reliability of the safety measures. Other factors, which influence the selection of safety measures, should be considered. These factors include: • the complexity of implementing	add operating experience	Y			

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		the safety measure; • the potential for common mode failure of the safety measures; • the reliability requirements for the set of safety measures; and • the ability of personnel to recognize abnormality or failure of the safety measure. • operating experience					
13.	4.17	The assessment should be performed utilizing a validated methodology. The assessment should provide the documented technical basis that demonstrates subcriticality during operational states including anticipated operational occurrences and design basis accidents and should consider all single failure faults. The criticality safety assessment should identify the safety measures, including any administrative safety measures, required to ensure subcriticality, it should specify their safety functions and determine their reliability,	add separation, system requirements separation is important part of defence in depth, also system requirements should be specified	Y			

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		redundancy, diversity, separation, system requirements and equipment qualification requirements.					
14.	5.6	For both types of facilities the different possible errors or failures should be taken into account. In laboratory/experimental processes the majority of errors are likely to be due to human error. In production facilities human error will contribute significantly to errors but hardware and process failures should also be taken into account. Operation of the organization, human and hardware errors should be studied as possible initiating events for criticality accidents.	add Operation of the organization, human and hardware errors should be studied as possible initiating events for criticality accidents. Operation of the organization should also be considered.	Y			
15.	5.63.	5.63. The fissile inventory of spent fuel mainly consists of the remaining uranium-235 and the plutonium-239 and -241 isotopes and it is significantly less than in unirradiated fuel. The fissile content of spent fuel somewhat decreases over time as plutonium-241 decays	The original text is too pessimistic and does not reflect the current practice		Your proposed text has been combined with that in para 5.63 to remove the pessimism.		

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		to americium-241 in time perspective of tens of years. Over time scale of tens of thousands of years plutonium-239 will decay to uranium-235 having a smaller fission cross section. On the other hand, the decay of samarium-151 will decrease neutron absorption in spent fuel in time scale of hundreds of years. If the criticality safety design of disposed waste packages are based on the assumption that the empty spaces of the package will be filled with groundwater and no burnup credit is adopted, the safety margin to criticality will be very high. Then degradation of the engineered structures in waste package with consequent recocation of the fissile components would not lead to a criticality accident. If burnup credit is adopted, the safety margin to criticality will be less and more sophisticated analyses and controls in waste packaging will be required. Notwithstanding the very low likelihood of criticality,					

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		assessments of criticality in a disposed waste package may be performed to show that the consequnces of such accident are acceptable low.					
16.	6.7	Despite all the precautions that are taken in the design and operation of nuclear fuel cycle facilities, there remains a possibility that a failure (i.e. I&C, electrical, mechanical or operational errors) or an incident may give rise to a criticality accident. In some cases, this may give rise to exposure or the release of radioactive materials within the facility and/or into the environment, which may necessitate emergency response actions. Such emergencies may include transport accidents. Adequate preparations should be established and maintained at local and national levels and, where agreed between States, at the international level to	add (i.e. I&C, electrical, mechanical or operational errors) the cause of accident can also be failure of falt in I&C or electrical system of component	Y			

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		respond to nuclear or radiological emergencies.					
17.		The design has to provide a diversity of communication systems to ensure reliability of communication under different plant states and conditions.	add requirement for a communication system after 6.9 t	Y			
18.	6.61	Uninterruptible power supplies should be available for criticality detection and alarm systems. Move after 6.62	delete portable system. It can not provide the automatic actions possible	Y			
19.	6.62	The design of the Criticality Detection and Alarm Systems should be single failure tolerant and as simple as is consistent with the objectives of ensuring reliable activation of the alarm and avoiding false alarms. reference should be made to general design criteria	add general design criteria should apply also to the alarm system It should be considered that all the requirements related to design are moved to chapter 3 dealing the design of the facility		Proposed text added to para 6.62.		
20.	6.71	The facility management should be given advance notice of testing the	the alarm system shall be always active , there		Proposed text added to para		

COMMENTS BY REVIEWER Reviewer: Marja-Leena Järvinen Page.... of.... Country/Organization: Finland, STUK Date: 11th May 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		subsystem of the alarm system.	should be a back-up system		6.71. The potential for the alarm system to be taken out of service is retained and reference to compensatory measures added (see also comment No 58 from France). The compensatory measure for such an unlikely event could be evacuation of the facility.		

TITLE : DS 407 - CRITICALITY SAFETY Draft 1

COMMENTS BY REVIEWER Reviewer: Page Country/Organization: France Date: 10/5/2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	2.2/8	Delete “criticality detection and alarm systems and”	Superfluous	Y			
2.	2.6/2nd bullet	Replace “supervisors” by “operators, supervisors and the plant management”	Criticality safety staff advise should be oriented to whoever needs to	Y			
3.	2.6/3rd bullet	Before “activities”, add “facilities or”	Modifications to facilities have also to be considered.	Y			
4.	2.7/1	Before “activities”, add “facilities and”	Facilities also have to be inspected	Y			
5.	2.7/2	Before “activities”, add “facilities and”	Modifications to facilities have also to be considered.	Y			

COMMENTS BY REVIEWER Reviewer: Country/Organization: France			Page Date: 10/5/2010	RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
6.	2.11		Why a priori limiting to DBA? What about BDBA. According to IAEA safety glossary, BDBA can are not limited to NPP…			Y	The criticality safety requirements established in the recent approved Safety Requirements document NS-R-5 "Safety of Nuclear Fuel Cycle Facilities" are only related to ensuring criticality safety in normal operation, anticipated operational occurrences and for design basis accidents. There is not a requirement to ensure criticality safety for beyond design basis accidents.

COMMENTS BY REVIEWER Reviewer: Page Country/Organization: France Date: 10/5/2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
7.	2.16/3		Same comment as 6. Why a priori limiting to DBA? What about BDBA. According to IAEA safety glossary, BDBA can are not limited to NPP…			Y	See response to comment 6 above.
8.	2.18/1	Before “amounts”, add “maximum”	Clarification	Y			
9.	3.8/2	After “lead” add “in principle”	To allow for the second sentence which considers less safe condition….			Y	Comment no longer relevant as the sentence was already modified by comment No 27 from Japan
10.	3.9/5	Replace “design basis accidents” by “accident conditions”	To be more consistent with IAEA safety glossary. See also comment 6.			Y	See response to comment 6 above
11.	3.15/5	…recommendations of para **2.16**…	Para 2.166 doesn’t exist	Y			
12.	3.30/2	Replace “implementing the criticality safety measures and for implementing” by “the implementation of the criticality safety measures and”	Alternate wording	Y			

COMMENTS BY REVIEWER Reviewer: Page Country/Organization: France Date: 10/5/2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
13.	3.30/3	Replace "Their authority and responsibility should be documented in the description of their functions and clearly reflected in the organizational diagram." By "Such authority and responsibililty should be documented in the licensee management system"	Too much detailed. Better to refer to the overall management system.	Y			
14.	3.31/5	Delete "The supervisors should also be identified in the organizational diagram."	Too much detailed.	Y			
15.	3.33/2	Before "culture", add "safety"	Clarification	Y			
16.	3.36	Delete 3.36	Too much detailed.	Y			
17.	3.38/4th bullet	Delete "include only the information required for operational and safety purposes;"	Why limiting a priori. There may be other information related to occupational safety or other matters related with the task…	Y			
18.	3.38/last bullet	At the end, add "and updated as necessary to take into account experience feedback"	Clarification		Agreed. Text incorporated into bullet.		
19.	3.39/1	After reviewed, add "according to the management system. As appropriate, it should include review"	To make link with the management system	Y			
20.	4.2/10	After "criteria", add ", if any,"	Clarification	Y			

COMMENTS BY REVIEWER Reviewer: Page Country/Organization: France Date: 10/5/2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
21.	4.3/7	Replace “and hardware” by “(hardware and software)”	Clarification	Y			
22.	4.4/5	Delete “This leads to a requirement to weigh criticality risks relative to risks from other hazards such as routine dose uptake or non-nuclear risks from handling/transport activities for example. In making these types of ‘risk-informed’ judgements it is important that the levels of conservatism incorporated into estimates of risk from the different hazards are broadly consistent. In these circumstances the more traditional deterministic approach to criticality assessment may need to be supplemented with a more realistic analysis of the type used in probabilistic assessment.”	Superfluous			Y	Retain text as it does relate to the practice in another Member State.
23.	4.7/3	Replace “design basis accidents” by “accident conditions”	To be more consistent with IAEA safety glossary. See also comment 6.			Y	See response to comment 6 above
24.	4.13/1	Replace “should be” by “is”	Typo	Y			

COMMENTS BY REVIEWER Reviewer: Page Country/Organization: France Date: 10/5/2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
25.	4.16/1	Replace "(i.e. incidents and accidents leading to anticipated operational occurrences and design basis accidents)." By "(conditions leading to anticipated operational occurrences or accident conditions)'	To be more consistent with IAEA safety glossary.			Y	The term "Conditions" is not defined in the IAEA Glossary, therefore leave text as is.
26.	4.27/2	Delete "design basis"	Why limiting a priori to design basis?			Y	See response to comment 6 above.
27.	4.27/1st bullet	Delete "This criterion, when applied to a fissionable material system, is such that a criticality accident cannot occur in the presence of any single fault (i.e. such as a component failure, a function control failure, a human error (e.g. instruction not followed) or an accident situation (fire for instance)." and refer to 3.13	To avoid redundancy within the guide. Furthermore, the SFC is defined in IAEA safety glossary	Y			

COMMENTS BY REVIEWER Reviewer: Country/Organization: France			Page Date: 10/5/2010	RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
28.	4.27/2nd bullet	Delete "The double contingency principle requires that fissionable material operations should include sufficient safety factors such that a criticality accident would not be possible unless at least two unlikely and independent concurrent changes occur in process conditions (e.g. mass, enrichment and isotopic proportions, geometry, concentration, density, moderation, reflection, neutron interaction, neutron absorbers, etc.)" and refer to 3.14	To avoid redundancy within the guide. Furthermore, the DRP is defined in IAEA safety glossary	Y			
29.	5.3/2	Delete "It should be decided if the facility is a laboratory/experimental facility or a production facility."	Superfluous	Y			
30.	5.4/1	Delete "For operational convenience a certain amount of flexibility is desirable. However"	Superfluous	Y			

COMMENTS BY REVIEWER Reviewer: Page Country/Organization: France Date: 10/5/2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
31.	5.5	Delete 5.5	Redundant with 5.4			Y	Para 5.5 deals with a different subject, i.e. the potential conflict between criticality safety and production pressures whilst para 5.4 deals with the provision of working procedures.
32.	5.6/2	Delete "In laboratory/experimental processes the majority of errors are likely to be due to human error. In production facilities human error will contribute significantly to errors but hardware and process failures should also be taken into account."	Superfluous Partially redundant with 5.3	Y			
33.	5.15/11	Powders may absorb moisture. **The maximum powder moisture content reached in contact with humid air should be taken into account in the criticality safety analysis. If necessary,** inert and dry glove box…	Such equipments are not used in UO_2 fuel fabrication units	Y			

COMMENTS BY REVIEWER Reviewer: Page Country/Organization: France Date: 10/5/2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
34.	5.40/4	…It is recommended **to limit if possible the use of soluble or fixed neutron absorbers,** and their use…	Soluble absorbers may be used for fuel dissolution and fixed absorbers for fuel storage and vessels containing plutonium solutions. "Exceptional circumstances" is a too strong expression.	Y			
35.	5.62/7	…construction risks etc.). **This involves therefore specific reflection about the optimization of the margins considered in the criticality safety analysis. If a global risk approach is used,** consideration should be given…	Other hazards have not to be increased in consequence of too large margins. Therefore these margins have to be optimized but without leading to the degradation of criticality safety.	Y			
36.	5.62/9	Delete "This may be achieved through the use of risk-informed assessment methods, where both the likelihood and consequences of a potential hazard are considered. Note that this approach may also be applied to assessment of post-closure criticality safety."	Superfluous	Y			
37.	5.63/10	Replace "may be based on risk-informed methods, where the aim should be to" by "should"	No need to mention risk-informed methods.	Y			

COMMENTS BY REVIEWER Reviewer: Page Country/Organization: France Date: 10/5/2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
38.	5.68/4	Delete "which does not allow risk-informed judgements."	Superfluous	Y			
39.	5.69	Delete 5.79	Superfluous as already covered by 5.67.		I understand that 5.79 should read 5.69, therefore para 5.69 has been deleted.		
40.	5.70	Delete 5.70	Superfluous as already covered by 5.67.	Y			
41.	5.74	Delete 5.74	Superfluous as already covered by 5.67.	Y			
42.	5.81/2	Replace "sensitized (i.e. educated and trained)" by appropriately educated and trained"	Alternate wording	Y			
43.	Title before 6.1	Replace "CAUSES AND CONSEQUENCES OF A NUCLEAR CRITICALITY ACCIDENT" by "PAST NUCLEAR CRITICALITY ACCIDENTS"	To be consistent with 6.3			Y	Keep the existing title as the section contains more than just a review of past events.
44.	6.1	Locate 6.1 after 6.9	More logical order			Y	Retain position as it is an introduction to the section.
45.	6.1/2	Delete "failures leading to"	Superfluous	Y			
46.	6.1/5	At the end, add "Once personnel has evacuated, bringing back subcriticality should be sought"	See 6.23			Y	Superfluous, covered by 6.23.

COMMENTS BY REVIEWER Reviewer: Country/Organization: France			Page Date: 10/5/2010	RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
47.	6.2	Locate 6.2 after 6.9 (and relocated 6.2)	More logical order	Y			
48.	6.13	Replace “approved by management” by “established and approved according to the management system”	To make clearer link with the management system	Y			
49.	6.18	Replace “Criticality safety staff should be competent to conduct” by “The licensee should be able to conduct or to have external experts conduct”	Dosimetric calculation may involve knowledge and (computer) tools not available within the licensee	Y			
50.	6.19/3	Delete “This evaluation may be based on professional judgment or a more detailed analysis.”	Superfluous	Y			
51.	6.19	Add: thinking should also be carried out to define measures for an easier intervention in order to stop a possible criticality accident	Availability of neutron absorbers and means to inject them into the materials where the accident occurs should be foreseen in order to make an easier intervention				
52.	6.39 and 6.40		Are 6.39 and 6.40 consistent ?		Para 6.40 deleted.		
53.	6.47/1	Delete “an” before “publications”	Typo	Y			

COMMENTS BY REVIEWER Reviewer: Country/Organization: France			Page Date: 10/5/2010	RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
54.	6.49/8	…or where the provision of criticality alarm systems offers **no benefit (e.g. in case of prediction of only one spike)**	measures taken in two different facilities must be homogeneous and not be dependant on the level of the other risks in these facilities	Y			
55.	6.50	Locate 6.50 after 6.1	More logical location			Y	Paragraph was deleted as a result of comment No 17 ENISS (WASSC).
56.	6.51	Delete 6.51	Superfluous. See IAEA transport regulations	Y			
57.	6.57	Combine 6.57 with 6.65	Same topic	Y			
58.	6.71/2	Add: operating rules should define the compensatory measures to be taken into account when the system is out of service.		Y			
/							

COMMENTS on DS 407 Draft 1

COMMENTS BY REVIEWER Reviewer: P. MALESYS Page 1 of 6 Country/Organization: International Organization for Standardization (ISO) Date: 5 May 2010							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Para 1.1 Lines 6 to 8	… fissionable material, including handling, processing, use, storage~~,~~ ~~**transport**~~ and disposal (operation and post-operation), and to prototype research and development facilities and also to activities such as transport of packages containing fissionable materials.	"transport" is unnecessarily repeated in lines 6 and 8.	Y			
2	Para. 2.2 Lines 3 and 4	… severe and often fatal for those in the immediate vicinity. Using the general usage of defence in depth **and the levels of defence described in detail in [1] and [12]**, it should be noted that the application of the 4th level of defence in depth, which…	To provide references for the levels of defense in depth which are used in the following part of this para. 2.2.		Using the general usage of defense in depth**, as described in Refs [1] and [13],** it should		
3	Para. 2.5 Lines 5 and 6	… and recommendations for such a management system are detailed in Refs [3] and [10, **18 and** 27 – 29], respectively.	[18] is also a relevant reference for this subject.	Y			
4	Para. 2.12	• Safety criteria ~~**could be**~~ based on	To have the same	Y			

COMMENTS BY REVIEWER Reviewer: P. MALESYS Page 1 of 6 Country/Organization: International Organization for Standardization (ISO) Date: 5 May 2010							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	Second bullet	controlled parameters such as mass, volume, enrichment, concentration, etc.	grammatical style as for the first bullet.				
5	Para 3.15 Third bullet Line 1	• the system's characteristics meet the recommendations of para 2.16~~6~~ so that each …	Mistyping.	Y			
6	Para. 5.34 Line 5	… on the application of burnup credit is available in Ref~~s [6] and~~ [16].	[6] does not include significant information and guidance on the application of burnup credit.	Y			
7	Para. 5.38 First bullet	• ~~**Reprocessing involves a wide**~~ **Wide** range of forms of fissionable material and the use of multiple controlled parameters may be required;	To have the same grammatical style as for the following bullets.			Y	Understanding is clear as written.
8	Para. 5.39 Third and fourth bullets	• ~~S~~solutions of uranium and/or plutonium • ~~P~~**p**lutonium oxide	Mistyping regarding the use of capital letters.	Y			
9	Para. 5.53 Line 3	… bonded to the inside surface of the cladding ~~**by polymerization**~~.	Polymerization is not the phenomenon which leads to bonding of plutonium		… bonded to the inside surface of the cladding **as a**		

COMMENTS BY REVIEWER Reviewer: P. MALESYS Page 1 of 6 Country/Organization: International Organization for Standardization (ISO) Date: 5 May 2010							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			to the cladding.		**result** of polymerization		
10	Para 5.57 Lines 3 and 4	… operations. The guidance is intended to cover the long-term management and disposal of ~~**spent fuel as well as other types of**~~ waste arising from operations involving fissionable material (e.g. 'Legacy Waste'[2]). The operations may be shielded or un-shielded and may …	• The "Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management" makes a clear distinction between "spent fuel" and "waste", and "spent fuel" is not included in "waste". • All needed information for spent fuel should be included in paras 5.22 to 5.30 relating to "Spent fuel operations".	Y			
11	Para. 5.61	5.61. ~~**The recommendations relating to criticality assessment identified in sections 2 – 4 should be addressed.**~~ The following is provided as an overview of some	To avoid unnecessarily repetition with para. 5.66.	Y			

COMMENTS BY REVIEWER Reviewer: P. MALESYS Page 1 of 6 Country/Organization: International Organization for Standardization (ISO) Date: 5 May 2010							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		of the issues with…					
12	Para 5.69	5.69. **Designs for t**~~T~~ransport packages containing ~~**radioactive**~~ **fissile** material **(as defined by the Transport Regulations [6])** for transport outside of a nuclear site and in the public domain ~~**should**~~ **shall** be ~~**licensed**~~ **approved** by the competent authority of all the countries through which the package travels **unless they are excepted by para. 672 of [6].**	1. Not each individual package has to be approved but "only" the package design. 2. Not all the packages containing radioactive material needs to be approved by the competent authority but the designs for packages containing fissile material (as defined by [6]) have to. 3. Licensing (or approval) of the package design is a requirement in the Transport Regulations [6]. 4. "approved" is the word used in the Transport Regulations [6]. 5. There are exceptions in [6] regarding the approval of designs for		Agree with the proposed changes. However, para 5.69 has been deleted by comment No 39 from France, which pointed out that the para was superfluous as it was already covered by para 5.67.		

COMMENTS BY REVIEWER Reviewer: P. MALESYS Page 1 of 6 Country/Organization: International Organization for Standardization (ISO) Date: 5 May 2010							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			packages containing fissile material.				
13	Para. 5.70	5.70. Transport packages **containing fissile material (as defined by the Transport Regulations [6])** ~~**should**~~ **shall** be shown to be safe for ~~**both**~~ **routine,** normal and accident conditions of transport conditions of transport.	Consistency with the Transport Regulations [6].		Agree with the proposed changes. However, para 5.70 has been deleted by comment No 40 from France, which pointed out that the para was superfluous as it was already covered by para 5.67.		
14	Para 5.73 Lines 1 and 2	5.73. Fissile material ~~**should**~~ **shall** be transported so as to maintain sub-criticality during **routine,** normal and accident conditions of transport. In particular, the following contingencies ~~**should**~~ **shall** be …	Consistency with the Transport Regulations [6].		Text added as recommended, but retaining the word SHOULD to be consistent with the recommendations in a Safety Guide.		

COMMENTS BY REVIEWER Reviewer: P. MALESYS Page 1 of 6 Country/Organization: International Organization for Standardization (ISO) Date: 5 May 2010							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
15	Para. 5.76 Line 4	… is high in ^{240}~~0~~**1** Pu content (e.g. >15 $^{w}/_{o}$), plutonium that is low in ^{240}Pu content (e.g. <5 $^{w}/_{o}$), …	Mistyping.	Y			
16	Para. 5.76 Line 5	… graphite, boron, gadolinium, hafnium, heavy water, zirconium, ~~**poreformer**~~ **pore former**, aluminium and …	Mistyping.	Y			
17	Para 6.8 Line 2	6.8. The requirements for developing an adequate emergency response to a nuclear or radiological emergency are provided **in** Ref. [8] **and in Ref [25]**.	Comprehensiveness of the information.	Y			
18	References	22. ISO 27467:2009, Nuclear Criticality Safety – Analysis of a Postulated Criticality Accident, International ~~**Standards**~~ Organization **for Standardization**.	Exact full name of ISO.	Y			
19	References	26. ISO 7753:1987, Nuclear Energy – Performance and Testing requirements for Criticality detection and Alarm Systems, International ~~**Standards**~~ Organization **for**	Exact full name of ISO.	Y			

COMMENTS BY REVIEWER Reviewer: P. MALESYS Page 1 of 6 Country/Organization: International Organization for Standardization (ISO) Date: 5 May 2010							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		Standardization.					
20	Annex I Bibliography	~~**ISO**~~ **International** Standards	The list which follows this title includes also a CEI/IEC standard.	Y			

IAEA SAFETY STANDARDS

Japan NUSSC comments on Draft Safety Guide Criticality Safety (DS407) Draft 1

COMMENTS BY REVIEWER Reviewer: H. Tezuka, T. Nakata, K. Nakajima, H. Tamaki, T. Oshima Country Organization; JNES, Kyoto University, NISA/ Japan Date 30/04/2010				RESOLUTION			
Comment No.	Para./Line No.	Comments/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
Note: inserted and ~~deleted~~							
1	General	There are still many areas to be completed, modified and improved. We would like to propose to the NUSSC reviews and discuss the revised draft after taking into account all necessary modification and improvement. Followings are the recommended points to be taken into account during the revision work: • State clear safety requirements or technical recommendations for criticality safety than giving teaching text, that are seen throughout the entire draft; • Gather the same content of the texts from the entire draft and delete repeating texts; and • Consider and make it clear the scope of the criticality accidents necessary for this safety guide.			Noted.		
2	Reference and Bibliography	References other than those of IAEA Safety Series should be opened and accessible. Please check References No.9, 11, 20, 21, 22, 23, 24 and 26. Also, documents shown in Annex I should be opened and accessible.			Availability of references 9, 11, 20, 21, 22, 23, 24 and 26 checked and confirmed.		

COMMENTS BY REVIEWER Reviewer: H. Tezuka, T. Nakata, K. Nakajima, H. Tamaki, T. Oshima Country Organization; JNES, Kyoto University, NISA/ Japan Date 30/04/2010				RESOLUTION			
Comment No.	Para./Line No.	Comments/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
3	Annex I	Reconsider if Annex I is needed. If so, the documents from other countries should be included for balance as the current resources of Annex I came mainly from the USA.			Agreed – content of the current bibliography represents the origins of the consultants drafting the safety guide. However, it is intended to increase the scope of material in it during the consultation with Member States.		
4	Section 3	Except the part of ADMINISTRATIVE SAFETY MEASURES, the text is very much premature to review. The content is redundant, repeating, including technical statements and teaching texts that do not say clear request for safety. It is recommended to rewrite the Section 3, other than the part of ADMINISTRATIVE SAFETY MEASURES. See the following comments on Section 3.				Y	The location and content of Chapter 3 is consistent with the approved DPP.
5	2.6/before 1st bullet	Add the following bullet; • Management should establish a comprehensive criticality safety programme for maintaining subcriticality to ensure that ~~measures for~~ all aspects of criticality safety are identified, implemented, surveyed and documented	For completeness. Establishing a criticality safety programme should be the 1st item to be addressed.	Y			

COMMENTS BY REVIEWER Reviewer: H. Tezuka, T. Nakata, K. Nakajima, H. Tamaki, T. Oshima Country Organization; JNES, Kyoto University, NISA/ Japan Date 30/04/2010				RESOLUTION			
Comment No.	Para./Line No.	Comments/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
		throughout the entire lifetime of the facility.					
6	2.6/ 1st bullet	• Management should clearly define and document personnel responsibilities for criticality safety.	For completeness.	Y			
7	2.6/ 3rd bullet	Clarify "new activities".	Clarification Does facility modification should also be included in new activities? If not, it should be added.	Y			
8	3.24	The geometrical distribution of neutron absorbers should ~~also~~ be considered. Effectiveness of the neutron absorbers is a function of the geometrical arrangement with regard to homogeneousness that should be considered. ~~Neutron absorbers that are homogeneously distributed in a thermal fissile material system are usually more effective than if they were~~	"Geometrical" is a key word that should be mentioned. Effectiveness of the absorbers thus influenced by the factor of their homogeneousness. That is all to say; current text is too much redundant.		Reference to geometrical distribution added. However, the original text is retained as it contains useful information		

COMMENTS BY REVIEWER Reviewer: H. Tezuka, T. Nakata, K. Nakajima, H. Tamaki, T. Oshima Country Organization; JNES, Kyoto University, NISA/ Japan Date 30/04/2010				RESOLUTION			
Comment No.	Para./Line No.	Comments/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
		~~heterogeneously distributed (although it should be noted that heterogeneous absorbers may be easier to administratively control). In a thermal system consisting of a heterogeneous arrangement of fissionable material and a fixed neutron absorber (e.g. the storage of fuel assemblies) the neutron absorber may be more effective the closer it is to the fissionable material. Any material (e.g. water, steel) between the absorber and the fissionable material can change the effectiveness of the absorber.~~					
9	4.16(1)/ 3rd bullet	• ~~Quantitative Probabilistic Risk Assessment methods;~~	This is repeating of the other methods; PSA includes all the other methods provided here. Thus PSA can be deleted.	Y			
10	2.12/2nd bullet	• Safety criteria could be based on controlled parameters such as mass, volume, enrichment,	One of the most important parameters to avoid criticality is 'geometry'.	Y			

COMMENTS BY REVIEWER Reviewer: H. Tezuka, T. Nakata, K. Nakajima, H. Tamaki, T. Oshima Country Organization; JNES, Kyoto University, NISA/ Japan Date 30/04/2010				RESOLUTION			
Comment No.	Para./Line No.	Comments/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
		concentration and geometry ~~etc~~.					
11	2.14/1	When defining safety ~~acceptable~~ margins to keff and to the critical value of a controlled parameter, ~~are a function of the criticality risk and the degree of~~ uncertainty and its degree in the evaluation ~~estimation~~ of keff and the critical value, including any code bias and the ~~rate at which they vary, i.e.~~ sensitivity~~, with changes to the system, particularly~~ with respect to changes in a controlled parameter should be considered.	Clarification of the message.	Y			
12	2.15/1	All margins adopted in criticality safety assessments should be justified and documented with sufficient detail, clarity to allow an independent review of judgment.	Clarification and completeness	Y			
13	3.17	The explanation on the use of safety factor for "k_{eff}"should be	The method to determine the safety criteria based on k_{eff}		Agreed. Text will be developed and added to the		

COMMENTS BY REVIEWER Reviewer: H. Tezuka, T. Nakata, K. Nakajima, H. Tamaki, T. Oshima Country Organization; JNES, Kyoto University, NISA/ Japan Date 30/04/2010				RESOLUTION			
Comment No.	Para./Line No.	Comments/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
		described as well as that for "Controlled parameters."	should be described.		safety guide before being sent to Member States for comment.		
14	3.17/1	Parameters to be controlled for ensuring criticality safety are as follows, but not limited to ~~Examples of parameter control are~~:	These are not examples but the exact parameters need to be controlled.	Y			
15	3.17/1st bullet	• Restriction to a certain type and chemical compound of the fissionable material (such as UF6, UO2F2, UO2(NO3)2, UO2, etc);	The contents of the fissionable material should be known for criticality safety analysis. However, whey does the chemical compound need to be restricted? We don't think this paragraph is needed.	Y			
16	3.17/2nd bullet	• Limitation of the isotopic composition of the fissionable material present in the system;	Isotopic composition changes by time. The isotopic composition of the fissionable material should be known for criticality safety analysis.			Y	The contents of the fissionable material should be known for criticality safety analysis and so this limitation is

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Comment No.	Para./Line No.	Comments/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
			However, whey does the isotopic composition need to be limited? Do we need this message?				retained.
17	3.17/10th bullet	"Shielding"should be "Neutron isolator" or "Neutron shielding."	Use a proper term.		The term neutron shielding was added.		
18	3.18	Delete this para.	The content is the same as the 6th bullet of para. 3.17.	Y			
19	3.35/5th bullet	Delete the parentheses and the content and create a new bullet from it as follows; • to conduct regular walk-downs through the plant and inspections of the facilities, systems or activities;	Two different activities are in a bullet. They should be separate.	Y			
20	4.17/1	The assessment should be performed utilizing a verified and validated methodology.	Not only validated but also verified methodology should be used.	Y			
21	4.18	Definition of "subcritical limits" should be described.	Clarification		Reference to subcritical limits now deleted.		
22	1.6/1	Move the following 1st sentence to SCOPE; This Safety Guide covers all of	The first sentence does not concern with STRUCTURE but with SCOPE.	Y			

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Comment No.	Para./Line No.	Comments/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
		the important aspects of nuclear criticality safety, from initial design, through operation to decommissioning.					
23	2.2/3	~~Using the general usage of defence in depth, it should be noted that the application of the 4th level of defence in depth, which deals with beyond design basis accidents and the protection of the confinement system to limit radiological releases, may not be fully applicable to criticality safety. However,~~ ~~m~~Mitigation of the radiological consequences of a criticality accident~~, the 5th level of defence in depth,~~ should be applied with consideration of the need for criticality detection and alarm systems and emergency arrangements.	Delete redundant text that does not include guide.			Y	The consultants that drafted the safety guide felt it was necessary to explain the limitations of applying the concept of defence in depth to criticality safety. This has also been supported by other Member States comments. Therefore, the text is retained.
24	2.3	Delete this paragraph.	Only teaching text that does not include guide.			Y	There isn't a requirement for every paragraph to

COMMENTS BY REVIEWER Reviewer: H. Tezuka, T. Nakata, K. Nakajima, H. Tamaki, T. Oshima Country Organization; JNES, Kyoto University, NISA/ Japan Date 30/04/2010				RESOLUTION			
Comment No.	Para./Line No.	Comments/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
							provide a recommendation. Background information on criticality safety and in this case on the anomalous behavior of some fissionable systems is useful.
25	2.7/3	~~The nature of the criticality hazard is such that deviations towards a less safe condition may not be intuitively obvious to operators and there will be no obvious indication that neutron multiplication is increasing. There is also a danger that conditions may 'creep' with time in response to factors such as ageing of the plant or due to increased production pressures, for example.~~	Delete this text that does not include guide.			Y	There isn't a requirement for every sentence to provide a recommendation. Background information on criticality safety and in this case on the potential for deviations to lead to less safe conditions is useful.
26	2.16/4	~~As part of that demonstration, operational limits set at values sufficiently below the critical values should be applied, so that~~	Repeating context of para 2.13.			Y	Similar text as para 2.13; however it is introducing the need for a sufficient

COMMENTS BY REVIEWER Reviewer: H. Tezuka, T. Nakata, K. Nakajima, H. Tamaki, T. Oshima Country Organization; JNES, Kyoto University, NISA/ Japan Date 30/04/2010				RESOLUTION			
Comment No.	Para./Line No.	Comments/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
		~~the safety measures can act in time to terminate the fault sequence and prevent a criticality accident.~~					margin to allow time for detecting and terminating the fault sequence.
27	From 3.1 to 3.8	It is strongly recommended to rewrite these paragraphs or delete all of them.	All these paragraphs are teaching text giving a concept of ensuring criticality safety and repeating of para.3.10 which is written better. Besides, some messages such as below are inappropriate and wrong: 3.6 If a passively safe design cannot be achieved, then the design should be fault tolerant. --> This should be for example; Design should take into account 'fault tolerance' in order to complement passive safety. 3.8 Failures, perturbations or	Y Y	Paragraph 3.8 re-written and	Y	The general information in this Chapter is to be retained. The background information on the design philosophy and the application of the defence in depth concept to criticality safety is useful.

COMMENTS BY REVIEWER Reviewer: H. Tezuka, T. Nakata, K. Nakajima, H. Tamaki, T. Oshima Country Organization; JNES, Kyoto University, NISA/ Japan Date 30/04/2010				RESOLUTION			
Comment No.	Para./Line No.	Comments/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
			mal-operations of the system or mal-functions in the system should not lead to less safe conditions. --> This is absolutely impossible to achieve.		the recommendation for failures etc to not lead to a less safe condition has been removed. However, the recommendation that the system should have characteristics so that key parameters deviate only slowly is retained.		
28	4.26	The handbook of benchmark experiments for criticality safety, ICSBEP, is better to be introduced.	For user's information.			Y	Agree with comment, however, in view of your comment no 2 and the fact that access to the handbook is restricted; reference to the handbook is not included.

TITLE: Draft Safety Guide Criticality Safety (DS407)

COMMENTS BY REVIEWER Reviewer: Stefan Theis Page 1 of 1 Country/Organization: Switzerland / Fed. Nuclear Safety Inspectorate (ENSI) Date: 2010-04-29				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	p. 37: insert new para before 5.57	"The collection and storage of unconditioned waste before waste treatment should be subject to the same considerations as the processes from which such waste was produced. Additionally special considerations may be necessary if such waste streams are mixed with other radioactive and/or non radioactive waste streams of different origin which is frequently the case in research centers. Although in the individual laboratories the inventory of fissile material may generally be small, significant accumulation of such material may occur during the subsequent waste collection and waste treatment procedures. "	Experience shows that at least for laboratories which work on fresh and spent fuel the assumption that they have only small inventories is not generally true, epically if the treatment of waste is also considered. (see also com. no. 2)	Y			
2	p. 40 par. 5.75 add	"The general assumption of low fissile inventories may not be applicable to laboratories which are	See reason for comment no. 1	Y			

		used for fuel examinations or experiments as well as their respective waste treatment facilities.”					

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General		This guide is welcomed and should be a useful starting point for those seeking guidance. The draft safety guide appears to be generally complete, although a little too prescriptive in parts, eg Para 3.36 and the following paragraphs, and Section 6 seems overly detailed. It might be useful to include a statement in Para 1.5 to say that this IAEA safety guide does not cover defence-related facilities.	Y	Noted.		
2	General		This draft safety guide appears to have been written from a USA perspective and this is reflected in the references		Agreed – content of bibliography represents the origins of the consultants		

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			and bibliography. Consider extending the existing set of references to include some of the UK and French work in this area, eg BS 3598, HSE SAPs and TAGs, and HPA guidance on accidents. Similarly, consider referencing or acknowledging UK codes such as MONK or FETCH.		drafting the safety guide. However, it is intended to increase the scope of material in it during the consultation with Member States. Reference to BS3598, HSE SAPS and HSE T/AST/041 "Criticality Safety" added to bibliography. Additional information is requested concerning the correct references to HPA documents and FETCH and MONK codes.		

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
3	General		The guide does not appear to include anything equivalent to the UK SAP Para 473, ie: "*The design and operation of plant and equipment dealing with fissile material should be such as to facilitate the termination of a criticality incident.*" Post accident termination should be considered in this draft safety guide.		Text has been added Para 6.19, see comment No 51 France.		
4	General		Consider referencing the published ICNC conference reports. These papers are useful as examples of good practice; they are a source of consensus international standards.			Y	Agree, it is useful background information, but not considered as a source of consensus standards.
5	Para 1.1, 1st sentence		It is not clear whether the word "foreseeable" should be inserted in			Y	See IAEA Safety Glossary.

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			front of "accident" or whether the phrase "anticipated operational occurrences" is intended to convey this. Clarification is needed.				
6	Para 1.3		Omission. No mention is made of the chemical form of the fissile material.			Y	Too specific.
7	Para 1.3, 1st sentence		Whilst reference to temperature effects is strictly correct, it is a bit of a red herring since this is never used as a means of criticality control.		Reference to temperature deleted.		
8	Para 1.5, 2nd sentence		Reference is made to "systems that have been exempted from the criticality safety regime". It would be helpful to the reader to either include an example here, or to reference another part of the safety guide where these systems are discussed in more detail.		Example of transport added.		

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
9	Para 1.9, 2nd sentence		Although there is a reference to code validation, there is nothing about verification, ie ensuring that there are no code errors introduced by mounting the code on a particular computer system. Consider referencing Para 4.20, which addresses the importance of verification.		Reference to verification added only. Further detail not added as this section is only providing information on the structure of the safety guide.		
10	Para 2.2		Consider including a reference to Ref [12] early in this paragraph. It would be helpful for those not familiar with the numerical levels of defence in depth.	Y			
11	Para 2.6		Further clarification on the need for periodic review of safety cases/analyses would be helpful. Similarly, clarification is needed on	Y			

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			the nature of independent inspections; these should be independent of plant operators but not necessarily independent of the licensee/organisation.				
12	Para 2.6, 3rd bullet	Consider adding the following text: "For new activities and changes to existing activities, operators and supervisory grades should be retrained prior to implementation of the changes."	For new activities and changes to existing activities, re-training of operators and supervisory grades, **prior to** implementation of the changes is important. Consider modifying the bullet point to make this clear.	Y			
13	Para 2.6, 4th bullet		Appropriate levels of training are quite rightly mentioned. However there is no mention of: ▪ routine refresher training, and; ▪ the maintenance of training records to ensure that the requirements for		Reference to refresher training added to 4th bullet and text amended in Para 3.33 to include the recommendation on records and their use.		

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			routine refresher training are identified, flagged and instigated. Consider referencing Para 3.33 here, which covers some of these issues.				
14	Para 2.6, 4th bullet		Although it is possibly a contentious issue to raise in this safety guide, there should be a requirement to test the operator's understanding of something as important as criticality training. It should not be possible for operators to get a 'tick in the box' by attending a series of lectures during which they are allowed to doze in the corner.		Noted. In order to try and eliminate repeating other requirements and recommendations, the safety guide exploits the content of other IAEA safety standards. In this case, the management system safety standards cross referenced in Para 2.5 contain the appropriate		

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
					requirements and recommendations concerning the evaluation of the effectiveness of any training.		
15	Para 2.10		While the contents of Para 2.10 are laudable, there should be a more general dissemination of information not just on a site but also between sites, and if possible globally. Hence advice should be included in this guide that fissile material operators should seek to set up information exchange networks with other operators on 'near miss' events pertinent to criticality safety.		Rather than adding specific recommendations on operating feedback systems for criticality, Para 2.11 has been added with a cross reference to the IAEA's overall guidance on establishing an adequate operational experience feedback system. The scope of the guidance includes installations concerned with criticality safety.		

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
16	Section 3		Should there be a requirement to demonstrate that the chosen combinations of criticality controls are ALARA?		Text already added to objective of level 4 as a result of comment No 8 from ENISS (WASSC).		
17	Para 3.4, Table (Level 4/5)		The potential to design in constraints on the dose contours from potential criticality accidents is not mentioned here, eg the use of shield structures, pond water depths, etc to limit the doses to on/off-plant personnel. Operators should be encouraged to at least consider such precautions at the design stage.		Reference to shielding and dose contours added to table. It is also noted that consideration of the effects of shielding in calculating the dose is covered in Para 6.20		
18	Para 3.9		Omission. There is no mention of substantiation of the required safety function.	Y			
19	Para 3.17, 2nd bullet		Limitation of isotopic composition is valid for Uranium but we would		Noted.		

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			suggest it is more difficult to control for Plutonium.				
20	Para 3.17, 6th bullet		Should consideration first be given to substitution of the moderator for an alternative with little or no moderating properties? For example, in the case of oils there is often the potential to swap long chain CH2 type oils, for oils containing units with (for instance) Chlorine present, hence adding a natural neutron poison to the system.		Suggested text has been added to Para 3.19 covering the factors affecting the use of moderators.		
21	Para 3.23, last sentence		It is not clear whether the sentence is intended to cover the need for systems to be in place to monitor potential long term degradation of neutron absorbers. For example: acid leaching of Boron from	Y			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			Borosilicate raschig rings where these deliver a vital criticality safety function, and degradation of absorber panels in fuel flasks, pond storage, etc. Clarification is needed, especially if the intention is to cover the need for such systems.				
22	Para 3.26		Consider stressing that, wherever possible, separation control should be via engineered separations, eg fixed storage racks in fissile material stores, space frames for storage of arrays of drums containing Pu Contaminated Material, etc.	Y			
23	Section on Administrative Safety Measures		Where the main method of criticality control relies on procedural controls (often a suite of procedures), the operator	Y			

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			should be able to demonstrate that they have exhaustively studied all potential deviations from such procedures and that they understand the combinations of deviations needed to reach a dangerous situation. Human Performance/Factors specialists should be consulted to inform the operator as to the robustness, or otherwise, of the procedures and to seek improvements where appropriate.				
24	Para 3.27		Suggest including consideration of procedural control of computer-based/paper-based accountancy record keeping systems (to provide change control for example).	Y			
25	Para 3.35		Trained criticality			Y	The

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			assessors often sit in 'service groups' somewhat remote from the plant itself, which is a system that has advantages and disadvantages. However, one UK licensee has established the role of a "Criticality Representative". This is usually an experienced middle manager on the plant, who receives intensive training in criticality safety, such that their knowledge in criticality safety makes them the “first port of call” for plant personnel to give on-plant advice. Importantly, the training ensures that the criticality representative will defer to a criticality specialist if they encounter anything they are not				recommendations covering the role and responsibilities of management, operators and criticality staff are covered. As is the nature of a safety guide, the means of addressing these recommendations are not prescribed.

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			sure about. The use of a criticality representative generally seems to work well. Consider whether there is an opportunity in this safety guide to raise awareness of the usefulness of such a role.				
26	Para 3.35		Omissions. There is no mention of the responsibility to construct CIDAS Omission cases or to advise on the placement of detectors. Also, surely criticality safety staff should also be involved in specifying criticality emergency arrangements and the periodic audit of these arrangements.	Y			
27	Para 3.39		Improve clarity. Revisions to procedures need to include a training step across supervisory		Noted. Text added in Para 2.6 to address comment No 12		

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			and operator grades.		and the recommendation for training.		
28	Para 4.5		Omission. There is no mention of decommissioning (and Post-Operational Clean-Out).	Y			
29	Paras 4.15-4.19 Define ciriticality safety assessment methodology		Omission. While the information contained in these paragraphs is good, there is no mention of the QA checking/independent audit/approval process for the assessment in its totality.		These management system recommendations are covered in the general sections, particularly, Para 2.5 and its references and in new Para 2.6 bullet no 1 added to address comment No 5 from Japan.		
30	Paras 4.20-4.26 Computational models		Omission. There is no mention of crosschecking calculations using independent nuclear data libraries or different	Y			

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			computer codes.				
31	Para 5.20		The need for periodic clean-out and accountancy checks should be included in this paragraph.	Y			
32	Para 5.25		Omission. For stored fuel there is sometimes a requirement to remove fuel pins/rods for Post-Irradiation Examination work, which can change the moderation state of the element (potentially increasing its reactivity). It is necessary therefore to control such changes and to ensure that the potential impact receives due attention at the assessment stage.	Y			
33	Para 5.26		Clearly any sampling of soluble boron in the pond water needs to be representative and the level of boron poisoning should be demonstrated	Y			

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			to be homogeneous across the pond. Modify the paragraph to make this clear.				
34	Para 6.1		Omission. There is no mention of minimising the consequences via shielding provisions. Note: If the text is modified to include shielding provisions as a protection measure, it is important that the implications on dose of any penetrations through the shielding are evaluated.		Para 6.3 added.		
35	Para 6.2		For completion. It may be useful to note that in some cases both audible and visual alarms will be required, particularly in areas of the plant where the ambient noise levels are high. Alarms will need to be included on maintenance schedules.		Recommendations on the visibility, audibility and testing of alarms given in Para 6.56, 6.67-6.69.		

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			Routine tests should also be carried out to ensure the alarm is audible and it's meaning is clearly understood by personnel working in the vicinity. It is also important that entrance warnings are provided to stop inadvertent entry of personnel into buildings where a criticality may have recently occurred and which may be an ongoing event.				
36	Para 6.30		Routine criticality inspections have already been mentioned elsewhere in this guidance; they should be extended to include the routine examination of emergency evacuation routes, signage, etc.		Text added to the inspection recommendations of Para 2.6.		
37	Para 6.66		Omission. In decommissioning facilities it is common	Y			

COMMENTS BY REVIEWER Reviewer: Country/Organisation: UK(NUSSC)/HSE(ND) comments for DS 407 Date: 27 April 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			practice to establish interim storage areas for items such as waste drums or to position modular containment systems around plant/ equipment items requiring size reduction. The implications of the siting of such areas on the continuing ability of the criticality detectors to 'see' the minimum incident of concern need prior evaluation.				

USA Comments on IAEA Safety Guide "Criticality Safety" (DS407 Draft 1)

COMMENTS BY REVIEWER Reviewer: U.S. NRC (NUSSC/RASSC/TRANSSC/WASSC) (Contact: Boby Eid) Country/Organization: United States of America Date: May 5, 2010				RESOLUTION			
Comment No.	Para/Line No.	Comment/Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General Comment	Please review the text to ensure consistent use of terminology. For example, the term *'facility'* is used differently throughout the document.	Completeness and accuracy: Given the wide multi-national, audience, we recommend a consistent use of terminology.		Text was reviewed for consistency; however, reference to specific examples would be helpful.		
2	General Comment	As stated in Sections 1.2 & 1.5 this IAEA Standard is "…intended to encompass all types of facilities and activities, except facilities that are designed to be critical, e.g. a nuclear reactor or a critical assembly." Different types of facilities were addressed in different parts of the document. However; in some instances certain facilities/activities,	Consistency: There inconsistency regarding the varying level of detail given to different facilities and activities in the text. Such inconsistency may lead to erroneous assumption that facilities/activities with lesser detail are of lesser importance, and therefore			Y	The difference in the level of detail between facilities and activities is not seen as an inconsistency. The level of detail is consistent with the input and recommendations of the drafting consultants and experts.

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		received relatively more explicit discussions while others received very little or none. We recommend having a balanced approach in addressing facilities and activities.	do not need to meet the same level of commitment to safety in preventing an inadvertent criticality event (ICE). Perhaps a hierarchy of subordinate standards would be suitable to address criticality issue for different facilities. However, this should be consistent with the long-term plan of the IAEA standards development as described in the SPESS.				It may not be realistic to have the same level of detail for facilities and activities that present different levels of criticality hazard.
3	General Comment	We understand that this is Safety Guide and the language is typically used with *"should"* statements. However, in certain instances such as in Para 6.64 *"may be"* was used instead of *"should."* In addition, in Para 6.63 and 6.64 it is stated "Ref. [26] *recommends* that..." whereas	Consistency and accuracy: IAEA DS407, uses the language "may be," and the detection and Criterion, 6.63 states, criticality alarm systems "should" be designed to		The comment on the use of terms such as "maybe" etc was also made by the IAEA Technical		

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		the reference cited is a requirement under ISO (e.g.; ISO 7753:1987). Therefore, we recommend that the Secretariat reconcile by using the appropriate the language.	detect promptly the minimum accident of concern; whereas, this same criterion in ISO 7753:1987 4.2 Detection Criterion identifies it as a requirement with "shall" statement.		Editor and has been addressed. References to requirements originating from other references have been changed to ensure consistency with that reference or the cross reference deleted.		
4	1.2 & 1.6	"This Safety Guide covers some of the important aspects of nuclear criticality safety, from initial design, through operation to decommissioning. It is the	Replaced *'all'* with *'some'* and added a sentence placing the burden upon the facility/activity to ensure		Comment accepted, however original paragraph has		

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		responsibility of the personnel involved to identify all of the important aspects of nuclear criticality safety of the facilities/activities under their purview. It consists of six sections, as well as an annex."	nuclear criticality safety (NCS). This standard does not cover all of the important aspects of every potential NCS analysis. It should be understood that it is the responsibility of the facility/activity to ensure NCS. They should not be "off the hook" if the standards are somehow incomplete.		been deleted as a result of comments from Japan.		
5	2.2 / 3	"…severe and often fatal for those in the immediate vicinity. Using the general usage of defense in depth (described later in Section 3.4), it should be noted that the application of the 4th level of defense in depth, which…"	Clarity/Completeness: Later In the same sentence the writer refers to a "4th level of defense of depth" without providing a reference or a description of this level. Section 3.4 contains a table describing the various defenses of depth	Y			

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			levels.				
6	2.13 And others	"In defining the criteria, a safety margin should be applied. This implies a value of k_{eff} somewhat less than unity or a controlled parameter value 'below' its **critical value**. In this context 'below' is used in the sense that the controlled parameter remains on the safe-side of the **critical value**."	Completeness: Define "critical value." "critical value" is very similar to 'criticality' and when discussing NCS the word 'critical' should be used judiciously.	Y			
7	2.15 / 1-3	"All margins adopted in criticality safety assessments should be justified and documented. When appropriate, justification should be by reference to ~~well established and documented company,~~ national <u>regulations</u> or international standards, or to codes of practice or guidance notes <u>that are compliant with these regulations and standards</u>."	Clarity/Consistency: Adopted safety limits and ensuing safety margins should be in compliance with criteria that are issued by the national regulatory body or by international organizations endorsed by this regulatory body. They should not be determined using private organizations acceptance	Y			

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			criteria.				
8	NEW 2.19	We recommend adding a new Para #2.19 as stated below: "Changes to the facility and/or activities should be evaluated to determine if the bases for the exemption are still met."	Completeness: When changes occur, they should be evaluated to determine whether an exemption is still warranted.	Y			
9	3.5 / 5	"…containers which ~~are~~ have geometrically ~~safe~~ subcritical configurations."	Clarity.	Y			
10	3.7	"The sensitivity of the system to potential faults should be minimized." This requirement is too vague. What does success look like? Is there a threshold or reference that can be used to describe the expectation?	Clarity		Agreed. Some text has been added as a result of comments Nos 7 &10 from Finland. However, further text will be developed and added to the safety guide		

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					before being sent to member States for comment.		
11	3.8	"Failures, perturbations or mal-operations of the system or mal-functions in the system should not lead to less safe conditions. However, if the change is to a less safe condition, the system should have characteristics so that key parameters deviate only slowly from their desired values so that actions of detection, intervention, and recovery are ~~is~~ viable ~~possible~~ to prevent a criticality accident." In addition, it is unclear from the above statement of the relationship between "desired values" and "critical values"	Clarity	Y			
12	NEW	We recommend adding a new Para	Completeness, Clarity:		Agreed. Text		

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	Paragraph after 3.8	to provide some guidance as when a design cannot be both passively safe and fault tolerant.	Considering rare, but actual reported accident where neither passive safety nor fault tolerance features were available; we suggest providing guidance on what should be done when a system is neither passively safe nor fault tolerant.		will be developed and added to the safety guide before being sent to member States for comment.		
13	3.9 / 4	"…and accidents, including; <u>human error,</u> initiating events, internal and external hazards, loss or failure of …"	Completeness: Added 'human error' to the list.		Reference to human error added. However, please note that the IAEA definition of the term "initiating event" includes human error.		
14	3.12	"…If subcriticality cannot be	Language:	Y			

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		ensured through these means further safety measures should be considered such as ~~controlling~~ limiting"	Limiting would provide "safety by design."				
15	3.17 / 3rd, 4th, & 5th Bullets	Add the basis for the 0.45, 0.90, and 0.80 failure criterion.	Clarity/Completeness: Provides supporting information and adds clarity		Agreed. Text will be developed and added to the safety guide before being sent to member States for comment.		
16	3.38 / last bullet	• be periodically reviewed ~~at predetermined intervals~~ in conjunction with other facility documents e.g., emergency response plan, criticality safety assessment, etc. to incorporate updated changes and lessons learned, and for training at predetermined intervals.	Clarity/Completeness: Specify reason for revising operating procedures, and also identify other documents that should be reviewed for periodic initial and refresher training.	Y			

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17	3.42	"Implementation of the safety measures includes inspections, periodic surveillances, continuous or quasi-continuous measurement. Accordingly, quality assurance measures should be developed and implemented to maintain the reliability of the safety measures. Other factors, which influence the selection of safety measures, should be considered. These factors include:" The guidance document would benefit by explaining what is being inspected, surveilled, and/or measured.	Clarity/Completeness		Agreed. Text will be developed and added to the safety guide before being sent to member States for comment.		
18	4.25 / add bullet	• Computational models should be reviewed periodically to determine if relevant new benchmark data has become available for further validation.	Completeness: Computational models used in criticality safety are sometimes validated against a very limited pool of benchmark data	Y			

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			(e.g., burnup credit methodology). It is important for analysts to periodically improve the accuracy of the methods and models as new data becomes available, if necessary.				
19	5.3 5.4 5.5 5.6 5.7	Replace 'production facilities' with 'production/utilization facilities'.	Clarity/Completeness: 'Production' facilities make reactor fuel and 'utilization' facilities use reactor fuel to generate electricity or some other product. Without explicitly including 'utilization' facilities it may not be clear that the guidance would apply to them.	Y			
20	5.3 5.4 5.5	Type of facility and operation It is not clear what is being gained	Clarity: Two differences are indicated, but they may		Accepted that the facilities are subjected		

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	5.6 5.7	by this section. It is not clear what is gained by splitting the facilities into the two types; 'laboratory/experimental' and 'production/utilization'. The items discussed are equally applicable to both types. The items in this section would seem more appropriate in paragraph 4.16.	not truly be differences. A 'laboratory/experimental' facility may also be subject to production pressure to complete activities due to the limited availability of equipment and material. A 'laboratory/experimental' facility may be subject to equipment failure just as a 'production/utilization' facility. However, the 'production/utilization' facility will likely have redundant equipment, a staff of trained maintenance personnel, and a warehouse full of parts, while the 'laboratory/experimental'		to the same issues, albeit to varying degrees. The text has been modified to ensure that the recommendations are applicable to both types of facility		

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			facility will likely have limited recovery capability for equipment failure.				
21	5.9	"Changes due to plant ageing should be considered. The ageing effects should be monitored and their impact on criticality safety should be assessed. Periodic testing of materials relied upon to maintain sub criticality should be performed to ensure the criticality safety analysis remains valid for any actual or potential material degradation."	Completeness; Virtually every neutron absorber put into the SFP environment has exhibited some material degradation. Newer materials do not have the longevity in the SFP environment to claim that there is no degradation mechanism.	Y			
22	5.17	This paragraph talks about the need to protect against the effects of an earthquake. However, the needs to protect against other natural events (e.g., tornadoes, hurricanes, floods, etc) were not addressed. In addition, this Para appears to apply only to fuel fabrication facilities, whereas it	Completeness		The recommendation to address hazards, both internal and external, in criticality safety		

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		needs to be applied to all other facilities listed in Section 5.			assessments and to demonstrate that the identified safety measures will continue to perform their safety functions during such hazards has been made in the general Sections 2 – 4. This para has now been modified to include reference to		

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					all external hazards.		
23	5.22 / add bullet	• <u>the fuel assemblies will also undergo physical changes during irradiation and those changes should be accounted for in the criticality safety analysis.</u>	Completeness: During irradiation in light water reactors the fuel assemblies undergo physical changes associated with irradiation and residence time in an operating reactor. Some of those changes are clad thinning to fuel rod growth, clad embrittlement, fuel densification, collapse of the pellet/cladding gas gap in the fuel rod, and crud build up on the outside surface of the fuel rod. In SFP criticality analyses fuel has been modeled as fresh and clean. As the	Y			

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			fuel undergoes extended burnup and residence in an operating reactor modeling it as fresh and clean becomes ever more of an approximation.				
24	5.24 / 5-6	"…supporting structures, engineered or administrative limits on the range of ~~cask~~ <u>movements of fuel elements and other objects in the vicinity of fuel elements,</u> and regular testing/maintenance of handling equipment.	Flexibility in application & Completeness: The previous wording restricted the guidance aspect to casks. We recommend changing the wording to have a broader application to any load that may be moved in the vicinity of fuel elements. Added the movement of the fuel elements themselves to the requirement.	Y			
25	5.26 / 6	"…absorber materials used for criticality control. For example, Boraflex sheets (a material	Accuracy/ Completeness: Boraflex utilization should not be limited to	Y			

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		impregnated with boron) used in some PWR and BWR spent fuel storage ponds have been found to shrink as a result of exposure	BWR spent fuel pools.				
26	5.28 / 7	"…or administrative controls and checks on fuel identity. When a spent fuel storage facilities may contain more than one type of fuel element and/or have storage areas with differing requirements for acceptable storage within the same facility, the possibility of miss loading of a fuel element into the wrong storage location should be considered in the criticality safety assessment."	Completeness: A miss loading can, and do occur at single reactor sites. If a storage facility has two or more regions with differing storage requirements, a miss loading is possible, it does not have to be fuel from a different reactor site. Given the history of miss loadings, a miss loading is a credible event unless a probability of occurrence analysis considering industry and site-specific information is performed and demonstrates the		Recommended text added as a new paragraph as follows: For spent fuel facilities on a single reactor site when the facility may contain more than one type of fuel element and/or have storage areas with differing requirements for acceptable		

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			probability of occurrence meets a pre-established limit for being non-credible.		storage within the same facility, the possibility of miss loading of a fuel element into the wrong storage location should also be considered in the criticality safety.		
27	5.32 /1st & 2nd bullet	• validation of the calculation methods used to predict the spent fuel composition <u>using the guidelines presented in Para 4.24 to 4.26</u>; • validation of the calculation methods used to predict keff for the spent fuel configurations	Completeness: To provide reference to the applicable guidance section.	Y			

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		using the guidelines presented in Para 4.24 to 4.26 (noting that this…					
28	5.37	"Several chemical processes are possible for reprocessing spent fuel. In addition to general considerations for reprocessing, each process may have unique aspects, which must be considered. ~~One of the most commonly used is the PUREX (Plutonium and Uranium Refining by Extraction) process. This separates the plutonium and the uranium and the products of fission (including the minor actinides) from each other by a method of solvent extraction.~~"	Consistency/Clarity: Second and third sentences were deleted as it not clear why one chemical process is mentioned in passing to the exclusion of all others. (Purex is mentioned later, although in no detail.) Added a sentence indicating each process may have unique aspects not covered in the general considerations in the subsequent discussion.	Y			
29	5.40 / 4	"…use should be fully justified in the criticality safety assessment. Periodic testing of materials relied upon to maintain sub criticality	Completeness: Added sentence requiring the periodic testing of credited neutron	Y			

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		should be performed to ensure the criticality safety analysis remains valid for any actual or potential material degradation. In all cases a key…"	absorbers, the same as was added for paragraph 5.9. Whenever neutron absorbers, soluble or permanent, are credited for maintaining sub criticality there should be a requirement to test to ensure they are actually present in the quantity assumed in the NCS analysis. Perhaps this should be captured in a general section rather than repeating it every time neutron absorbers are mentioned.				
30	6.3 6.4 6.5 6.6	These paragraphs discuss the ICE and lessons learned from process facilities, but there is no discussion of the ICE at other facilities. It appears that these paragraphs are only applicable to process facilities	Completeness			Y	The content and recommendations of Chapter 6 are intended to cover all facilities and activities within the

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		without any guidance for other facilities. Therefore, we recommend rewriting of the sections to be applicable to all facilities, or adding sections to address other types of facilities.					scope of the guide. These specific paragraphs are just referring to known criticality accidents and highlighting their causes as an aid to understanding. It is acknowledged that these documented criticality accidents are mainly associated with processes.
31	6.7	"Despite all the precautions that are taken in the ~~design and operation of nuclear fuel cycle facilities,~~ handling and use of fissile material there remains a possibility that a failure (i.e. mechanical or operational errors)…"	Completeness/ Inclusiveness: As currently written the requirement is applicable to fuel cycle facilities. That excludes all laboratory/experimental facilities and other production facilities	Y			

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			described in Paragraph 5.3. The changing types of facilities and varying details given might cause a reader to question what is required of their particular facility/activity.				
32	6.12 / 1st bullet	"• Define responsibilities of the management team and the technical staff, including the criteria for notifying the relevant local ~~or~~ and national authorities;"	Completeness: As currently written either the local or the national authorities are being notified, not both. It should be both.	Y			
33	6.30	"Facility changes should not unnecessarily impede or otherwise lengthen evacuation time and should be subjected to assessment and approval before being implemented." This is a "buried" aspect of the guidance that needs to have more prominence as an independent Para.	Clarity: It is unlikely that every facility change will receive this scrutiny. This would be especially true at facilities/activities, which have an exemption and therefore not have a full NCS program to		Reference to facility changes not unnecessarily impeding evacuation too remain, but reference to assessment		

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			intercede on behalf of NCS.		has been deleted.		
34	6.38	"Re-entry during the emergency should only be made by personnel trained in emergency response and re-entry. Re-entry should be performed by more than one person. Personnel dosimetry should be worn during re-entry. "	Completeness/Clarity Good practice (possible requirement) to wear personnel dosimetry in areas where radioactive materials and radiation are present.		Text added as recommended but modified as: **Personal** dosimetry should be worn during re-entry.		
35	6.39	"Re-entry should only be made if radiological surveys indicate that the radiation levels are acceptable. Radiation monitoring with alarm capability should be performed during re-entry."	Good practice (possible requirement) to perform portable radiation monitoring during re-entry, rescue, and stabilization.	Y			
36	6.47	"Criticality safety staff should familiarize themselves with ~~all~~ publications on criticality accidents to ensure that learning from past experience is factored into accident analyses and the emergency response plan."	Reconsider the use of the word 'all' in this requirement. Otherwise, it would be a violation if personnel were unfamiliar with an obscure document that	Y			

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			may have no relevance to the situation of interest.				
37	6.55	"In areas in which criticality alarm coverage is required, a means should be provided to detect excessive radiation dose or dose rate and to signal personnel evacuation."	Redundancy: There appear to be no substantive difference between this requirement and that of Paragraph 6.48.			Y	Paragraph contains slightly different recommendations.
38	6.55	Paragraph 6.55 is the only paragraph under the sub-section "Detection and Dependability." However, paragraph 6.55 has no specific guidance on "dependability."	Consistency & Completeness: Add guidance on the dependability. Dependability topic shows up later in paragraphs 6.58, 6.59, 6.60, and 6.61. Perhaps paragraph 6.55 should be moved (if it is retained) under the sub-section "Alarms" and the sub-section "Detection and Dependability" be deleted.		Reference to "Dependability" in the sub section title has been deleted. It is noted that dependability is already addressed in its own sub section later in the Chapter.		

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39	6.55 through 6.71	Add Ref. [26] where appropriate	Completeness: Add appropriate reference to ISO 7753:1987.			Y	Individual references to Ref. [26] (now Ref. [27]) have been deleted and a general cross reference added at the end of Chapter 6.
40	6.57 / 3	"…but sufficiently high to minimise the probability of alarm from sources other than criticality. 6.58 Alarms should have the capability to be manually reset, with restricted access, outside the areas to be evacuated. Ref. [26]"	Completeness/Clarity: Manual reset criteria described in ISO 7753:1987, 3.4 Alarm, 3.4.4 is not addressed in IAEA DS407.			Y	Individual references to Ref. [26] (now Ref. [27]) have been deleted and a general cross reference added at the end of Chapter 6.
41	6.61	"Uninterruptible power supplies should be available for criticality detection and alarm systems or else portable instruments should be available to compensate during such interruptions.	Trigger alarm failure criteria described in ISO 7753:1987, 3.5 Dependability, 3.5.4 is not addressed in IAEA DS407.			Y	Individual references to Ref. [26] (now Ref. [27]) have been deleted and a general cross reference added at the end of Chapter 6.
42	6.62	Add to Para 6.62:	Completeness:			Y	Individual references

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		Detectors shall not fail to trigger an alarm when subjected to intense radiation exceeding 10^3 Gy/h. Ref. [26]"	Add appropriate reference to ISO 7753:1987.				to Ref. [26] (now Ref. [27]) have been deleted and a general cross reference added at the end of Chapter 6.
42	6.72	"Records of the tests (e.g., instrument response and entire alarm system) should be maintained in accordance with approved quality assurance plans as part of the overall management system.	Clarity: Specify records that should be maintained with an approved QA plan.	Y			
	Add Para 6.73	6.73 Procedures shall be formulated to minimize false alarms and return the system to normal operation immediately following the test. Ref. [26]"	Completeness: Procedure criteria described in ISO 7753:1987, 4.6 Testing is not addressed in DS407. Add, as appropriate in reference to ISO 7753:1987.			Y	Individual references to Ref. [26] (now Ref. [27]) have been deleted and a general cross reference added at the end of Chapter 6.