Protection against Internal and External Hazards in the Operation of Nuclear Power Plants (DS503)

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: **Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)** (with comments of GRS) Page.... of.... Country/Organization: **Germany** Date: 2020-04-08							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	5.6	Identification of ~~a~~ response criteria ~~for which the applicable internal hazard needs to be terminated or mitigated to prevent unacceptable consequences~~ to be commensurate with the hazards identified and the potential consequences [see GSR Part 7 No. 4.18]	Clarification of the message and reference to GSR Part 7		X Identification of a response criteria to be commensurate with the internal hazards identified and the potential consequences		This para is about internal hazards.
2	10.4	Infrastructures concerning the general hazard protection measures ~~that~~ should be inspected, maintained, and tested include the following: […]	Not every measure must be linked to infrastructure. Therefore, it is now more clearly stated that certain infrastructures require special attention.			X	We don't use the term "infrastructure" except off-site social infrastructure. We agree that not every measure must be required special attention. But the facilities, or SSCs which linked to measures required inspection, maintenance, and testing is limited in this para.

Protection against Internal and External Hazards in the Operation of Nuclear Power Plants (Revision of NS-G-2.1)

COMMENTS BY REVIEWER Reviewer: Jila Karimi Diba Page.... of.... Country/Organization: IRAN/ National Radiation Department of Iran Nuclear Regulatory Authority (INRA) Date: 2020-05-24				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.6/ Last line	"…and the ~~hazard~~ risks associated with internal and external hazards."	Considering the definitions of the terms 'hazard' and 'risk' in IAEA Safety Glossary 2018, the definition of the term 'hazard risks' is not so clear.	X			
2	Page 18/ Subtitle	"RECOMMENDATIONS FOR SPECIFINC ITERNAL ~~EVENTS~~ HAZARDS"	No where in the document, "internal event" is used except in this subtitle.	X			
3	2.8/ First line	"…to prevent ~~an~~ a hazard…"	editorial	X			
4	2.8/ Third line	"… hazard management ~~program~~ programme"	editorial		X …hazard mangamement …		"program" is deleted
5	3.4/ First line	"The ~~plant~~ operating organization …"	In consistency with the other parts of the draft	X			
6	Draft	"~~plant~~ operating personnel"	It is suggested to replace "plant operating personnel" with "operating personnel" in the document (in consistency with SSR-2/1 and 2)	X			
7	4.2/ Lines 1-5	" Requirement 4 of the SSR-2/1(Rev. 1) [8] states that:	It is direct quoting from SSR-2/1 and nothing	X			Hazard coping strategies and

		"Fulfilment of the fundamental safety functions for a ~~NPP "~~ nuclear power plant shall be ensured for all plant states: (i) control of reactivity; (ii) removal of heat from the reactor and from the fuel ~~storage area~~ store; and (iii) confinement of radioactive material, shielding against radiation and control of planned radioactive releases, as well as the limitation of accidental radioactive releases"	should be changed. Also it is not clear what shall be ensured.				mitigation measures should ensure that the fundamental safety functions are maintained for all plant states.
8	7.6/ Line 5	"…the site accident management ~~plan~~ programme…"	In consistency with Requirement 19 of SSR-2/2	X			
9	B.12.7/ Second Line	"…emergency response ~~staff~~ personnel…" or "…emergency ~~response staff~~ workers…"	In Requirement 38 of SSR-2/1, the term 'emergency response personnel' is used. It is suggested to use the term '**emergency worker**' from IAEA Safety Glossary 2018 Edition and GSR Part 7, with the following definition: "**emergency worker** A person having specified duties as a *worker* in response to an *emergency*. ⓘ *Emergency workers* may include *workers* employed, both directly and indirectly, by *registrants* and *licensees*, as well as personnel of *response organizations*, such as police officers,	X			

			firefighters, medical personnel, and drivers and crews of vehicles used for *evacuation*. ⓘ *Emergency workers* may or may not be designated as such in advance of an *emergency*. *Emergency workers* not designated as such in advance of an *emergency* are not necessarily *workers* prior to the *emergency*."				
10	B.11.2/ Third line	"…of ~~emergency~~ on-site emergency response and fire-fighting …"	In consistency with GSR Part 7	X			
11	B.10.6/ Lines 2 and 4; B.12.4/ Lines 2 and 4;	"…emergency ~~personnel~~ workers…"	The term 'emergency personnel' in not used in GSR Part 7 and IAEA Safety Glossary 2018 Edition.	X			
12	B.13.4/ Second line	"…plant operators and emergency ~~staff~~ workers…"	The term 'emergency personnel' in not used in GSR Part 7 and IAEA Safety Glossary 2018 Edition.	X			

Japan EPReSC comments on DS503 "Protection against Internal and External Hazards in the Operation of Nuclear Power Plants"

COMMENTS BY REVIEWER Reviewer: Japan EPReSC member Page 1. Country/Organization: Nuclear Regulation Authority (NRA) Date: 1 June, 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	3.10	The programme should also identify relevant external organizations, such as local government, ~~and~~ emergency services~~,~~ and response organizations and	Clarification of "external organizations". Response organizations also include meteorological services.	X			

Comments on Protection against Internal and External Hazards in the Operation of Nuclear Power Plants, DS 503

COMMENTS					RESOLUTION			
Reviewer: Thomas Languin Page 1 of 1 Country/Organization: Ministry of Energy - (France) - department of nuclear security Date: 14/04/2020								
Comment No.	Section /Page No.	Need for update identified	Justification	Suggested addition/deletion/change (if any)	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.10	Clarity and precision	According to safety glossary, "*initiator is used in relation to event reporting and analysis; that is, when such events have occurred. For the consideration of hypothetical events at the design stage, the term postulated initiating event is used* ". As this sentence is about design, "postulated initiating events" seems better. NSS focuses on the prevention and mitigation of malicious acts, rather than on how to treat events caused by these acts (even if NSS16 gives guidance on how to use safety initiators to help identifying vital areas).	~~**In**~~ —This safety guide~~**,**~~ **considers only** internal and external ~~**hazard initiators**~~ **postulated initiating events** caused by human actions ~~**are considered to be**~~ of accidental origin. **Prevention and mitigation of malicious acts that could lead to similar events** (either by on-site personnel or by third parties, e.g. terrorist incursions) are outside the scope of this document, and guidance on **this issue is** covered by IAEA guidance for nuclear security.	X			

DS503 Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Country/Organization: Russia			Page 1 of 1 Date: 28 May 2020				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Page 15, Security aspects	Add NSS-4 - Engineering Safety Aspects of the Protection of Nuclear Power Plants against Sabotage and NSS-35 - Security during the Lifetime of a Nuclear Facility	Guidance mentioned should be considered	X			

DS503, Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

COMMENTS BY REVIEWER Reviewer: Maegon E Barlow (from Warren Stern) Page.... of.... Country/Organization: USA/ DOE/NNSA/BNL Date:5-29-20				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	general	the document should include a much stronger statement recognizing the link between the safety "hazards" and malicious acts and refer to relevant nuclear security series documents	The document's scope explicitly excludes malicious acts. However, it also notes that "This safety guide is **focused** on safety issues with possible interfaces between nuclear safety and nuclear security" (Page 7). This document includes essentially no guidance on the interface between safety and security and doesn't uses the term "interface" again in association with security. One small section on Decision Making notes correctly that the operational	X			See modified 1,14 and 1.15. After our security section (NSNS) and our team discussed, we added articles about interface with physical protection arrangement. The added recommendations are; i) any management programmes for hazards should develop and modified under the communication with physical protection staff, and ii) if applicable hazards occurred (especially; fire hazard), notification

			hazard management program should be compatible with the security program of the nuclear power plant and refers to IAEA Nuclear Security Series No. 27-G. Given that many of the external and internal hazards addressed in the document (e.g. fire) can be caused by a malicious act, the document should include a much stronger statement recognizing the link between the safety "hazards" and malicious acts and refer to relevant nuclear security series documents (including but not limited to INFCIRC 225 and 27-G). In addition, there should be a deeper analysis of the interface between the				for physical protection staff should be required. [See 3.6, 3.20, A1.19, A1.40] NNS-4, 13, 27-G, 35-G is referred.

			two disciplines, in particular since the scope statement suggests the guide is focused on safety issue with possible interfaces with security.linked to security.				

DS 503 -Step 5 (Preparing draft)– Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

COMMENTS BY REVIEWER Reviewer: Page.... of.... Country/Organization: Belgium – FANC/Bel V Date: 28/04				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.3, page 8	Third article should be numbered as 2.3 (and not 23)	Typographical comment	X			
2	2.3, page 8	Specific applicable paragraphs ~~is~~ are para 5.21, 5.22 and 5.23	Typographical comment	X			
3	2.3, page 9	Some ~~of~~ actions are of particular importance	Typographical comment	X			
4	2.6, page 10	To be reworded by Authors	This article is not clear and sentence seems incorrectly structured		X		Para 2.6 is deleted.
5	5.6, page 17	Identification of ~~a~~ response criteria for …	Should be in plural; criteria might be different for different hazards	X			
6	5.7, page 18	The following is a list of common internal hazards consistent with Ref. [1].	"hazards" in plural	X			
7	6.5, page 19	… the external hazard mitigation measures in a specific period	Typographical comment		X in specific high risk periods.		Modified in plural by other comment.
8	6.13, page 21	To be added to the list: • Toxic gas clouds drifting to the site	Important for control room habitability. Moreover, "Release of hazardous substances (Asphyxiant and toxic gases, corrosive and radioactive fluids)" is covered in Appendix B.13, so it would be good to mention it also here in 6.13	X			

9	7.5, page 22, last sentence	Also, combination of hazards means that additional …	Typographical comment	X			The comment meant "…combination of hazards means that…"
10	8.2, page 24	~~The operational hazard management programme should be taken into account in the initial plant design.~~ The operational hazard management programme should be consistent with the initial plant design.	To be reworded as proposed? Indeed, the operational hazard management programme comes after the initial design. So it seems impossible that this programme is taken into account in the initial design. See proposal for rewording.	X			
11	8.11, page 25	… and now present different hazards, etc.	The meaning of this last part of the sentence is unclear: to be reworded?	X			…changed their operating state affected by other hazards
12	10.4, page 27	To be added to the list: • On-site equipment and features for mitigating hazard effects;	Since 10.5 is limited to off-site equipment, the on-site equipment is missing. Therefore, to be added in 10.4.		X on-site equipment and features for mitigating hazard effects such as emergency vehicles;		An example added.
13	10.5, page 27	… Maintenance and inspection procedures need to include the additional ~~onsite and~~ off-site engineered equipment …	Given the first line of 10.5, onsite equipment is out of scope in 10.5 and should be covered in 10.4	X			
14	11.6, page 30	… Some examples of these types of additional risk are provided in paras 11.7 and 11.8 below.	11.8 mentioned twice. First appearance to be replaced by 11.7?	X			
15	A.1.20, page 38	Lay out of the paragraph	*For solids:* should be at the start of a new line	X			

16	B.3 and B.4	Consider combining the two sections into 1 section	Many of the sentences in B.4 are a repetition of sentences of B.3. It would therefore be beneficial to combine the two section and specify which parts are only for tsunamis/storm surges.			X	The following points are different between two floods, so we decided to divide; - Monitoring & Communication protocol; - Mitigation action such as consideration of low water condition.
17	B.3.8, page 52	Lay out of the paragraph	The paragraph should not start with a bullet	X			
18	B.5	Extreme winds (including Tornados, ~~Tropical~~ Cyclones~~, Hurricanes, Typhoons~~)	Basically, all cyclones are tropical and Hurricane and Typhoon are synonyms for the same thing.		X Extreme Winds including Tornados and Tropical Storms (Cyclones, Hurricanes, and Typhoons)		they are all basically the same tropical storms, but are given different names depending on where they appear.
19	Appendix B	Add a specific hazard for pandemic?	Looking at the actual concern and measures with respect to the COVID-19, a pandemic could also be considered as an external hazard		X		See 1.12. We clarified that this guide discusses hazards which cause physical impact for nuclear safety, but the lists of hazards are not exhaustive.

							And see 3.7. Regarding the pandemic and other situation, the consideration of the number of staff was added. However, this guide is dealing with physical hazards with impact on structures, systems and components (flooding, fire…). Pandemic must be considered among the "safety related" hazard, and affect only through humans. This will be discussed in the new revision of NS-G-2.4 "The Operating Organization for Nuclear Power Plants" and DS503 will keep it separated from other external challenges.

Protection against Internal and External Hazards in the Operation of Nuclear Power Plants - DS503

COMMENTS BY REVIEWER Reviewer: HUGO PONTES GALVÃO Page..1of.7. Country/Organization: Braziliam Navy Technological Center in São Paulo (CTMSP) Date: May, 15 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.2 / 2	Hazards at a NPP	Typing mistake.		X		"a nuclear power plant"
2	3.20 /3	Include: Alternative strategy if an action is unable to be performed.	Decision Making for hazard management.	X			
3	5.6 / 5	Identification of appropriate and diverse warning or monitoring.	Warming or monitoring systems should be diversified.			X	Diversity is not always operational recommendation.
4	6.13 / 6	Include: Rock-Soil slope instability	This kind of external hazard is relevant for some NPP such as Angra 1, 2 and 3.		X See B.1.5 and B.4.8		During operating phase, landslide is considered within monitoring of sedimentation level of dams or slope condition. This should be associated with earthquake and extreme precipitation
5	8.2 / 3	Include: during the operating stage, or during the descommmissioning process, ...	The operational hazard management should include the decommissioning process.		X See modified 8.2		It should be recommended for all appreciable stage of plant life.

COMMENTS BY REVIEWER Reviewer: JOSE ANTONIO BARRETO DE CARVALHO Page. 2 of 7. Country/Organization: National Nuclear Energy Commission (CNEN) - Brazil Date: May, 15 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
6	General	The document is strongly related to a development of an *Operational Hazard Management Programme* to cope with internal and external hazards. Each plant, based on its management system, can has different programmes or procedures to do that, Thus the NUSSC should discuss if the adoption of such Programme is a recommendation or an option to manage hazards. The essence of the DS503 should be the hazards coping measures (either preventive or mitigative), through a formal procedures or activities, independent on having a specific programme to that.	To recommend a development of new programme can undue input a work load, as many plants can have many of the requirements already implemented in other programmes or plans.	X See modified section 3.			
7	General	If a programme for manage the hazards management is adopted consider to use the name *Hazard Management Programme* (without the word *Operational*).	In same languages the translation of *Operational Hazard Management Programme* can be interpreted as a Programme to deal only with hazard coming from operational event or activities.	X			The terminology "Operational hazard management programme" is replaced.

Protection against Internal and External Hazards in the Operation of Nuclear Power Plants - DS503

COMMENTS BY REVIEWER Reviewer: JOSE ANTONIO BARRETO DE CARVALHO Page. 3 of 7. Country/Organization: National Nuclear Energy Commission (CNEN) - Brazil Date: May, 15 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
8	General	The term "internal hazards" should be better explained.	Differently of *"external hazards", "internal hazards"* has no a common understanding.		X See modified para. 2.1.		The description from SSR-2/1 is referred.
9	1.9	remove all paragraph	The DS503 deals with measure to cope hazards, independent if the plant is a new one. Of course, new plants have better design, with better provisions against hazards. The design enhancement of old plants is recommended by others documents, but is not a purpose of DS503.		X See modified para 1.9 (new 1.13)		The application for existing plants is clarified.
10	2.6 / line 2	Remove: *hazards depending upon which is the operating organization of the different NPPs.*	The hazards coming from nearby plants should be considered independent of the organizations involved		X See modified para 2.6.		Clarified.

COMMENTS BY REVIEWER Reviewer: JOSE ANTONIO BARRETO DE CARVALHO Page. 4 of 7. Country/Organization: National Nuclear Energy Commission (CNEN) - Brazil Date: May, 15 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
11	2.8	*Rewrite or remove.*	As written, the paragraph is more related to design. The example in parentheses is inappropriate, as the protection of a blackout due to a quake is a design feature and can not be provided by operational team.		X See modified para 2.8.		Rewritten considering that this is an operational guide.
12	2.9 c)	Rewrite as: "*An internal or external hazard occurring does not affect the habitability of the main and supplementary control rooms. In case the former is not habitable, access to the supplementary control room is ~~to be~~ ensured. In addition, and when necessary, plant personnel should be able to access equipment in order to perform local actions."*	The habitability should be ensured in both control rooms (main and supplementary). The word "latter" in the original text is inadequate as only one control room is cited in the previous phrase.		X See modified para 2.9.		It is not always exists "supplementary" room.
13	2.10 / lines 6-7	Proper surveillance and in-service inspections should be implemented for equipment and features that cope *(and, if possible, detect) with hazards.*	Better wording	X			

COMMENTS BY REVIEWER Reviewer: JOSE ANTONIO BARRETO DE CARVALHO Page. 5 of 7. Country/Organization: National Nuclear Energy Commission (CNEN) - Brazil Date: May, 15 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
14	3.2	New wording: *3.2. The arrangements for delegation of responsibilities should be included in the operational hazard management programme. This documentation identifies the organizational structures, processes, specific responsibilities, level of authority, and interfaces of personnel involved in hazard management including their relationship with internal and external organizations, taking into accounting the differences in site challenges, plant design aspects and local and national governance.*	Better wording , mainly that related to lines 5 to 7 of the original version.		X See modified para. 3.2.		Other comments are reflected on this para.
15	3.18 & 3.19	*Replace the term "working level of understanding" by just "level of understanding".*	"working level of understanding" is not anusual expression.	X			
16	3.20/Line 3-4	New wording: *A timely evaluation/assessment that the <u>response</u> criteria for specific hazards are met.*	The criteria should be related to the action to respond the hazards, not to the hazards themselves.	X			
17	3.21/Line 8	*Replace the term "in good time" by "in a timely manner".*	More appropriate wording.	X			

COMMENTS BY REVIEWER Reviewer: JOSE ANTONIO BARRETO DE CARVALHO Page. 6 of 7. Country/Organization: National Nuclear Energy Commission (CNEN) - Brazil Date: May, 15 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
18	5.4	*Replace the term "will help in defining" by "should define".*	A programme should not help, but it should define the responsibilities.	X			
19	6.12	*Remove the entire item.*	Unnecessary. At least the mention to stand- down additional staff should be removed, as it depends on very particular circumstances and is not necessary to be a requirement.		X See modified para. 6.12.		Other reviewer's comments are reflected.
20	7	*Review the item to differentiate the combination of hazards, when they come from independent events from that when they come from consequent events. The latter cases are more credible and should have special attention.*		X See modified section 7 and App. C			
21	8.2/Line 12	Rewording: *8.2. The plant design. should be taken into account in operational hazard management programme.*	the original text suggests that the project comes after the programme. (in fact is the opposite).		X See modified para 8.2.		Other comments are reflected.

COMMENTS BY REVIEWER Reviewer: JOSE ANTONIO BARRETO DE CARVALHO Page. 7 of 7. Country/Organization: National Nuclear Energy Commission (CNEN) - Brazil Date: May, 15 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
22	9.1	Remove the inital part of the sentence: ~~*The operational organization should understand that.*~~	Inadequate wording)in fact everyone should understand, but it is not necessary to say that). Removing this will not change the sense of the paragraph.	X			
23	9.2	Replace the term “metallic” by *“heavy”.*	he sense of the requirement should be the materials that have the potential to damage ESC, independent if they are metallic or not.	X			
24	10.3	*The item should incorporate ageing management matter.*			X See modified para. 8.7. (new 7.7)		Consideration for Ageing management is linked to upgrading programme (assessment phase).
25	10.4	*The item should include structures and fenders*		X			

CNSC Comments on

DS503 SG Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

	COMMENTS BY CNSC Country/Organization: Canada / Canadian Nuclear Safety Commission Date:				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Project lead response	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	Section 1.2/2	To ensure safety, it is necessary that the operating organization of a NPP recognizes that the personnel involved ~~in~~ should be cognizant…	Typo.	Accepted		X ..that the personnel involved in activities at the site should be cognizant..		corrected
2.	Section 5.1/7	The hazard analysis and operating procedures should also be updated regularly over the lifetime of the plant to reflect lessons learned from operating experience.	It should be emphasized in this prargraph, while consideration of hazards begins at the early design phase, there is periodic updating of the overall programme throughout operation in accordance with paragraph 8.2	Accepted	X			

Comments to DS 503

Protection against Internal and External Hazards
in the Operation of Nuclear Power Plants

COMMENTS BY REVIEWER **Reviewer:** Mr/ Moustafa Aziz **Page.... of....** **Country/Organization:** Egypt (Nuclear and Radiological Regulatory Authority) **Date:**				RESOLUTION			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
	Item 2.2 Page 8	**a NPP**	**Space between a and NPP**	**X**			
	Item 6.1	**Specifically, the operational hazard management programme should be fulfilled for levels of hazards more severe than those considered for design derived from the evaluation for the impact of these hazards**	**Comma should be deleted between design and derived**	**X**			
	Item 8.4	**Although DS494[1] ,DS498[2] and DS490[3]**	**Reference no 3 refers to DS490 not as indicated in the item 8.4**	**X**			

ENISS comments on
DS 503 Protection against Internal and External Hazards in the Operation of Nuclear Power Plants (Step 7) April 2020

COMMENTS BY REVIEWER				RESOLUTION ENISS			
Reviewer: ENISS Country/Organization: ENISS			Page 1 of 5 Date: 25/05/2020				
Comment No.	Para/Line No.	Proposed new text	Reason	Accept ed	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	3.20	3.20~~1~~. The operating organizations should put in place processes to ensure that meteorological forecasts are monitored and that the appropriate actions are taken when an external hazard is predicted to occur (for example coastal flooding, tornadoes, etc). The operating organization should then prepare and activate the organization as required to minimise the effects of a predicted hazard on the NPP, and implement hazard mitigation measures and coping strategies. For these hazards that are predictable or partially predictable, the operating organization should undertake the steps listed **in the paragraph ~~above~~below** to ensure that the site is prepared in good time. In addition, all of the following should be considered and implemented: - Cooperation with local state, and national external organizations: […]	Reversal of the order of 3.20 and 3.21 is advised since: • 3.20 does talk about the decision making after the hazard has occurred. • 3.21 does talk about operating organizations when a hazard is expected to occur. This is in contradiction with the normal chronology.	X			

		- Security aspects […] - Multi-unit plant sites […] 3.20~~θ~~1. When a hazard has occurred, decision making should be performed by the operating organization to ensure: - A timely evaluation/assessment that the criteria for specific hazards are met; -That time-sensitive actions and confirmation of actions are to be performed in order to manage the risk imposed by the hazard; - Identification of any required support (e.g., internal organizations, external organizations, emergency support equipment, specialized personnel); - That the fundamental safety functions required for the appropriate plant operating mode are not or will not be threatened.					
2	3.21	(…) For these hazards that are predictable[1] or partially predictable[1], (…) [1]Footnote: The basis of a valid forecast or prediction is formed by facts that are collected using formalized	For ensuring a common understanding, there should be a definition of "predictability" and "partially predictable". This applies to the whole document.	X			

		methods and forecast technologies to create data. Resulting predictions are available from local, national and regional organizations which are specialized in their production and provision. On-site monitoring can support the information. On this basis decisions then can be made with a certain probability.					
3	3.21 (linked to 1.11)	- Security aspects ~~The operational hazard management programme should be compatible with the security programme of the nuclear power plant.~~ The operational hazard management plan should appropriately account for security aspects (cf. §1.11). ~~also be developed cooperatively with off-site security and/or law enforcement organizations as recommended by the plant's security staff. Guidance to be considered is given in the plant's security plan, IAEA Nuclear Security Series No. 27-G, Physical Protection of Nuclear Material and Nuclear Facilities (implementation of INFCIRC/225/Revision 5) [12], and in other relevant Nuclear Security Series documents.~~	The operator has primary responsibility for the safety and for physical protection measures at the plant and the means put in place to ensure both. In DS503, the interface between safety and security, globally covered by §1.11, seems sufficient. The proposal is made for clarification. §1.11 makes already reference to the IAEA Nuclear Security Series.		X The operational hazard management programme should appropriately account for security aspects (see para.1.15). The programme should be developed in consultation with physical protection personnel and should include the procedures to inform the modifications to the physical protection features and procedures to notify for any		The references are removed to avoid the duplication with para 1.15. (Para. Number is also revised.) The interfaces between security is added by the comment resolution from other MSs.

					hazard occurrence to security personnel to ensure the operation for both evacuation and hazard coping and mitigation strategies.		
4	6.6.	Hazard mitigation measures and coping strategies for external hazards should include the following elements to be adapted to the hazard characteristics and especially its predictability: -Identification of a realistic predictability or warning time for the applicable hazard, -Identification of appropriate warning or monitoring systems and equipment for the applicable hazard, -Characterization of the functional risk caused by the hazard, e.g., specific equipment that may need protection from the hazard, -Development and implementation of an operational strategy for responding to events with warning, e.g., procedures required to support anticipatory actions, -Development and implementation of a plant strategy for responding to events without warning e.g., response actions that may be required	It is important to state this additional aspect in order to avoid misinterpretation. It applies especially to the two first bullet points which cannot be developed for unpredictable hazards for example.	X			

		for a particular hazard such as debris removal following a tornado or seismic event, -Development and implementation of communication standards and protocols with external organizations					
5	A6.6	When evacuation or retention capacities cannot contain the flow of an internal flood, the operating organization should establish operating procedures for the detection and mitigation of internal floods. Procedures should include instructions for the isolation of leaking systems and flooded rooms, and the potential use of deployable pumping equipment to drain flood water.	The ultimate purpose being to avoid any safety or security consequences on the installation or staff, procedures aren't the only way to solve it. Passives dispositions can be taken into account (floor drains, evacuation pipes or tank retentions areas…).	X			
6	B4.3	The operating organization should establish and implement procedures that describe pre-, during and post-event actions corresponding to the expected amount of precipitation or in case of river flood the expected time of ~~maximum river flood height~~ the different events which justify to put in place protections or to implement specific actions.	In case of river flood, there are actions to put in place before the maximum river flood height (preventive actions may be taken for different river flood thresholds, defined below the maximum height).	X			

SG Protection against Internal and External Hazards in the Operation of Nuclear Power Plants**, STEP 7**
(DS503*)*

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: M-L Järvinen Country/Organization: STUK			Page.... of.... Date: 14th May 2020				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	General	DS503 is a challenging topic for development of an IAEA safety guide. The current draft provides a lot of useful guidance on internal and external hazards. However, IAEA should considerer suitability of the content to IAEA Safety Guide. The draft safety standard recommends para 3.4 establishing of an overall hazard management programme. However, there is no basis in SSR-2/2 requirements for such a programme. In SSR-2/2 there are explicate requirements for operational programmes of NPPs. However, no explicate requirements are presented for an overall or a comprehensive hazards programme. Only for fire safety there are explicate requirements in SSR-2/2. The role of an overall or a comprehensive hazards management programme is not clear and its	ref. WENRA Guidance Document Issue T: Natural Hazards Head Document, April 2015	X			

		relation to other operational programmes and SSR-2/2 Requirement 12 on periodic safety reviews. SSR-2/2 para 1 .1 states that “The safety of a nuclear power plant is ensured by means of proper site selection, design, construction and commissioning, and the evaluation of these, followed by proper management, operation and maintenance of the plant. In a later phase, a proper transition to decommissioning is required. The organization and management of plant operations ensures that a high level of safety is achieved through the effective management and control of operational activities.” In many member states such as WENRA countries internal and external hazards are managed from design to operation in line with SSR-2/1 and SSR-2/2 with the following idea: ▪ design is performed conservatively in order to ensure sufficient safety margins. ▪ possible, the protection is implemented so that it does not require actions from the operating personnel. ▪ is ensured that the management of assumed operational occurrences and postulated					

		accidents is possible during and after internal and external design basis events. ▪ predictability of external events and the available warning time is taken into account in the provisions. ▪ possibilities and procedures to control the plant's status during and after internal and external events are ensured. ▪ possible simultaneous effect of external events on parallel and diverse (sub)systems, several systems, structures and components, several nuclear power plant units and other nuclear facilities located on the same site, the regional infrastructure, material deliveries from outside the plant site and the implementation of countermeasures is taken into account. ▪ sufficiency of personnel and other resources is ensured considering the use of shared equipment and personnel at several nuclear power plant units and other nuclear facilities located on the same site. ▪ is ensured that protection against internal and external hazards does not adversely affect the				

		management of initiating events caused by other reasons.					
2.	General	It is important to notice the difference of fire hazards compared to other internal and external hazards. It should be ensured that the generic guidance does not risk the effectiveness of fire safety guidance. NS-G-2.1 para. 1.1 states that "Operational experience gained from incidents in nuclear power plants around the world has continued to demonstrate the vulnerability of safety systems to fire and its effects. Considerable developments have taken place in recent years in the design of and regulatory requirements for fire safety in operating nuclear power plants, resulting in substantial improvements at many plants. If these improvements are to be maintained, a systematic approach to fire safety is necessary for both plants built to modern standards and those built to earlier standards." At the moment all the element for fire safety can be found from the safety guide but the content is distributed, and generic part of the safety guide miss key issues related to fire safety.		X The notice of fire hazards are added as para 1.3.			
3.	General	The development of all of the safety guides related to the use of NPPs should be developed in an integral		X			

		manner. DS503 is closely related to DS497 safety guides and GSG-7 as presented in the DPP DS503. The close relation should be visible in the safety guide from the introduction. Constancy and clear allocation of issues in between different safety guide should be ensured.					
4.	General	Up-date-references should be used and safety standards preferred to other documents such as the safety series documents, INSAG, .		X See the resolution for comment No.11, No.35, 36.			
5.	General	The terms internal hazard and external hazard should be defined. At the moment there is only term external event defined in the IAEA glossary. "*Events* unconnected with the *operation* of a *facility* or the conduct of an *activity* that could have an effect on the *safety* of the *facility* or *activity*." Internal event? events connected to the operation…… Para 5.1 discusses internal hazards specific for the site. Please clarify. Internal hazard is neither defined in DS494.			X See the resolution for comment No.9.		

6.	General	IAEA should consider replacing hazard management programme as appropriate with hazard management or hazard management measures in the safety guide DS503.		X			
7.	Introduction	A proposal for new introduction is attached.	The introduction should describe the content of the safety guide and it should be in line with DPP DS503 approved in 2017. We have made proposal for the new introduction to facilitate discussion on the content and scope of the safety guide DS503.		X See the modified version.		Some elements are kept or modified. e.g. Recommended para 1.4 (External phenomena) is not general and not connected to later description. Recommended para 1.7 (DiD for fire) is mentioned in the Section 4 and removed in Section 1 to avoid duplication. Etc.)
8.	Chapter 2	Chapter 2 should be modified to discuss the relation of this specific safety guide and already existing safety guide under revision (DS497). As an example, • DS497A deals with OLCs considering also hazards • DS497B deals with modifications and there are several new recommendations on			X		See 2.10 Making references to DS497 series in Section 3 to explain how the individual management programmes link to these guides and avoiding repeating general contents. DS497B and DS 497G were added. However, the DS497 series is still in progress of

		internal and external hazards • DS497C operating organization covering also issues related to hazards • DS497D discusses core and fuel management, and among other issues heavy loads • DS497E deals with maintenance, surveillance and testing activities. There are several paragraphs on internal and external hazards. • DS497F training • DS497G deals with operation of the NPP, among other this hazards, house keeping , materials etc.					revision, so it is difficult to reflect many items at this time, therefore the part which is not changed from original NS-G-2.X were mainly picked up.
9.	2.1.	Internal hazards are those hazards to the plant that originate within the site boundary and are associated with failures of facilities and activities that are in the control of the	see. General definition of internal hazard and external hazard, please align the sentence after the definitions have been made and checked to be constant with SSR-2/1 text.		X The internal and external hazards are described in par. 5.16 and 5.17 of Safety Standards Series No. SSR-2/1 (Rev. 1) [5]. Internal hazards		The guide should just refer the SSR and reduced unnecessary descriptions. Although these general terminologies are not defined in any IAEA standards.

		operating organization. External hazards are those natural or human induced events that originate external to both the site and the processes of the operating organization, and which the operating organization may have very little or no control. Such events are unconnected with the operation of the NPP site or conduct of an activity on the site but could have an adverse effect on the safety of the NPP site or activity. Throughout this safety guide, the word “hazard” implies both internal and external hazards unless where specifically noted.			that originate within the plant are associated with failures of facilities and activities of the operating organization. External hazards are those natural or human induced events that originate external to both the site and the processes of the operating organization, for which the operating organization may have very little or no control. Such events are unconnected with the operation of the NPP site or conduct of an activity on the site but could have an adverse effect on the safety of the NPP site or activity. Throughout this Safety Guide, the word “hazard” or		

					"hazards" implies both these internal and external hazards, and the combination of these hazards unless where specifically noted.		
10.	2.5.	Provisions that ensure plant safety in the event of hazards should be maintained for each stage of plant life, from design to construction and commissioning, plant operation and through decommissioning.	please clarify the content of para.2.5.. The provisions are typically design features and operational measures that ensure the plant safety in the event of a hazard. The para. recommends maintaining these measures during the design, construction and through decommissioning. hazards should be considered at each phase. However, maintain provisions may not be relevant to all of the life cycle phases.		X The hazard management that ensure plant safety in the event of hazards should be maintained current and applicable for each stage of plant life, from construction and commissioning to plant operation and through decommissioning . .		
11.	2.6	2.6. Hazards caused by (or occurring at) different NPPs at the same site should be considered internal or external hazards depending upon which is the operating organization of the different NPPs.	Something seems to be missing in Para 2.6. In addition, the categorization of hazards based on organizational factors is questionable. From a safety point of view, for example, an	X See modified para 2.6.			

			explosion pressure wave or an external fire at a neighbouring facility is an external hazard irrespective of the operating organization. IAEA use of internal and external hazard should be checked across IAEA documents.				
12.	2. 10	… Proper surveillance and in-service inspections should be implemented for coping with (and, if possible, detecting) hazards. Hazards should be taken into account in in-service inspections and, where necessary, additional in-service inspections should be in place for coping with hazards.	It is important that the need to consider internal and external hazards in each in-service inspection. In some cases special in-service inspections on coping with hazards may be necessary.		X … Proper in-service inspections should be implemented for coping (and, if possible, detecting) with hazards. Hazards should be taken into account in in-service inspections and, where necessary, additional in-service inspections should be in place for coping with hazards.		The internal comment was reflected; "surveillance is aimed to keep under control degradation and configuration management."
13.	2. 11	An appropriate management system should be applied to all hazard protection and	Originally, ordinarily or mainly instead of ordinally.	X			

		mitigation features, including those that were not ~~ordinally~~ originally installed or designed as safety systems or features,					
14.	Chapter 3	Please rewrite chapter3 to a more flexible form. An overall or comprehensive operational hazard management programme should not be recommended. Instead of that a set of hazard management measures should be defined in the management system. Among those measures there may be specific operational hazard management programmes such as an operational fire management programme required by SSR-2/2.		X			See the second review table
15.	3. 3.	Responsibilities for deploying protective measures should be realized by plant management and plant operating personnel in a timely manner when a hazard is predicted (e.g, severe storm). The operating organization should identify and establish staffing levels and capabilities, and organise them appropriately, in the period prior to the event, to mitigate and cope with the hazard.	Para 3.3. applies for sustain type of external hazards. Chapter 3. organization and responsibilities 3.1 ref. GRS Part 2, NS-G-3.5 3.2 delegation of responsibilities, interfaces with personnel, external etc. 3.3. predictable hazards		X		The paragraphs were modified and clarified.
16.	3. 6.	The operational hazard management programme should consider and include:	Please add: detection prevent, detect, mitigate	X			

		- The prevention of avoidable hazards that can affect nuclear safety, - Detection of hazards - Mitigation measures for hazards or credible combinations of hazards, and - Hazard coping strategies.	Please clarify the role of Hazard coping strategies.				
17.	4. 2	Please check quotations, odd number of quotation marks.		X			
18.	4. 4	The reference INSAG Series No. 10 dates from 1996. Perhaps IAEA has a more up to date document on DiD. Please consider using safety standards eq. SSR-2/1 etc..		X			
19.	Chapter 4	Please align Chapter 4. with SSR-2/1 discussion on DiD. The basis for the text should be found from the safety Requirements documents in this case SSR-2/2 and SSR-2/1. SF-1 should not be used as a basis for safety guide level documents.	-	X See reviced section 2			
20.	Chapter 4	To ensure the concept of defence in depth of nuclear power plant according to SSR-2/1 against fires, it is necessary to verify defence in depth for internal fire hazards (appendix A.1) in-line with corresponding operational limits and conditions.		X			
21.	6.1	6.1. The operational hazard management ~~programme~~ for external hazards should be based on	The identification of hazards and plant vulnerabilities should be	X			Management programme is deleted

		identification of site-specific external hazards and plant vulnerabilities. These are identified, for example, in connection with site evaluation, plant design, periodic safety reviews, evaluation of operational experiences, and external hazards PRA. For those external hazards considered applicable to a particular site, the focus should be on the proper consideration of the hazard challenge presented and documented in the appropriate hazard analysis. Specifically, the operational hazard management ~~programme~~ should be fulfilled for levels of hazards more severe than those considered for design, derived from the evaluation for the impact of these hazards. DS498 [2] and DS490 [3] provide general guidance on the design aspects of external hazards including hazard analysis.	mentioned explicitly as the basis for the operational hazard management.				
22.	6.5	6.5. The operational hazard management ~~programme~~ should enhance the external hazard mitigation measures in specific period. (See para 5.3.) The expression "specific period" should be explained in this Para.		X			Management programme is deleted
23.	6.12	The operating organization should re-establish normal conditions and ~~stand-down any~~	"Stand-down" is a noun and "stand down" would not be suitable here.	X			

		~~additional staff deployed from normal duties~~ return any additional staff temporarily assigned to coping with hazards to their normal duties in a controlled manner after the cancellation of a national or local hazard warning.					
24.	8.1		Reference is made to IAEA Safety Standards Series No. NS-G-2.4, yet para 6.2 of aforementioned document doesn't include operational hazard management programme.	X			Management programme is deleted
25.	8.2	8.2. ~~The development of the operational hazard management programme should be taken into account in~~ The development of the operational hazard management ~~programme~~ should be started concurrently with the initial plant design. It should be updated if additional hazards have been identified after the plant was constructed, during the operating stage, or as part of a re-licensing application, or for a periodic safety review (IAEA Safety Standards Series No. SSG-25, Periodic Safety Review for Nuclear Power Plants [17]).	The operational hazard management program is developed based on the plant design solutions, and it should be developed interactively with the plant design.		X The hazard analysis method and development of hazard management should be consistent with the plant design bases and/or design assumptions. It should be reviewed and updated; - if additional hazards or the reassessment of severity of hazards have been		Clarified.

					identified in applicable stage of plant life, or as part of a re-licensing application, or for a Periodic Safety Review [17], - if new information shows the existing design bases (or if applicable for existing reactor, design extension conditions) may be inadequate (See par. 1.13.).		
26.	Ch. 10	Fire loads, especially transient fire loads should be mentioned specifically in Ch. 10		X			
27.	Ch. 10	Fire doors, watertight doors and cable penetrations should be mentioned specifically as items to be included in surveillance and inspection programmes. Outages should be mentioned separately.		X			
28.	A.1.20 (b) / last line	… and fire protection measures provided.	The word “protection” is missing.	X			
29.	A.1.36 / line 4	However, fire has the potential to fail multiple systems and thus to pose a threat to safety, ….	Speaking about common cause failure may be misleading.	X			
30.	A.2.1 / line 6	… may also come from High Energy Arc Flashes in electrical equipment.	Speaking about high voltage equipment screens out most of the equipment related to the	X			

			hazard at NPPs, e.g. 400 V and 6 kV electrical cabinets.				
31.	A.6.4 / last line	… whereas others may require actions by plant personnel.	Wording	X			
32.	A.7.3 / line 4	There should be considerations of the need for on-site personal protective equipment (e.g. breathing apparatus, protection suit) …	Terminology, safety equipment = breathing apparatus, protection suit?	X			
33.	App C.5	Replace coincidental by correlated.	Coincidental is ambiguous, it may mean happening at the same time but also happening by chance.	X			
34.	App. C.7	Consequential fires should be mentioned.	There is no mention of consequential fires (after seismic events, explosions, extreme heat etc.) in the entire document. As a very important factor for safety, they should be explicitly mentioned.	X			
35.	Reference 15	[15]. INTERNATIONAL ATOMIC ENERGY AGENCY, Implementation of Accident Management Programmes in Nuclear Power Plants, Safety Report Series No. 32, IAEA, Vienna (2004). Please replace with a new safety guide SSG-54 “Accident Management Programme for Nuclear Power Plants”, IAEA Vienna (2019)		X			

36.	Reference 15	[16]. INTERNATIONAL ATOMIC ENERGY AGENCY, The Operating Organization for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-2.4, IAEA, Vienna (2002). Please replace with DS497C.		X			
37.	Reference 20	[20]. INTERNATIONAL ATOMIC ENERGY AGENCY, Earthquake Preparedness and Response for Nuclear Power Plants, Safety Series Report No. 66, IAEA, Vienna (2011) Please use new safety standards as a reference instead of Safety Series Report.				X	The Safety Series Report No.66 is referred from this guide as a good example of pre-event and post-event external hazard action programme. (See para 6.1) The seismic experts of the agency recommended to refer this report, which is still valid and is not incorporated to the SSG-9 or DS507.

SG Protection against Internal and External Hazards in the Operation of Nuclear Power Plants**, STEP 7 Draft June 2020, file 2020612 (DS503*)***

COMMENTS BY REVIEWER Reviewer: M-L Järvinen Page.... of.... Country/Organization: STUK Date: 24th June 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	General	The development of all of the safety guides related to the use of NPPs should be developed in an integral manner. DS503 is closely related to DS497 safety guides and GSG-7 as presented in the DPP DS503. The close relation should be visible in the safety guide from the introduction. Constancy and clear allocation of issues in between different safety guide should be ensured. Some examples of the foreseeable difficulties are presented below as an example.		X			
2.	General	**IAEA should consider replacing hazard management programme as appropriate with <u>hazard management or hazard management measures</u> in the safety guide DS503**.	Some changes have been made but no systematically in the safety guide DS503 draft. Please check the safety guide and remove term management programme	X			The term was replaced with "hazard management" or "hazard management measures" through the entire document.

			for hazards. the technical content is clear without use of programme.				
3.	2.3	**Requirement 11: Management of modifications** **"The operating organization shall establish and implement a programme to manage modifications."** The management programmes for hazards should be maintained and updated as necessary to ensure that the changes in the actual plant modifications. The consideration for the plant modification is particularly significant for fire hazard management. Specifically, applicable paragraphs are 4.40 and 4.41. ….	The management programmes for hazards should be maintained and updated as necessary to ensure that the changes in the actual plant modifications. Is there a word missing? Please clarify. Why modifications are important only in connection of fire hazards? Counter example: At Loviisa it was noted that number of oil tankers passing Loviisa NPP has increased significantly. Loviisa ultimate heat sink is see. Modification was made to add another ultimate heat sink independent of the see. This was a significant improvement to the Loviisa NPP and significant modification was made.	X			The text were corrected and the yellow part were deleted.

4.	2.3	Please check the references to other paragraphs. Examples are given below: Specifically applicable paragraphs are par. 7.10. and 7.11. housekeeping? Specifically, applicable paragraphs are 8.1-8.7, 8.13, 8.14 and 8.14A maintenance an testing?		X			Fixed and some useless references were removed.
5.	2.4.	The management programmes that ensure plant safety in the event of hazards should be maintained current and applicable for each stage of plant life, from design to construction and commissioning, plant operation and through decommissioning.	please clarify the content of para.2.4.. The programme should be started during design phase. SSR-2/1 does not define such a programme-	X			The texts were modified.
6.	2.6	Hazards have the potential to induce initiating event to cause failures of means that are necessary to prevent significant harmful effects, and to adversely affect (directly or indirectly) the barriers to release of radioactive ~~materials~~ substance. The following should be considered: …	Please replace material with substance. Radioactive material is under regulatory control. Releases of radioactive substance according to the glossary.	X			Replaced.
7.	2.8	Protection against hazards is provided by ensuring the high quality and reliability of SSCs and adequate additional means. This should notably be done by application of: qualification of these	2.8 is very complicated. Please clarify and see DS497E (NS-G-2.6) simple recommendations on the topic.	X			The former parts were deleted.

		SSCs and additional means, redundancy diversity, physical separation operability , segregation, functional independence, fail safe features and through design of appropriate barriers. Designing protection against the effects of hazards is an iterative process, integrating the needs of protection against several hazards, assessed using a graded approach. Therefore, as operational recommendations, proper in-service inspections should be implemented for equipment and features that cope (and, if possible, detect) with hazards (or of signs that can lead to the occurrence of an internal hazard) and implementation of necessary corrective actions to ensure protection against the hazard. Hazards should be taken into account in in-service inspections and, where necessary, additional in-service inspections should be in place for coping with hazards.					
8.	2.12	The operating organization should consider an ~~simple~~ approach for defence in depth applicable during operation presented in IAEA SSR-2/1 (Rev. 1) [5] to protect the plant from hazards (See Appendix A and B).	Please delete simple. No added value in the text.	X			Deleted.

9.	Chapter 3	Please rewrite chapter3 to a more flexible form. Management programme for hazards should not be recommended. Instead of that a set of hazard management measures should be defined in the management system. Among those measures there may be specific operational hazard management programmes such as an operational fire management programme required by SSR-2/2. Overview of the hazard management could be presented as an example in FSAR general chapters.	Please check the whole document for consistency.	X			Managemet programmes were not be recommended and wordings in the entire chapter 3 were modified in more flexible form.
10.	3.5	Specific management programmes are required for fire safety by IAEA SSR-2/2 (Rev.1) [6]. For the management programme for other hazards, it also required to be integrated with the nuclear and radiation safety programme (See par. 2.2). All operational provisions for hazards management should be covered by various plant management processes and programmes [16]. The entire processes for hazard prevention, protection and mitigation measures and hazard impact coping strategies	Please clarify the reference to para.? Here is relation to safety guide GSG-7. Please check the referencing and para 1.2 of DS503.	X			The references were corrected and GSG-7 is added to relevant parts.

		should be incorporated in those programmes based on the safety assessment[1] [4] [7].					
11.	3.6.	In the context of internal and external hazard, the followings are examples of items which recommended to include in each management programme: - management programme for plant operations; operational limits and conditions and/or procedures for hazards, formal communication systems with plant organizations during hazards, shift rounds to monitor indication of hazards, deviations in fire protection such as deterioration protection systems and the status of fire doors, accumulations of combustibles, condition of flooding protection features, seismic constraints, unsecured components, and housekeeping [13]. - management programme for maintenance, surveillance and in-service inspection; work control and administrative procedures	Please clarify the text and connection to other safety guide related to operation of NPPs. Also please explain why modifications are discussing industrial safety etc. not the plant modifications as in DS497B (NS-G-2.3). DS497 presents extensive recommendations for managing modifications at the NPPs.				3.6 were deleted. And the examples of measures in each programmes were moved to footnote in Section 2. We checked the STUK documents and cofirm other member states situation, we concluded that the overview of a set of management programmes are differ from the regulation and also different from hazards. Instead to put the high-level example, we put the specific example for the extreme wind in B.5.7. to describe how the management programmes were required to activated to cope with a

[1] The structure of management programmes for other hazards can be determined based on graded approach depends on the degree of safety significance of the site specific hazards, and other factors, such as the extent and difficulty of the efforts required to implement an protection activity against those hazards, the number of related processes, the overlap of the processes and the resource optimization (see 3.4 and Fig. 1 in GSR Part 4 (Rev. 1) etc. [7]).

		for fire hazard control, surveillance programme for hazard mitigation and coping equipment, and management for storage facilities to limit the risk of fire, flooding, earthquake, missiles and release of hazardous substances [18]. - plant modifications; specific safety consideration for industrial hazards such as high voltages, working at heights, fire and use of chemicals or explosives, and special temporary emergency procedures during the modifications [21].					hazard. We hope this help the understanding of member states. These remarks in 3.6 were moved to the footnotes. For the modification management, the some texts were added to express that entire plant modification programme may be appreciable for the hazard management.
12.	3.6	The management systems for physical protection, emergency preparedness, feedback of operational experience, safety assessment and review and training and qualification can also include operational provisions for protection against hazards. The operating organization should create an overview document of the processes contained in those programmes and add appropriate information to these programmes that will allow for an efficient management for hazard protection.	IAEA should not recommend producing a certain type of document. The national frameworks define the document produced by the licensees. This may be unnecessary in many counties even in the case there is no management programme for hazards. Where licensing basis covers all types of plant states also accident	X			Deleted from para 3.6 and moved to the footnote of para 3.20 as an example for effective decision making. B.5.7. were also added as an example.

			conditions with DECs overall information could be in general part of FSAR as an example.				
13.	3.6	Throughout this guide the collective term “management programmes for hazards” imply these various operational management programmes which including processes for prevention, protection and mitigation measures and impact coping strategies against any internal, external hazards and these combinations.	The definition of the management programme for hazards should be defined at the beginning of the safety guide if used. Also, the other alternatives should be presented.	X			The hazard management were defined in Section 2.
14.	5.1	Management programmes for protection against external hazards should be based on identification of site-specific external hazards and plant vulnerabilities. These are identified, for example, in connection with site evaluation, plant design, periodic safety reviews, evaluation of operational experiences, and if applicable, external hazards Probabilistic Risk Assessment. For those external hazards considered applicable to a particular site, the focus should be on the proper consideration of the hazard challenge presented and documented in the appropriate hazard analysis. Specifically, management programmes for protection against external hazards should consider the potential impact	Please-clause is complicated and the exact meaning is not quite clear. What is the meaning of random protection? Delete and replace rest of the sentence with Levels of hazards more severe than those considered for design should also be considered in the management programmes based on the evaluation of the impacts of these hazards.	X			The sentence were modified and replaced with suggested texts.

		of external hazard levels lower than the design basis, but in combination with other hazards or random protection or equipment failures, design basis external events where the protection makes use of temporary measures and operator actions ~~..~~ Levels of hazards more severe than those considered for design should also be considered in the management programmes based on the evaluation of the impacts of these hazards. IAEA DS498 [2] and DS490 [3] provide general guidance on the design aspects of external hazards including hazard analysis.					
15.	5.3	Notification protocols between appropriate external organizations and the operating organization for periods of increased risks from third-party activities (e.g. rally groups, demonstrations, etc.) should be considered crucial and established in advance. These protocols should allow timely preparation to be taken by the plant organization to mitigate potential external hazards resulting from these third-party activities. The protocols should also include the consideration for events at or near the site boundary area (e.g. temporary increases in population and traffic, potential external hazards and the dispatch plan of the	Should the operations at the switchyard be included? The operation is very different from examples given in para. 5.3. Maybe an own para. is needed?	-			No, we cannot understand the necessity to include the operations at the switchyard because it seems not relevant to this paragraph.

		external organizations to those hazards, etc.) so that the operating organization can provide clear guidance for the notification and implementing pre- and post-event actions.					
16.	5.8	The operating organization should take actions to prevent or mitigate the propagation of hazard effects throughout the entire site prior to (for a forecasted event) or during an external hazard that impacts a vulnerable/sensitive portion of the site. In a wider sense, this includes ensuring site access routes that may be impacted from the hazard are available and useable or by providing alternative means of site access (e.g., by boat or helicopter). Adverse working conditions due to the hazard should be taken into consideration in the operating procedures. Operator personal safety should be taken into account, particularly during an event.	please add sentence). … Adverse working conditions due to the hazard should be taken into consideration in the operating procedures. …	X			Added
17.	6.6	If a combined hazard event occurs that has not been anticipated as part of the safety analysis, then the precautionary conservative decision-making principles should apply. For reactors operating at the time of the combined hazard, shutdown or power reduction should be considered on the basis of the operational decision-making process	Is the safety guide SSG-32 correct? Should it be SSG-54?	X			Fixed

		performed by the operating organization. The operating personnel should then follow the site accident management programme in accordance with IAEA SSR-2/2(Rev.1) [6], and Safety Standard Series No.SSG-32, Accident Management Programmes in Nuclear Power Plants [15].					
18.	7.2	…. An update should include a harmonisation with other programmes in force at the plant site such as monitoring or emergency preparedness programmes. An update should also be performed when the severity of a hazard or plant vulnerability to a hazard has not been previously recognised. For that purpose, continuous periodic monitoring of external hazards should be considered, especially at the early stage of the lifetime of the plant.	Please check the grammar. There seems to be a slight grammatical problem	X			The texts were modified.
19.	7.3	The management programmes for hazards should be considered as an important ~~part of~~ contributor to the overall safety analysis for the plant and utilized as an input to operational decision making.	Please clarify: Safety analysis does this mean Final Safety Analysis Report?	X			Modified. Replaced to “safety assessment” as defined in Safety glossary.
20.	8	Chapter 8 is overlapping with DS497G (NS-G-2.14) para. 6.19-6.25	In this safety guide only reference should be made to DS497G and those	X			Some general paragraphs were deleted. The

			thins should be said that are missing from the safety guide DS497G. The paragraphs 8.3is generic. The added value compared to house DS497G of pagraphs 8.3-8.6 should be checked.				specific part for the hazard were kept.
21.	8.2	Management programmes for hazards should include specific plant walkdown procedures for periodic, pre-event, and post-event. The implementation of plant walkdowns should be advised in the Operational Hazards Management Programme and the results of the walkdowns should be properly documented. By these walkdowns should ensure that those SSCs needed for prevention, protection and mitigation of events due to hazards and for coping with effects from hazards mare are in place and maintained reliably operable. General examples are listed below. Some of these actions are of particular importance at times when an external hazard (such as extreme winds or flooding) is forecast, but proper housekeeping should be in effect at all times: — Ensuring that culverts are kept clean immediately prior	Hazard management could be used instead of programme.	X			Replaced.

		to a predicted major external flooding can have a significant impact on the ability of the site drainage systems to dewater the site. — Ensuring loose materials (especially heavy objects) are cleared away or tied down as they can create potential airborne missiles in the eventual hazard. Further examples of actions that need to be taken, and checked during these walkdowns, have been given in Appendices A and B.					
22.	8.6	Management programmes for hazards should include housekeeping procedures which include specific activities to increase hazard resilience by protecting essential areas and equipment.	Which is the mater: management programme for hazards of housekeeping that should be organized in line with DS497G.	X			The texts were corrected.
23.	9.2	The protection against and the mitigation of most internal and external hazards are performed by conservative design. Therefore, the maintenance of hazard prevention, protection and mitigation design features should be included in operational condition surveillance programmes. The operating organization should also perform regularly scheduled inspections and maintenance to preserve the integrity and functional availability of all engineered structures and	Please define operational condition surveillance programme. Is this different from the programmes mentioned in DS497E.	X			Replaced to “surveillance programme”. “testing programme” were not also appeared in other IAEA documents and replaced.

		barriers designed to mitigate hazards.					
24.	A1.28	… (d) The storage of all other combustible materials should be prohibited. — For liquidi) The amounts of flammable or combustible liquids introduced into fire areas during maintenance or modification activities should be limited to the amount needed for daily use. Suitable fire protection measures such as the provision of portable fire extinguishers should be taken, as appropriate.	A mistake in the paragraph layout. For liquid: (i) The amounts…	X			Corrected
25.	A1.35	… (b) While the work is in progress the fire watch should perform no other dutieI(c) Suitable dedicated fire-fighting equipment should be readily available and means should be provided by which additional assistance can be readily obtained, if necessary. Adequate access and escape routes for fire fighters should be maintained.	A typo and a line break is missing. …duties. (c) Suitable…	X			Corrected.

26.	A1.40	A fire-fighting strategy (if necessary, as15replantreplan) should be developed for each area of the plant identified as important to safety (including those areas, which present a fire exposure risk to areas important to safety). These strategies should provide information to supplement the information provided in the general plant emergency plan. The strategies should provide all appropriate information needed by fire fighters to use safe and effective fire-fighting techniques in each fire area. The strategies should be kept up to date and should be used in routine classroom training and in actual fire drills at the plant. The fire-fighting strategy developed for each fire area of the plant should cover the following: …	”as preplan” ?	X			Corrected. Yes, it is “preplan”
27.	App C.2	. An initial event, e.g. an external or internal hazard, that affects the plant subsequently results in one or more other events, e.g. external or internal hazards that also affects the plant operation in different way (concurrent induced event). ….	Is this the same as consequential event or is there a difference?	X			deleted
28.	App C.3	… Example Combination: — Meteorological conditions such as storms that	These could be rather examples of consequential/concurrent induced hazards.	X			Deleted

		intrinsically involve the combination of several phenomena such as rainfall, wind, and storm surge. — A tsunami as the common cause for external flooding, internal flooding and internal fire — High-energy piping rupture might cause missiles and internal flooding. The internal flooding might lead a short-circuit and an internal fire as a tertiary event.					
29.	B.9	**B.9. Electromagnetic interference (including Solar Storm)**	The emphasis is on solar storm. Consideration of other electromagnetic interferences is very limited.	X			The entire B.9. is modified including EMI(RFI) and EMP.
30.	B9.2	Solar flares may impact the electrical grid potentially resulting in a loss of plant internal power systems, In order to prepare for a loss of off-site power a sufficient emergency fuel should be in place at the site.	Does this refer to damage to plant internal power systems or los of off-site power? Next sentence refers only to loss of off-site power.	X			The texts wre modified.
31.	B13.4	There should be considerations of the need for on-site safety equipment	Please clarify, safety equipment	X			Replaced to “personal protective equipment”

		(e.g. breathing apparatus, protection suit) to allow plant operators and emergency workers to move to places of safety.	personal protective equipment" ?				
32.	C	This Appendix provides recommendations for the operational management of combinations of internal and/or external hazards. It also provides a potential classification system that could be used for combinations of hazards and gives examples to illustrate how to consider these cases of impacts from hazard combinations as part of management programmes.	Somewhat different terms for multiple hazards are described in other IAEA documents. Is a new classification necessary? At least reference should be made to other classifications. Eg. SSG-3 (PSA), Safety Report No. 92.	X			Agree that this guide is not provide new classification so the yellow texts were deleted. The name of classification is modified to make consistent with SSG-64.
33.	C4	Please check the numbering of paragraphs at page 79. Paragraph numbering goes wrong.		X			Corrected.

		C.5, C.6 and C.7 would be the correct ones on this page					

TITLE: DS 503 - Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

COMMENTS BY REVIEWER Country/Organization: FRANCE Date: Pages				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	General	Consider reducing references to an "operational hazard management program" in all the document to efficient operational provisions for the prevention and limitation of risks induced by hazards.	The recommendation to establish such a general program and the development of related chapter are neither consistent with existing requirements neither DPP. There should be consideration of hazards in operational provisions and this should be obviously adequately organized, documented… It may be relevant to establish such a program for some hazards or some parts of consideration of hazards within operational provisions. Nevertheless, general recommendations for establishment of a program are not relevant.	X See the revised Section 3 and the entire draft.	~~X~~ ~~See the revised Section 3.~~		We carefully removed the "operational hazard management programme" and relevant text which requires the establishment of a comprehensive programme for hazards. Instead of that, we placed "hazard management" or "hazard management measures" and added the footnote to recommend to consider the structure of programmes based on the graded approach in safety assessment, and the justification to incorporate hazard protection process to the various programmes.
2.	1.1	This publication is a revision of the IAEA Safety Guide on Fire safety in the operation of NPPs issued in 2000 as IAEA Safety Standards Series No. NSG-2.1. This publication is widened to cover operational aspects for all internal and external hazards.	It should be enhanced that it is not a simple revision of an existing guide. The scope are extended.		X See modified para 1.1. and 1.2.		The footnote was also added to explain the structure of this guide.

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3.	1.6	This Safety Guide is developed for new and existing reactors of types in general use, such as light water reactors and heavy water reactors. The general guidance may also be applicable to a broad range of other types of nuclear reactor designs, including gas cooled reactors and other types of nuclear ~~installations~~ reactors, but its detailed application will depend on the particular technology and the hazard risks.	See para. 1.9 This publication is only applicable to reactors not to others nuclear facilities.		X See modified para 1.6 (new 1.10) and 1.9 (new 1.13.)		
4.	1.8	While hazard mitigation measures and coping strategies should address plant operating personnel required to respond and implement hazard mitigating measures and coping strategies, this safety guide does not specifically discuss conventional aspects of protection of the safety of plant operating personnel, or the protection of property, except where this could affect the safety of the NPP.	This paragraph is not easy to understand. Suggestion to split in two sentences.		X See modified para 1.8 (new 1.12).		The former part is deleted.
5.	2.7	The following should be considered: • External hazards can affect several NPPs on the same site. • External hazards can generate internal hazards (e.g. an earthquake followed by an internal flood) • Internal hazards can also…	Take into account the possibility that external hazard can touch two or more NPPs on the same site.		X		The parts were deleted.

TITLE: DS 503 - Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

6.	2.10	Consider deletion of the article or ~~In accordance with the concept of defence in depth (the first level of defence in depth), p~~Protection against hazards is provided in general by ensuring quality and reliability of relevant SSCs. This should notably be done by adequate application of following means: environmental qualification of the SSCs, ~~by application of principles of~~ redundancy, diversity, ~~by~~ physical separation, functional independence, and through design of appropriate barriers. Therefore, the protection against the effects of hazards is an iterative process, integrating the needs of protection against several hazards. Proper surveillance and in-service inspections should be implemented for coping (and, if possible, detecting) with hazards.	Mentionning DiD in this article is at least not useful and probably not exact: level 1 would be for example avoidance of flammable materials, siting… Moreover the list of protection means is neither exhaustive neither always applicable (redundancy and physical separation is not adequate for seism, flooding from sea…) This list should be mentioned as a general possibility	X			
7.	3.7	The operational hazard management programme should include a combination of personnel from the various site sections or organizations such as engineering design, operations, maintenance, and emergency response. These personnel perform activities to ensure the plant is protected by proper design and maintenance and operated to mitigate and cope with the impacts of hazards. The operating organization should ensure that an adequate number of competent staff are available at all times to operate the plant safety in both normal and abnormal conditions in case of hazard and induced effects.	In accordance with Safety Guide NS-G-2.14 : The managing of a hazard and its induced effects may require large numbers of staff (storm, flooding, biological phenomenon like pandemic, etc.).	X			
8.	3.17	Appropriate measures should be taken for radiation protection for personnel from external organizations intervened on the plant (e.g. fire fighters and other staff carrying out plant response or casualty recovery).	Add for a better understanding	X			

TITLE: DS 503 - Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

9.	4	Consider deletion of chapter 4 Or At a very minimum, consider deletion of article 4.2 and 4.4	When developing DPP, it seemed very relevant to implement a chapter related to DiD considering that "special attention is paid to hazards that could potentially impair several levels of defence" (INSAG 12). This topic is very challenging and the current version of DS 503 reflects the efforts made regarding these challenges. Unfortunately, it does not reflect the specificity and mention elements that are: • General for DiD (4.1, 4.3, 4.4) • Not directly linked to DiD and not exhaustive (4.2) • Not exact : 4.4 → for example, physical separation (which is not DiD) is not relevant regarding earthquake	X			The entire section is deleted, some paragraphs were moved to section 2 and modified for clarification. 4.1 is deleted. 4.3: the description of programme is modified. 4.4: "and when relevant" is added.
10.	6.7	The operating organization should establish operating procedures that describe pre-event, event, and post-event actions corresponding to each external hazard. They define and taking into account all hazards that can be generate by original hazard, also define credible combinations of hazards.	Add red text to be consistent with 7.5	X			
11.	6.11	Depending upon the expected severity of the external hazards, if sufficient time is available prior to occurrence, the operating organization should consider evacuating all non-essential plant personnel.	It is the role of operating organization to do that? They have to manage the reactor, to bring to and maintained a safe shutdown. Add red text to do this action only if they have enough time.		X See modified 6.11.		

TITLE: DS 503 - Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

12.	6.13	The following is a list of common external hazards consistent with DS490 [3] and DS498 [2]: • Seismic Hazards • Volcanic Hazards • … • ~~External Fires and Explosions~~ • External Fires • External Explosions including Missiles and Shockwaves • … • Release of hazardous substances	Consistent with the appendix B		X See modified 6.13.		
13.	10.3	The operating organization should develop and maintain a list of hazard protection measures that are relevant for the site and that require inspection, maintenance and testing to ensure their availability. Operability requirements should set the exploitation conditions of these hazard protection measures in accordance with the assumptions of the hazard safety studies.	In accordance with Safety Guide NS-G-2.2, "*limits and conditions for normal operation are intended to ensure […] that the assumptions of the safety analysis report are valid*". This is applicable to the hazard protection measures required in the hazard safety studies.		X See modified 10.3.		
14.	NEW 10.3.a	Where operability requirements cannot be met to the extent intended, the actions to be taken to reduce the risk due to the unavailability should be specified, and the time allowed to complete the action should also be stated.	cf. supra : in accordance with Safety Guide NS-G-2.2.		X See modified 10.3.		
15.	10.3.b	The inspection, maintenance and testing programme for the site should include general hazard protection measures and protection measures that are required for specific hazards.	End of the initial point 10.3		X		
16.	11.6	Some examples of these types of additional risk are provided in paras 11.7 and 11.8 below	Typing error		X		
17.	A.1.4	SSCs important to safety and hazard protection and mitigation features are adequately protected to ensure that the consequences of a single fire will not prevent those systems from performing their required function, account being taken of the effects of ~~a~~ the worst single failure	The studied failure of a component is, at least, the worst for the safety.		X		

TITLE: DS 503 - Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

18.	A.3.2	Add a bullet "In the rooms where safety components are located, inspection of the pressure vessels and of high energy valves to detect possible flaws (the presence and good tightening of all bolts fastening the cap of the valves on their bodies should be checked)"	The verification of high energy components is missing	X			
19.	A.6.5	Replace by "inspections and plant walk downs should check the general condition of drainage system (verification that it can provide the adequate draining flowrate), the presence and good state of thresholds, the integrity of watertight penetrations, and the good conditions of seals of the doors)"	The text is not specific enough.		X See modified A.6.5.		
20.	A.6.6.	Add at the end: "the staff should be suitably trained to the application of these procedures. Exercises should be performed periodically to prove the ability of the staff to apply the procedures and to evaluate the time of detection and isolation of the leaks in diverse locations"	The text is not specific enough.		X See modified A.6.6. and 11.5.		
21.	B.7.5	For leaves and similar debris, the operating organization should perform routine inspections and walkdowns (including along the rivers banks) to ensure drainage systems or vital pant equipment remain operational.	The property of the rivers banks must also be verified.	X			
22.	NEW B.7.7	For silting up in water intake, the operating organization should perform routine inspections and periodic dredging to ensure vital pant equipment remain operational.	Not covered by safety guide	X			
23.	B.12.2	Since NPP sites are generally regarded as "no-fly zones," the operating organization should review and apply ~~understand~~ the requirements of the site and report any violations to national or local air traffic control agencies.	editorial	X			

TITLE: DS 503 - Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

24.	B.12.6	As aircraft accidents are rare, the operating organization should consider deployment of fire-fighting staff and equipment when notified of this hazard. This should be available on site. As appropriate, this includes the prompt dispersment of equipment and personnel from any central location to prevent a large loss of emergency response capability.	Fire-fighting staff and equipment have to be available on the site at any time. It is possible to use staff and equipment for the other NPPs in the same site.	X			
25.	B.12.8	~~If sufficient time is available prior to~~ If an aircraft crash occurred, the operating organization should bring ~~make preparations to shutdown~~ the plant in safe state.	An aircraft crash is "spontaneous", we cannot have time prior to an aircraft crash		X		The para is modified.
26.	B.12.9	The operating organization should consider the evacuation of non-essential plant personnel for this hazard.	See comments 11 and 24 for a question		X		The para is modified.
27.							
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Draft Safety Guide DS503
"Protection against Internal and External Hazards in the Operation of Nuclear Power Plants"
(Draft dated February 2020)
Status: STEP 7

	COMMENTS BY REVIEWER Reviewer: **Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)** (with comments of GRS) Country/Organization: **Germany**			Pages: 65 Date: 03.06.2020	RESOLUTION			
Relevance	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows X1: see the modified text. This para was already modified by other comments from other revieweres are already reflected (including the case that the entire part commented was deleted). We recognize that the comment or parts of comments was "indirectly" reflected.	Rejected	Reason for modification/rejection
1	1.		*General:* This Safety Guide is focused on mitigation and coping strategies. Guidance on preventive measures is only given in some hazard specific appendices (e.g., on fire, pipe whip) and missing in the main part of this guide although it is a first level of protection against hazards. This Guide should be revised accordingly to include guidance on preventive measures which can be taken to completely meet Principle 8 "Prevention of accidents" in par. 2.2 of IAEA SSR-2/2 (Rev. 1) [6].	This Safety Guide should be put in accordance with further IAEA Safety Guides, and thus requires an extensive additional revision		X		According to the coordination staff, the renaming guide from DS494 to SSG-64 is not required at this step of publication.

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

			Moreover, the Guide needs to be made consistent to IAEA SSR-2/1 and IAEA SSR-2/2 as well as to IAEA SSG-64 (formerly DS494), DS490 and DS498. This requires an extensive revision.					
2	2.	1.2	~~To ensure safety, it is necessary that the operating organization of a NPP recognizes that the personnel involved in should be cognizant of the demands of safety, should respond effectively to these demands, and should continuously seek better ways to maintain and improve safety. This is especially important when plant operators are challenged by the adverse impacts of internal and external hazards.~~	The text presents general principles of safety culture and is therefore here not explicitly needed as background. We propose to delete it.	X			
1	3.	1.3 Line 5	…, and implemented corresponding measures. ~~This includes installed provisions and additional deployable equipment that have enhanced the plants' coping and mitigation strategies and equipment availability to implement these strategies. It was identified that operational guidance should be extended to pre-planning of responses to these hazards. This understanding includes improved decision making for those hazards where a sufficient warning period may allow protective preparation measures to be taken.~~	Explicit examples of measures taken are not expected in Introduction; they should be part of the recommendations and guidance given in specific sections of this Safety Guide.	X			
1	4.	1.5	The objectives ~~are~~ is to provide the operating organizations involved in design, manufacture, construction, modification, maintenance, operation, safety assessment and decommissioning for NPPs in analysis, verification and review, and in the provision of technical support, as well as regulatory bodies~~y of Member States,~~ with recommendations and guidance on~~:~~ ~~- Measures for ensuring that adequate hazard mitigating and coping strategies against internal and external hazards are maintained throughout the lifetime of a NPP, and~~ ~~- Measures to ensure that early indications of an imminent hazard lead to appropriate decisions by nuclear power plant managers and operators that will in-~~	We suggest to provide explicit measures in the hazard specific sections, but not in the Objective of the Guide		X1		

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

			~~crease the likelihood of successful management of the adverse effects of the hazard. Hazard.~~ suitable measures for an adequate level of protection against internal and external hazards (including combinations of hazards) throughout the lifetime of a nuclear power plants are taken, in order to meet the requirements established in IAEA SSR-2/2 (Rev. 1) [6].					
1	5.	1.8	While hazard prevention and mitigation measures and coping strategies should address plant operating personnel required to respond and implement hazard prevention and mitigation~~ng~~ measures and coping strategies, …	See general comment		X1		
3	6.	1.9	For plants designed ~~with~~ according to earlier standards, …	Editorial	X			
3	7.	1.10 Line 4	… and guidance on these ~~are~~ is covered by IAEA guidance for nuclear security.	Editorial	X			
3	8.	2.1 Line 3	… External hazards are those natural or human induced events that originate external to both the site and the processes of the operating organization, ~~and~~ for which the operating organization may have very little or no control.	Editorial	X			
1	9.	2.2	This safety guide provides recommendations and guidance for the operational management aspects of preparing for, prevention, mitigating and coping with hazards at a NPP, to ~~fulfil~~ meet the relevant requirements of … and in particular Requirements 11, 12, 22, 23, 28, 31, 32, and 33.	See general comment, and editorial changes	X			
1	10.	2.3 Line 3	… Requirement 10: Control of plant configuration "The operating organization shall establish and implement a system for plant configuration management to ensure consistency between design requirements, physical configuration and plant documentation." … Requirement 11: Management of modifications	Requirements 10, 11, 12, 14 and 18 of IAEA SSR-2/2 (Rev. 1) [6] have to be added. Issues related to plant configuration, modifications, periodic safety review,		X1		We agree that the requirement 10 and 14 is related to hazard management but we limited here. (see comment #9)

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

			"The operating organization shall establish and implement a programme to manage modifications." … Requirement 12: Periodic safety review "Systematic safety assessments of the plant, in accordance with the regulatory requirements, shall be performed by the operating organization throughout the plant's operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources." … Requirement 14: Ageing management "The operating organization shall ensure that an effective ageing management programme is implemented to ensure that required safety functions of systems, structures and components are fulfilled over the entire operating lifetime of the plant." … Requirement 18: Emergency preparedness "The operating organization shall prepare an emergency plan for preparedness for, and response to, a nuclear or radiological emergency." …	ageing management and emergency preparedness are mentioned in the main part of this Guide as well as in hazard specific appendices. The text after the requirement including applicable paragraphs has to be completed.				
1	11.	2.3 Line 13	… The hazard prevention, mitigation and coping strategies are implemented by personnel involved in activities at the plant.	See general comment; the text is not consistent with Requirement 23 of IAEA SSR-2/2 (Rev. 1) [6]. The implementation, monitoring and review of relevant preventive measures is not mentioned.	X			
1	12.	2.3 Line 20	The management and control of materials and housekeeping on a routine basis ~~can~~ may have a non-negligible ~~great~~ impact on the occurrence or progres-	See general comment; Clarification	X			

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

			sion of hazards and their consequences. Proper housekeeping should be in effect at any time, even if some of the actions are of particular importance only at times when an external hazard is forecast. ~~housekeeping should be in effect at all times~~. Specifically applicable paragraphs are par.~~a~~ 7.10. and 7.11.					
1	13.	2.3 Line 29	…. Enhanced protection against hazards should be ~~put~~ int~~o~~ place during these activities. It is also important to identify ~~and include these~~ such activities for hazard protection, ~~and~~ prevention and mitigation measures and include them in the hazard management programmes. Specifically applicable paragraphs are par. 8.1-8.7, 8.13, 8.14 and 8.14A.	See general comment; Editorial for clarification	X			
1	14.	2.3 Line 36	~~In the~~ During outages including low power and shutdown operation, risk caused by hazards may increase. Enhanced preparing for preventing, mitigating and coping with hazards should be ~~put~~ int~~o~~ place during ~~the~~ outages. Specifically applicable paragraphs are ~~P~~para. 8.19, 8.20, 8.21 and 8.22.	See general comment; Clarification and precision	X			
3	15.	2.4	This S~~s~~afety G~~g~~uide should be used together with IAEA SSG-64 ~~DS494~~ … These ~~s~~Safety ~~g~~Guides should be used to ensure that all design aspects related to a particular hazard are maintained and updag~~ra~~ted based upon periodic reviews.	Editorial; General remark: Probably it should be “Safety Guide” all over the document.	X			
1	16.	2.6	Hazards caused by (or occurring at) different ~~NPPs~~ reactor units or different plants at the same site should be considered. ~~hazards~~ ~~d~~Depending ~~up~~on ~~which is~~ the operating organization(s) of the different reactors, the consequences from hazards either occurring at another reactor unit on the same site or affecting more than one reactor unit at the same site have to be considered differently.	Sentence is not clear It cannot only be different NPPs but must be different reactor units (which can be commercially used or also be an additional research, pilot or demonstration reactor). Site-	X			

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

				level analysis is the key aspect here. Moreover, there are differences in external hazards (e.g. seismic) which may directly impair more than one reactor unit on a site and internal hazards occurring at one unit but having the potential of inadmissibly impair the safety of another unit. For both types it may be important that the organisations operating the units closely cooperate, if it is not only one organisation. These interdependencies are treated typically in site-level analyses (e.g. Site-Level PSA).				
1	17.	2.7	Hazards have the potential to induce initiating events~~;~~, to cause failures of equipment that is necessary to mitigate ~~hazards;~~ the consequences of such events, and to adversely affect~~,~~ (directly or indirectly)~~,~~ the barriers for the prevention of the release of radioactive materials. ~~Additionally,~~ H~~h~~azards can, because of their nature, simultaneously challenge more than one level of defence in depth and increase, for example, the degree of the dependency between the origination of initiating events and the failures of	See general comment. The text in 2.7 is not consistent with IAEA SSG-64 (formerly DS494), needs to be revised accordingly. In particular, the first two bullets of	X			

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

			prevention or mitigation equipment. ~~The following should be considered:~~ ~~- External hazards can generate internal hazards (e.g. an earthquake followed by an internal flood)~~ ~~- Internal hazards can also result in cascading effects, and induce other internal hazards (e.g. a missile can cause a pipe break and then internal flooding). The mitigation of one hazard can cause the initiation of another hazard. (e.g. the use of water to extinguish an internal fire may cause internal flooding)~~ All credible combinations of hazards are also considered within the scope of this Safety Guide. Credible combinations of hazards are also considered in ~~DS494~~ IAEA SSG-64 [1], DS498 [2], and DS490 [3]. Section 7 and Appendix C give~~s~~ additional guidance on combined hazards.	the list need to be deleted since these are incomplete and do not provide adequate guidance on possible combinations of hazards. Text from IAEA SSG-64, Appendix I needs to be adapted and added in Section 7 and/or Appendix C.				
2	18.	2.8	While it m~~ay~~ight not be practical or possible to prevent a~~n~~ hazard from triggering an anticipated operational occurrence (AOO), one of the objectives of an operational hazard management program of a nuclear power plant is to ensure that , to the extent practicable, hazards do not trigger an accident (e.g., avoidance of a s~~S~~tation b~~B~~lack-~~-~~o~~O~~ut caused by a seismic hazard).	Editorial for clarification	X			
1	19.	2.9	The aim of considering hazards in the design and operation of ~~NPPs~~ nuclear power plants is to ensure that the fundamental safety functions (see Requirement 4 of IAEA SSR-2/1 (Rev. 1) [18]) are fulfilled in any plant state and that the plant can be brought to and maintained in a safe shutdown state after any hazard occurrence. This implies the following ~~that~~: (a) ~~The r~~Redundant ~~cies of the~~ systems are segregated to the extent possible, ~~or~~ adequately designed and maintained operationa~~led~~, and protected as necessary to prevent the loss of the safety function performed by the systems; (b) The design and operation of individual struc-	See general comment; clarification and precision as well as completion, plus editorial corrections	X			

			tures, systems and components (SSCs) is such that design basis accidents or design extension conditions induced by hazards are avoided to the extent practicable; (c) The segregation, separation and protection measures in place are adequate and are maintained to ensure that the system response described in the analysis of postulated initiating events is not compromised by the effects of the hazard; (d) An internal or external hazard occurring at the plant site does not affect the habitability of the main control room. If the main control room ~~In case the latter~~ is not habitable, access to and habitability of the supplementary control room are ~~is~~ to be ensured. In addition, ~~and~~ when necessary, suitable means should be in place to ensure access by plant personnel ~~should be~~ able to ~~access~~ equipment for ~~in order to~~ performing local actions.					
1	20.	2.10	In accordance with the concept of defence in depth (the first level of defence in depth), protection against hazards is provided in general by ensuring the high quality and reliability of SSCs. by environmental qualification of these SSCs, by application of the principles of redundancy, diversity, by physical separation, segregation, functional independence, and through design of appropriate barriers. Therefore, the protection against the effects of hazards is an iterative process, integrating the needs of protection against several hazards. Proper surveillance and in-service inspections should be implemented for coping with (and, if possible, early detection of detecting) ~~with~~ hazards (or of signs that can lead to the occurrence of an internal hazard) and implementation of necessary corrective actions to ensure protection against the hazard.	Addition of "segregation" as an important aspect; clarification and more precision	X			

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

1	21.	2.11	An appropriate management system should be applied to all hazard prevention, protection and mitigation features, including those that were originally not ~~ordinally~~ installed or designed as safety systems or features, such as embankments, spillways, etc., in order to reduce the potential for common cause failures and thus pose a threat to safety. Throughout this ~~s~~Safety ~~g~~Guide, the ~~word~~ term hazard protection and mitigation features impl~~y~~ies these items unless where specifically noted.	See general comment; moreover, to most readers, the meaning of "ordinally" will not be clear. Therefore, it is proposed to replace it by a more common term.	X			
2	22.	3.1	Responsibilities of ~~site staff~~ plant personnel involved in the establishment, implementation, and ~~management~~ administration of the operational hazard management programme …	Clarification	X			
2	23.	3.5 Line 3	…, for mitigating and coping with the event progress from ~~internal or external~~ hazards to a nuclear or radiological emergency. …	Clarification to include also combined hazards.	X			
1	24.	3.7	The operational hazard management programme should include a combination of personnel from the various site sections or organizations such as engineering design, operations, maintenance, and emergency response. These personnel perform activities to ensure the plant is protected by suitable ~~proper~~ design and maintenance, and operated accordingly to prevent hazards and to mitigate and cope with the impacts of hazards and their consequences.	See general comment; addition for more precision	X			
2	25.	3.8	For hazard impacts ~~that are~~ of sufficient duration (e.g., heavy snow fall, hurricane, riverine flooding, etc.), the operating organization should utilize all available resources to cope with the hazard impact and not allow the impact of the hazard to propagate, become more severe, or jeopardize the fundamental safety functions.	Clarification, addition of a well-known example		X1		
2	26.	3.9 Line 2	… This includes implementation of design and other plant modifications, lessons learned, and best practices from industry operating experience~~s~~.	Clarification for completion	X			
2	27.	3.12	Defined roles and responsibilities of ~~site staff~~ plant	Clarification		X1		

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			personnel involved in the establishment, implementation, and administration of the operational hazard management programme should be documented and ~~maintained current~~kept updated.					
2	28.	3.14	Procedures should give clear instructions for plant operating personnel on actions in the event of ~~precursors and~~ indications of hazards and potential precursors to events resulting from hazards. These actions should be primarily directed to ensuring the safety of the nuclear power plant including personnel. In some cases, shutdown or power reduction of the ~~plant~~ reactor(s) may be necessary.	Clarification, more precise terminology	X			
2	29.	3.15	The procedures should set out the roles of plant operating personnel in relation to the roles of any external organizations (e.g. ~~local authority~~ plant external professional or voluntary fire brigades).	Clarification, more precise terminology; additional suggestion: give one more example	X			
2	30.	3.16	Special attention should be paid to cases where there is a risk of radioactive releases ~~of radioactive material following the initiation of a hazard event~~ as consequence of an event initiated by a hazard. The emergency arrangements of the operating and external organizations should ensure that these cases are adequately covered. ~~It should be ensured that such cases are covered in the emergency arrangements with operating organizations and external organizations.~~	Clarification of partly misleading text	X			
2	31.	3.17	Appropriate measures should be taken for radiation protection for personnel from external organizations (e.g. fire-fighters and other external personnel ~~staff carrying out plant response or casualty recovery~~).	Clarification for consistency; deletion of “carrying out plant response and casualty recovery”, since external organizations are not responsible for plant response and “casualty recovery” is a highly unspecific	X			

				term not providing guidance.				
1	32.	3.18 Line 3	… This includes an understanding of hazard prevention, coping and mitigation strategies and measures to increase the plant's resilience.	See general comment.	X			
1	33.	3.21	The operating organization(s) should put in place processes and procedures to ensure that meteorological forecasts are monitored and that the appropriate actions are taken in due time when an external hazard is predicted to occur (e.g., ~~for example~~ coastal flooding, tornadoes, etc.). The operating organization should then prepare and activate the ~~organization~~ established processes and procedures as required to minimize the effects of a predicted hazard on the nuclear power plant~~NPP~~, and implement hazard prevention, mitigation measures and coping strategies. For ~~these hazards that are~~ predictable or partially predictable hazards, the operating organization should undertake the steps listed in the paragraph above to ensure a timely preparation of ~~that~~ the plant site ~~is prepared in good time~~.	See general comment; in addition, clarification, and additional precision has been given; a new text has been proposed.				
2	34.	3.21 second bullet	- Security aspects The operational hazard management programme should be compatible with the contingency plan ~~security programme~~ of the nuclear power plant. The operational hazard management plan should also be developed cooperatively with off-site security and/or law enforcement organizations as recommended by the plant's security staff. Guidance to be considered is given in the plant's security plan, IAEA Nuclear Security Series No. 27-G, Physical Protection of Nuclear Material and Nuclear Facilities (implementation of INFCIRC/225/Revision 5) [12], and in other relevant Nuclear Security Series documents.	How does the "security programme" differ from the common "security plan" or "contingency plan"? Please clarify. If not, please use "contingency plan" or "security plan" as applicable		X1		
2	35.	3.21 third bullet	- Multi-unit plant sites For multiple ~~NPPs~~ reactor units co-located at ~~on~~ the same site or being closely adjacent, either operated	Clarification	X			

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			by one organization or~~,~~ ~~but~~ managed by different operating organizations, the operating organizations should consider how this site configuration affects their hazard coping and mitigation strategies, particularly for hazards with an increased predictability, and ensure appropriate cooperation.					
1	36.	4.1 Line 6	… Thus, hazard prevention and mitigation measures and coping strategies ~~and mitigation measures~~ should be provided as part of the defence in depth concept and the operational hazard management programme to control hazard occurrence and impacts.	See general comment.	X			
1	37.	4.2 Line 5	… Thus, hazard coping strategies and prevention and mitigation measures should ensure that the fundamental safety functions are maintained for all plant states.	See general comment.	X			
2	38.	4.4 Line 4	…. Protection should be diverse, redundant, separated and segregated as far as reasonably practicable ~~where possible.~~ (examples s~~S~~ee Appendix A and B ~~for examples~~).	Clarification	X			
1	39.	5.1	For a particular nuclear power plant site, i~~I~~nternal hazards ~~for a particular site~~ have to be and are taken into account ~~during~~ in the design (see IAEA SSG-64) ~~phase~~ and the operation of the plant. With a few exceptions, ~~I~~internal hazards are ~~mainly~~ prevented and mitigated to a large extent by designing and constructing engineered features. As such, an initial hazard analysis forms part of the basic design phase. ~~However, t~~~~T~~his initial hazard analysis should be supplemented to account for ~~any site or plant specific aspects, such as local drainage, grid connections, etc., and should include~~ the realisation of operational~~ng~~ procedures for preventing, mitigating and coping with internal hazards. ~~specific for the site.~~ Site-specific aspects (particularly for both multi-unit or multi-source sites) should be also considered in the plant design against internal hazards and the operation of the plant.	Para 5.1 covers different aspects which are not clearly distinguished. First, a clear statement should be made on internal hazards.	X			

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1	40.	5.3 Line 4	… in order to ensure that the hazard prevention and mitigation measures are not reduced.	See general comment	X			
2	41.	5.4	The operational hazard management programme will help in defining roles in controlling actions following hazards. The plant operators should have a role in ~~initiating~~ actuating some ~~installed~~ protection systems in place, in reducing the extent of the effects of particular ~~some~~ hazards by plant realignment, or by initiating local actions as part of hazard coping strategies to address plant challenges from the hazard (such as local firefighting or the deployment of local flooding protection).	Editorial for better understanding; Question: the term "local" is more often used – it is not clear what is intended by using this term here, plant or site specific, unit or plant area specific? Text should be revised. Answer: Most of them mean "regional". Some of them mean a field area concerned, but for the later case we should delete "local" to avoid confusing.	X			
2	42.	5.5	Where additional hazard mitigating equipment or personnel may need to be deployed, the operational hazard management programme should allow for and characterize ~~describe communications~~ means for communication with external organizations and should include aspects of training and practice drills (see ~~s~~Section 11).	Clarification	X			
2	43.	5.6 bullets	- … ~~applicable~~ credible internal hazards … - … ~~applicable~~ credible hazards … - … - … ~~applicable~~ credible hazards …	Consistency with IAEA SSG-64 as well as inside Guide itself	X			
2	44.	Title between	RECOMMENDATIONS FOR SPECIFIC INTERNAL HAZARDS ~~EVENTS~~	precision and consistency	X			

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		para 5.6 and 5.7						
2	45.	5.7 Line 5	… ~~s~~Sections 5.1 through 5.6 are applicable. The following is a list of common internal hazards consistent with Ref. [1]. • Internal fires • Internal explosions • Internal m~~M~~issiles • ~~Collapse of structures and falling objects~~Heavy load drop • Pipe breaks (pipe whip and jet effect and flooding) • Internal floods~~s~~ing • ~~Release of hazardous substances~~ • Electromagnetic Interference • Release of hazardous substances inside the plant • Other s~~S~~ite specific or design specific internal hazards as appropriate	Please bring in accordance with IAEA SSG-64 [1]	X			
1	46.	6.1 Line 3	… Specifically, the operational hazard management programme should be fulfilled for those design basis external events where the protection makes use of temporary measures and operator actions as well as levels of hazards more severe than those considered for design, derived from the evaluation for the impact of these hazards.	If temporary measures or operator actions are part of the protection concept against design basis external events, operational procedures ensuring the timely and adequate implementation of these measures are of utmost importance.	X			
1	47.	6.2	~~With~~Based on the external hazard impacts characterized in the operational hazard management programme, potential hazard prevention and mitigation	The current text is difficult to understand. The proposed	X			

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			measures should be identified for each hazard that will increase the viability of a hazard coping strategy ~~deployment~~ for external hazard conditions.	changes should help to make the intention clearer. In addition, the paragraph should not be limited to the topic of "mitigation" as "prevention" of hazard impacts should be the preferred approach.				
2	48.	6.3	Notification protocols between appropriate external organizations and the operating organizations ~~of~~ for periods of enhanced risks from third-party activities should be considered crucial and established in advance.	Clarification	X			
1	49.	6.3 Line 5	… The protocols should also ~~avoid confusion in~~ provide clear guidance for implementing pre- and post-event actions if the potential of a deliberate event is considered.	The current text is difficult to understand and misleading. The proposed changes should help to make the intention clearer. In addition, pre-event actions might also benefit from such guidance.	X			
1	50.	6.8	The operating organization(s) should take actions ~~for mitigating hazard effects~~ to prevent or mitigate the propagation of hazard effects throughout the entire site prior to (for a forecasted event) or during an external hazard that impacts a vulnerable/sensitive portion of the site. In a wider sense, ~~T~~this includes ensuring site ~~ingress and egress~~ access routes that may be impacted from the hazard are available and useable or by providing alternative means of site access (e.g., by boat or helicopter).	Ensuring site access is not a good example for avoiding the propagation of a hazard effect from one plant are to another, because limited site access does not necessarily lead to safety rele-	X			

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			Operator personal safety should be taken into account, particularly during an event.	vant effects on the plant. Therefore, it is recommended to decouple the topics to some degree. Besides this, site access not necessarily has to rely on roads (what seems to be implied by the current wording). In case of external hazards also other means of access are acceptable.				
1	51.	6.9	While the initiation of external hazards is generally unpredictable, conditions may occur where the potential for a hazard may increase (e.g., storm warnings, tornado warnings, extreme drought, movement of hazardous materials), and sufficient time is available to initiate prevention and mitigation measures.	See general comment: The recommendation should not be limited to "mitigation" as "prevention" of hazard impacts should be the preferred approach - not only in design but also from an operational point of view.	X			
2	52.	6.12	The operating organization should re-establish normal conditions and stand-down any additional personnel ~~staff deployed~~ withdrawn from its normal duties in a controlled manner after the cancellation of a national or local hazard warning.	Clarification of the sentence.		X1		
2	53.	6.13	~~Appendix B describes in more detail special recommendations that should be incorporated into the operational hazard management programme for the following commonly considered external hazards.~~ For	Restructuring of the paragraph is proposed to avoid duplication (first and		X1		

			all external hazards, the general recommendations given in sections 6.1 through 6.12 are applicable. Appendix B describes in more detail special recommendations that should be incorporated into the operational hazard management programme for the following commonly considered external hazards . ~~The following is a list of common external hazards~~ (consistent with DS490 [3] and DS498 [2]):	third original sentence).				
2	54.	6.13 bullet list	• Seismic Hazards • Volcanic Hazards • External Floods including Tsunami and Storm Surge • External Floods from Rivers or Extreme Precipitation • Extreme Winds including Tornados, Tropical Cyclones, Hurricanes, and Typhoons • Other Meteorological Hazards (including Extreme Temperatures) • Biological Phenomena~~on~~ • Collisions of Floating Bodies with Water Intakes and Ultimate Heat Sink Components • Electromagnetic Interference (including Solar Storm) • External Fires and Explosions • Accidental Aircraft Crash • Release of hazardous substances (toxic, radioactive, flammable, corrosive, and asphyxiant). • ~~Electromagnetic Interference (including Solar Storm)~~.	The bullet list should be consistent with Appendix B in terms of scope and order of items.		X1		
1	55.	7.1	The effects of combined hazards ~~(i.e. two or more hazards whose effects occur simultaneously or within a specified or short timeframe)~~ and mitigation strategies against them should be considered in the operational hazard management programme. The credible hazard combinations ~~that should be considered~~	All types of hazard combinations (consequential, correlated and unrelated ones, see comment before) must be		X1		The role of the guides are more explicitly clarified through Section 7.

			strongly depend ~~heavily~~ on the location of the site and the general plant design. ~~Clearly, combinations involving a variety of external hazards, (natural hazards such as tsunami, blizzard, sand storm, but also human induced ones, such as explosion pressure waves) are not applicable to all sites.~~ Therefore, it is not feasible or necessary to identify a set of hazard combinations that are applicable to all plants. ~~Therefore, it is not feasible or necessary to identify a set of hazard combinations from first principles that are applicable to all plants.~~ Hazards should be identified (in the plant design using a combination of engineering judgement, operating experience and lessons from similar site characteristics, plant designs, and the results of deterministic and probabilistic hazard assessment and safety assessments. The identification and the characterization of hazards should include a consideration of the initial conditions (e.g. plant operational states), the magnitude and the likelihood of the hazards, the locations of the sources of hazards, the resulting environmental conditions and the possible impacts on SSCs important to safety, or on other SSCs for which failure could lead to a postulated initiating event. The hazard identification and characterization process should be rigorous, supported by plant walk-downs for verification purposes, and should be well documented. Possible hazard combinations should be identified based on the individual hazards identified before. Possible combinations of external–external, external-internal, and internal–internal events and any consequential effects are required to be considered in the design (see e.g. par. 5.32 of IAEA SSR-2/1 (Rev. 1) and operation of the plant). ~~Instead, a screening process is required to determine those hazards that should be taken into account for a~~	considered, the text in parenthesis therefore needs to be deleted. Moreover, combinations of all types of hazards (external (natural and man-made ones) and internal hazards must be considered. The process of identification and screening needs to be presented consistent to IAEA SSG-64 [1]. The original text focusses too much on only very specific hazard combinations, mainly of external hazards. We also suggest that the new sentences added at the end of the paragraph, being important for all hazards and hazard combinations, should perhaps be moved to a place in the more general part of the Guide “Ensuring Safety Against Hazards In The Operation of				

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			~~particular site.~~	NPPs“.				
1	56.	7.3	The hazard combination approach for hazard mitigation measures and coping strategies should be performance-based which defines a desired outcome and clear, measurable criteria to determine whether that outcome has been reached. This approach does not prescribe specific steps that should be taken ~~as the potential combination of hazards is potentiallylimitless.~~	The last half sentence needs to be deleted since after hazard combinations identification and screening the number of possible combinations is very limited. State-of-the-art screening tools are meanwhile available and results demonstrating that the number of credible combinations is limited have been published.	X			
1	57.	7.7	The operating organization(s) should be aware of the potential for the mitigation combinations of hazards, e.g., of a ~~one~~ hazard causing the initiation of ~~an~~other hazards (consequential or correlated hazards). ~~For example, the use of water to extinguish an internal fire may cause internal flooding due to the potential accumulation of the fire extinguishing water.~~ Examples are ~~shown~~ provided in Appendix C, which covers combinations of hazards.	Text was incomplete, needs to be comprehensive and consistent		X1		
2	58.	7.8	Communication protocols with internal or external organizations may need to take hazard combinations ~~of hazards~~ into account.	Clarification	X			
1	59.	8.2 Line 5	The operational hazard management programme should be taken into account in the initial plant design. It should be updated if additional hazards have been identified after the plant was constructed, during the operating stage, in case of plant modifications, ~~or~~ as part of a re-licensing application, or for a ~~p~~Periodic ~~s~~Safety ~~r~~Review (IAEA ~~Safety Standards~~	Suggestion to add this formulation to be in line with other programmes in force at the site.		X1		

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			~~Series No.~~ SSG-25, ~~Periodic Safety Review for Nuclear Power Plants~~ [17]). The update should include a harmonisation with other programmes in force at the plant site such as monitoring or emergency preparedness programmes.					
2	60.	8.6	The operating organization(s) should consider ~~industry~~ operating experience, and new…	Clarification	X			
1	61.	8.8	The operating organization should consider and address, in the periodic updating of the operational hazard management programme, SSCs important for hazard prevention and mitigation including portable emergency equipment and passive design features.	See general comment.	X			
2	62.	8.10	Hazard coping strategies should be considered and updated for changes to the physical and social infrastructure around the plant site.	Clarification	X			
2	63.	8.12	Modifications in the nuclear power plant design and/or operation ~~Changes to the NPP~~ …	Clarification	X			
1	64.	9.2	Plant walkdowns should be performed on a regular schedule as well as at times when external hazards have been forecast, and after internal or external hazards are experienced. By these walkdowns should ensure that those SSCs needed for prevention and mitigation of events due to hazards and for coping with effects from hazards mare are in place and maintained reliably operable. General examples are listed below. Some of these actions are of particular importance at times when an external hazard (such as extreme winds or flooding) is forecast, but proper housekeeping should be in effect at all times: …	Text needed completion to cover all types of hazards. More examples also valid for internal hazards are needed.		X1		
1	65.	10.2 Line 2	… Therefore, the maintenance of hazard prevention and mitigation design features should be included in operational condition surveillance programmes.	See general comment.	X			
1	66.	10.4	In g~~G~~eneral, hazard protection measures that should be inspected, maintained, and tested include the following: - engineered structures and barriers to minimize the impact of hazards	List was incomplete w.r.t. barriers and mobile equipment for hazard mitigation		X1		

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			- elements (mainly active ones) of protective barriers for segregation of hazards (e.g. fire barrier elements); - mobile equipment for mitigation of hazard effects (e.g. bilge pumps or mobile diesel generators) - hazard detection and alarm systems; - communication systems for use in hazard events; - emergency lighting systems; - emergency vehicles; - access and escape routes for hazard response personnel; - respirators and protective clothing for radiological applications.					
1	67.	10.5	Special considerations for off-site equipment dedicated to hazard mitigation should include: - Protective barriers and other protection measures not located on site (e.g. dykes). Such barriers and protection measures may not be under direct control of the operating organization and their maintenance might therefore require special arrangements. - Equipment provided by external organizations or stored in an offsite location needs to be included in an ~~inspection,~~ maintenance, ~~and~~ testing, surveillance and inspection programme. - Maintenance and inspection procedures need to include the additional onsite and off-site engineered equipment which may be utilized in hazard mitigation and coping strategies. - For predictable or partially predictable hazards, the operating organization should consider pre-event inspection and/or testing on hazard mitigation equipment to ensure the availability of the equipment when the hazard event occurs.	The focus of the paragraph seemed to be on mobile off-site equipment. However, also permanent off-site protection measures should be subject to maintenance and inspections.	X			
2	68.	11.4	This hazard training should include information regarding their responsibilities prior to, during, and following hazards events: a. Hazards safety principles at the plant, and roles	The bullet points following b. seem to address independent issues and should	X			

			and responsibilities; b. General awareness of specific hazards. This aspect is further developed in paragraph 11.5; c. Recognition of audible and visual alarm signals including fire alarms, tsunami warnings, and other alarms as applicable to the site; d. The means of exit and emergency evacuation routes in the event of an internal or external hazard; e. The need to delay or discontinue certain plant activities in case specific external hazards are predicted such as extreme ambient temperatures, flooding, or extreme wind; including the means of reporting hazards and actions to be taken to make work safe; f. The different types of portable or resilience equipment provided and their use in mitigating hazard effects in the initial stage. This may include fire-fighting equipment, aqua dams and dam boards, and special communication equipment such as satellite phones.	therefore be treated on the same level as items a. and b.				
1	69.	11.5 at the end of the paragraph	For high winds (including the above): (a) Awareness of the hazard associated with loose items and their potential to become wind-borne missiles. For earthquakes (including the above): (a) Awareness of the potential collapse of temporary platforms and scaffolds and the need to adequately secure them.	Missing items with respect to high winds and earthquakes, please add		X1		
2	70.	11.6 Line 3	… Some examples of these types of additional risk are provided in paras 11.~~8~~7 and 11.~~8~~9 below.	Clarification	X			
2	71.	11.8/(c)	Actions to take if a seismic event occurs during a fuel or waste movement operation to ~~ensure~~ verify that the integrity of the transport package has not been compromised and that the receiving facility has not been damaged and is still able to accept th fuel or	Clarification	X			

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			waste transfer.					
1	72.	A.1 new subtitle	INTERNAL FIRES DEFENCE IN DEPTH	Please, add the subtitle "Defence in Depth" Please, pay attention, the structure of APPPENDIX A.1 INTERNAL FIRES should include subtitles according following structure: - Defence in Depth - Fire Safety Management - Fire Prevention and Protection - Organization and Responsibilities - Fire Hazard Analysis - Impacts of Plant Modifications on Fire Safety - Control of Combustible Materials - Inspection, Maintenance and Testing of Fire Protection Means - Manual Fire-fighting Capability - Fire Rellated Training of Plant Personnel - Quality Assurance for Matters Relating	X			

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				to Fire Safety				
2	73.	A.1.1	~~A.1.1~~ A1.10. The operational organization(s) should establish an on-site group with the specific responsibility for ensuring the continued effectiveness of the fire safety arrangements. Responsibility for co-ordinating fire safety activities should be assigned to an individual ~~staff~~ personnel position, generally referred to as the fire safety co-ordinator.	Clarification: re-ordering and editorial; this paragraph belongs to subtitle ***"Organization and Rsponsibilities"*** (see Section 3 of IAEA NS-G-21) and therefore should be the new paragraph A.1.10.	X			
2	74.	A.1.2	~~A.1.2~~ A.1.11. The fire safety co-ordinator should retain the responsibility for ensuring that all fire safety activities and functions necessary for safety are effectively co-ordinated to achieve the objectives of the fire prevention and protection programme.	Clarification: re - ordering according to new structure; therefore former A.1.2 is new A.1.11.	X			
1	75.	A.1.3	~~A.1.3~~ A.1.1. To ensure adequate fire safety in a nuclear power plant in operation, an appropriate level of defence in depth ~~for internal fire hazards~~ should be maintained throughout the lifetime of the plant, through the fulfilment of the following three principal objectives: …	Re-ordering according to the structure of the main body of the Guide, deletion of unnecessary texts and focus on plant operation; former A.1.3 is new A.1.1.	X			
1	76.	A.1.4	~~A.1.4~~ A.1.2. By satisfying the ~~above~~ three objectives in par. A.1.1, ~~the following~~ it should be ensured that: - the probability of a fire occurring is reduced to as low as reasonably practicable; - SSCs important to safety ~~and hazard protection and mitigation features~~ are adequately protected to ensure that the consequences of a single fire will not prevent those systems from performing their required function, account being taken of the effects of a single failure.	Re-ordering according to the structure, deletion of "and hazard protection and mitigation features" since sufficient fire protection and mitigation can be ensured even if the single failure criterion is not applied.	X			

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2	77.	A.1.5	~~A.1.5~~ A.1.8. Procedures should be established for the purpose of ensuring that amounts of combustible materials (the fire load) and the numbers of ignition sources be minimized in areas containing items important to safety and in adjacent areas that may present a risk of exposure to fire for items important to safety.	Re-ordering according to the structure; former A.1.5 is new A.1.8	X			
1	78.	New issue (after new A.1.8.)	A.1.9. Effective procedures for maintenance, testing, surveillance and inspection should be prepared and implemented throughout the lifetime of the plant with the objective of ensuring the continued minimization of fire loads, and the reliability of the features in place for detecting, extinguishing and mitigating the effects of fires, including established fire barriers.	Since texts in Sec. 9 and 10 do not cover the specifics of plant internal and external fires being different of several other hazards, texts from IAEA NS-G-2.1 are to be added as new paragraph A.1.9. and adapted accordingly	X			
1	79.	New issue (after new A.1.2)	A.1.3. The three objectives of defence in depth listed in par. A.1.1. should be achieved through a combination of design, installation and operation of fire prevention and protection features; management of fire safety; fire prevention and fire protection measures; quality assurance; and emergency arrangements. These aspects are addressed in the following paragraphs.	New paragraph A.1.3. added	X			
2	80.	after new A.1.3 new subtitle	FIRE SAFETY MANAGEMENT	Addition of new sub-title for clarification	X			
1	81.	New issue (after new A.1.3)	A.1.4 The operating organization(s) should clearly define in writing the responsibilities of all personnel involved in the fire prevention and protection programme and in the firefighting activities and mitigation measures.	Missing text from IAEA NS-G-2.1 added as new paragraph A.1.4 and adapted correspond-	X			

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				ingly.				
1	82.	New issue (after new A.1.4)	A.1.5. Plant personnel engaging in activities relating to fire safety should be appropriately qualified and trained so as to have a clear understanding of their specific areas of responsibility and how these may interface with the responsibilities of other individuals, and an appreciation of the potential consequences of errors.	Missing text from IAEA NS-G-2.1 added as new paragraph A.1.5.	X			
1	83.	New issue after new A.1.5	A.1.6. Personnel should be encouraged to adopt a rigorous approach to their firefighting activities and responsibilities and a questioning attitude in the performance of their tasks, to foster continual improvement.	Missing text from IAEA NS-G-2.1 added as new paragraph A.1.6 and adapted correspondingly	X			
1	84.	New issue after new A.1.6	A.1.7. The cause(s) of any fire or of the failure or spurious operation of fire protection features that has the potential to affect safety should be established and corrective actions should be taken to prevent a recurrence. The potential implications for fire prevention and protection of operational experience from fires at other plants should be considered. Communication should be maintained and information exchanged between plants (and with the regulatory body) on safety related aspects of fire safety.	Missing text from IAEA NS-G-2.1 added as new paragraph A.1.7 and adapted correspondingly	X			
2	85.	after new A.1.7 new subtitle	FIRE PREVENTION AND PROTECTION	New subtitle has been added after new paragraph A.1.7	X			
2	86.	after new A.1.9 new subtitle	ORGANIZATION AND RESPONSIBILITIES	New subtitle has been added after new paragraph A.1.9	X			
2	87.	after new A.1.11	FIRE HAZARD ANALYSIS	New subtitle has been added after new paragraph	X			

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		new subtitle		A.1.11				
2	88.	A.1.6	~~A.1.6~~ A.1.12. A comprehensive fire hazard analysis should be performed for the plant in order to do the following: - demonstrate the adequacy of ~~existing~~ fire protection measurens (both passive and active) in place to protect areas identified as important to safety for all plant operational states; - identify any specific areas where levels of fire protection are inadequate and where corrective measures are necessary; - provide a technical justification from the recommended practices (see IAEA ~~Safety Series No.~~ SSG-64~~, Protection against Internal Hazards in the Design of Nuclear Power Plants~~ [1]-) for which no corrective measures are taken. The fire hazard analysis should be updated regularly over the lifetime of the plant and in case of any plant modifications.	Re-ordering according to the structure; additions and changes for clarification and precision; former A.1.6 is now A.1.12	X			
2	89.	A.1.7	~~A.1.7~~ A.1.13. Any modification that may affect, directly or indirectly, the ~~installed~~ fire safety measurens in place, including the manual fire-fighting capability, should be subject to a procedure for controlling modifications. Such a procedure for modifications should provide assurance that there will be no detrimental effects on the ~~installed~~ fire safety measurens in place or on the ability to provide an effective manual fire-fighting capability in those areas for which fire safety measurens are identified as necessary to maintain safety.	Re-ordering and clarification, the term “fire protection means” covers passive means as well as active measures; former A.1.2 is new A.1.113.	X			
2	90.	A.1.8	~~A.1.8~~ A.1.14. The technical justification from recommended practice (IAEA ~~Safety Series No.~~ SSG-64 [1]) that is identified when the fire hazard analysis is updated should include a discussion of the plant modifications that would be necessary to follow ac-	Re-ordering according to structure, editorial; former A.1.8 is now A.1.14	X			

			cepted practice and the reasons why it is not reasonably practicable to implement such modifications. The technical justification should also describe compensatory features provided to maintain an acceptable level of safety, where applicable.					
2	91.	after new A.1.14 new subtitle	IMPACTS OF PLANT MODIFICATIONS ON FIRE SAFETY	New sub-title added after new par. A.1.14 according to followed structure of IAEA NS-G-2.1	X			
2	92.	A.1.9	~~A.1.9~~ A.1.15. A review of implications for fire safety should be carried out for the following modifications to the plant as part of the fire hazard analysis update: - modifications to the fire protection features; - modifications to the protected items important to safety or systems that could adversely affect the performance of the fire protection features; - any other modification that could adversely affect the performance of the fire protection features, including modifications affecting area fire loading.	Re-ordering according to the structure and precision; former A.1.9 is now A.1.15. Question: Does the term "area fire loading" mean the fire load density = fire load per floor area ? The term "area fire loading" is not a typically used one. Answer: "area fire loading" means just "fire load per floor area"		X		"if necessary" is added. Fire hazard analysis is required if there are permanent or relatively long-term modifications, but in MSs, many temporary modifications are not always evaluated as a formal fire hazard analysis.
1	93.	New issue after new A.1.15	A.1.16. Operating licences issued to nuclear power plants usually include a requirement for approved, written procedures for controlling modifications to SSCs important to safety. All proposed plant modifications should be scrutinized for their potential effect on area fire loading and fire protection features, since a modification involving non-safety-related SSCs could conceivably change an area fire loading or could degrade a fire protection feature whose primary	A new paragraph from IAEA NS-G-2.1 (par. 5.1) has been added as A.1.16, because this is fire specific and important for operation	X			

			purpose is to protect safety systems.					
2	94.	A.1.10	~~A.1.10~~ A.1.17. A formal review system to evaluate the impacts of modifications on fire safety should be incorporated into the overall modification procedure. Alternatively, a separate procedure should be established and implemented specifically for reviews for fire protection. Modifications should not be commenced until the review has been completed.	Re-ordering; former A.1.10 is new A.1.17	X			
2	95.	A.1.11	~~A.1.11~~ A.1.18. The personnel ~~staff~~ assigned the responsibility for carrying out such reviews for issues of fire safety should be suitably qualified to …	Re-ordering; former A.1.11 is new A.1.18	X			
2	96.	A.1.12	~~A.1.12~~ A.1.19. Plant modifications should only be carried out on the authority of a work permit issued by a person who is competent in and …	Re-ordering; former A.1.12 is new A.1.19	X			
2	97.	A.1.13	~~A.1.13~~ A.1.20. If a modification necessitates the removal from service of any of the fire protection features, careful consideration should be given to the consequent reduced level of protection of item~~(s)~~ …	Re-ordering; former A.1.13 is new A.1.20	X			
2	98.	A.1.14	~~A.1.14~~ A.1.21. The fire hazard analysis should be reviewed and updated to reflect the modification, as appropriate.	Re-ordering; former A.1.14 is new A.1.20	X			
2	99.	after new A.1.21 new subtitle	CONTROL OF COMBUSTIBLE MATERIALS	New sub-title from IAEA NS-G-2.1 was added for clear structure	X			
1	100.	New issue after new A.121.	A.1.22. Administrative procedures should be established and implemented for effective control of combustible materials throughout the plant. The written procedures should establish controls for delivery, storage, handling, transport and use of combustible solids, liquids and gases. Consideration should be given to the prevention of fire related explosions within or adjacent to areas identified as important to safety. For areas identified as important to safety, the procedures should establish controls for combustible	New paragraph was added from IAEA NS-G-2.1 (par. 6.1.) as new A.1.19	X			

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			materials associated with normal plant operations and those which may be introduced in activities related to maintenance or modifications.					
2	101.	A.1.15	~~A.1.15~~ A.1.23. Written procedures should be established and enforced to minimize the amount of transient (i.e. non-permanent) combustible materials, …	Re-ordering; former A.1.15 is new A.1.23	X			
2	102.	A.1.16	~~A.1.16~~ A.1.24. The total fire load due to combustible materials in each area identified as important to safety should be maintained as low as reasonably …	Re-ordering; former A.1.16 is new A.1.24	X			
2	103.	A.1.17	~~A.1.17~~ A.1.25. The use of combustible materials in the furnishings of the ~~power~~ plant should be minimized. Combustible materials should not be used for decorative or other non-essential effects in areas identified as important to safety.	Re-ordering according to structure; editorial for consistency with e.g. IAEA SSG-64; former A.1.17 is new A.1.19	X			
2	104.	A.1.18	~~A.1.18~~ A.1.26. Administrative controls should be established and implemented to ensure that areas important to safety are inspected periodically in order to evaluate the general fire loading and plant housekeeping conditions, and to ensure that means of ~~exit and~~ access and escape routes for manual ….	Re-ordering; former A.1.18 is new A.1.26; addition for precision	X			
2	105.	A.1.19	~~A.1.19~~ A.1.27. Administrative procedures should be established and implemented to provide effective control of temporary fire loads in areas identified as important to safety during maintenance and modification activities. These procedures should cover combustible solids, liquids and gases, their containment and their storage locations in relation to other hazardous material such as oxidizing agents. These administrative procedures should also include a procedure for issuing work permits that requires in-plant review and approval of proposed work activities prior to the start of work to determine the potential effect on fire safety. The on-site ~~staff~~ personnel member responsible for reviewing work activities for potential temporary fire loads should determine whether	Re-ordering according to structure, editorial adaption to state-of-the-art; former A.1.19 is new A.1.27	X			

			the proposed work activity is permissible and should specify any additional fire protection measures that are needed (such as the provision of portable fire extinguishing~~ers~~ equipment or the use of a fire watch officer, as appropriate).					
2	106.	A.1.20	~~A.1.20~~ A.1.28. Administrative procedures should be established and implemented to control the storage, handling, transport and use of flammable and combustible solids and liquids in areas identified as important to safety. The procedures should be ~~established i~~n accordance with national practice and should provide controls for solids and liquids. For solids: (a) The use of combustible materials (such as wooden scaffolding) should be restricted. Where wooden materials are permitted, they should be chemically treated or coated so as to be fire retardant. (b) The storage of combustible materials such as charcoal filters and dry unused ion exchange resins should be restricted; large stocks of such materials should be placed in a designated storage area with appropriate fire rated compartmentation and fire measures provided. (c) The storage of combustible materials such as papers and protective clothing should be restricted; large stocks of such materials should be placed in designated storage areas with appropriate fire rated compartment barriers ~~compartmentation~~ and fire protection measures provided. (d) The storage of all other combustible materials should be prohibited. For liquids: (i) The amounts of flammable or combustible liquids introduced into fire areas during maintenance or modification activities should be limited to the amount needed for daily use. Suitable fire protection measures such as the provision of portable ~~hand-held~~	Re-ordering; former A.1.20 is new A.1.28; editorial according to state-of-the-art for more precision	X			

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			fire extinguishers should be taken, as appropriate. …					
1	107.	new issue A.1.29	A.1.29. Administrative procedures should be established and implemented to control the delivery, storage, handling, transport and use of flammable gases throughout the plant. The procedures should be established in accordance with national practice and should be implemented to ensure that: (a) Cylinders of compressed gases that sustain fires, such as oxygen, are properly secured and are stored separately from flammable gases and away from combustible materials and ignition sources; (b) Where a supply of flammable gas is needed inside a building for permanent use, it is supplied from cylinders or a bulk storage area safely located outside the building in a dedicated storage area such that a fire affecting the storage area would not compromise safety.	New paragraph A.1.29 was added from IAEA NS-G-21 (par. 6.8) to consider also combustible gases being very important; former A.1.12 is new A.1.19 Correspondingly, an addition in the Appendix A.3 on explosions that flammable gases are covered here as well is recommended	X			
2	108.	A.1.21	~~A.1.21~~ A.1.30. Administrative procedures should be established and implemented to control potential ignition sources throughout the plant. …	Re-ordering; former A.1.21 is new A.1.30	X			
1	109.	New issue A.1.31	A.1.31. Administrative procedures should be established and implemented to control maintenance and modification activities that necessitate the use of a potential ignition source or that may themselves create an ignition source. The performance of such work should be controlled by means of formal written procedures, i.e. by means of either the work permit system discussed earlier or a special system for hot work permits. In the permit system adopted, procedures should be established to cover management, supervision, authorization and performance of the work, inspection of the work area, assignment of fire watch (if stipulated) and access for firefighting. All personnel concerned with the preparation, issuing and use of permits for hot work should be instructed in the proper use of the system and should have a clear understanding of its purpose and application. Wheth-	See general comment; prevention is also essential in plant operation; therefore, hot work controls etc. are highly important. Accordingly, missing text from IAEA NS-G-2.1 (par. 6.10) has been added as new paragraph A.1.31.	X			

			er or not a fire watch is provided, at least one person engaged in the work should be trained in the use of any fire safety features provided.					
1	110.	New issue A.1.32	A.1.32. In areas containing items important to safety, work which involves the use of a potential ignition source or which may create ignition sources ("hot work") should be permitted only after consideration of the possible consequences for safety. For example, such work may be prohibited from occurring simultaneously on functionally redundant items important to safety or in the areas containing such items.	See general comment and comment before; accordingly, missing text from IAEA NS-G-2.1 (par. 6.11) has been added as new paragraph A.1.32 and adapted.	X			
2	111.	A.1.22	~~A.1.22~~ A.1.33. Procedures should be established to ensure that, before any hot work is attempted, the immediate work area and adjacent areas are …..	Re-ordering; former A.1.22 is new A.1.33	X			
2	112.	A.1.23	~~A.1.23~~ A.1.34. During hot work, regular inspections should be carried out ~~made~~ to ensure that the conditions of the permit are observed, that there ….	Re-ordering; former A.1.22 is new A.1.33; editorial	X			
2	113.	A.1.24	~~A.1.24~~ A.1.35. In cases where the hot work permit identifies the need for a fire watch, the following procedures should be followed: (a) The fire watch should be on duty in ~~the immediate vicinity~~ close proximity before any hot work is attempted, the work should be stopped if the fire watch leaves the work area, and the fire watch should remain in the work area for an appropriate period after open flame work is completed. (b) While the work is in progress the fire watch should perform no other duties. (c) Suitable dedicated fire-fighting equipment should be readily available and means should be provided by which additional assistance can be readily obtained, if necessary. Adequate access and escape routes for fire-fighters should be maintained.	Re-ordering; former A.1.24 is new A.1.35; addition for precision	X			
2	114.	A.1.25	~~A.1.25~~ A.1.36. Any equipment or vehicle in use in areas in which a flammable gas could be released should be appropriately qualified for use in explosive	Re-ordering; former A.1.25 is new A.1.36.	X			

			atmospheres.	Remark: The paragraph is important for internal explosion and therefore either should be moved to Appendix A.2, or reference to this paragraph needs to be given in Appendix A.2				
2	115.	A.1.26	~~A.1.26~~ A.1.37. The use of compressed gas cylinders for cutting or welding operations or other hot work should be controlled by a system of work permits.	Re-ordering; former A.1.26 is new A.1.37	X			
2	116.	A.1.27	~~A.1.27~~ A.1.38. Warning signs should be placrd ~~erect-ed~~ at the entrances to areas containing combustible materials to warn personnel of restrictions or ….	Re-ordering; former A.1.274 is new A.1.38; editorial	X			
2	117.	after new A.1.38 new subtitle	INSPECTION, MAINTENANCE AND TESTING OF FIRE PROTECTION MEANS	New subtitle has been added after the A.1.38 (new number, formerly A.1.27) for clarification and following the structure from IAEA NS-G-2.1 adapted accordingly	X			
1	118.	A.1.28	~~A.1.28~~ A.1.39. The ~~inspection,~~ maintenance, ~~and~~ testing, surveillance and inspection programme should cover the following fire protection meansures: - passive fire rated compartment barriers and structural elements ~~components~~ of buildings, including the seals of barrier penetrations; - fire barrier elements with active functions ~~closures~~ such as fire doors and fire dampers; - locally applied separating or protective elements such as fire-retardant coatings and qualified cable wraps;	Re-ordering; former A.1.28 is new A.1.39; but also important additions for completion and more precision according to the state-of-the-art	X			

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			- fire detection and alarm systems including fire detectors, flammable gas detectors and their electrical support systems; - water based fire extinguishing systems; - ~~a~~ fire water supply system including a water source, a supply and distribution pipe, sectional and isolation valves, and fire pump assemblies; - gaseous and dry powder fire extinguishing systems; - portable fire extinguish~~ers~~ing features; - other manual firefighting equipment including emergency vehicles; - smoke and heat removal systems and air pressurization systems; - emergency lighting systems; - communication systems for use in fire incidents; - respirators and protective clothing for radiological applications; - access and escape routes for firefighting personnel; - emergency procedures. ~~- manual fire-fighting equipment.~~					
2	119.	after new A.1.39 new subtitle	MANUAL FIREFIGHTING CAPABILITY	New subtitle has been added after the A.139 (new number, formerly A.1.28) for clarification and following the structure from IAEA NS-G-2.1 adapted accordingly	X			
2	120.	A.1.29	~~A.1.29~~ A.1.40. A fire-fighting strategy should be developed for each area of the plant identified as important to safety (including those areas, which present a fire exposure risk to areas important to safety). These strategies should provide information to supplement the information provided in the general plant emergency plan. The strategies should provide all appropriate information needed by fire-fighters to	Re-ordering; former A.1.29 is new A.1.40, more precision according to state-of-the-art	X			

			use safe and effective fire-fighting techniques in each fire area. The strategies should be kept ~~current~~ up to date and should be used in routine classroom training and in actual fire drills at the plant. The fire-fighting strategy developed for each fire area of the plant should cover the following: - access and ~~exit~~ escape routes for fire-fighters; - locations of structures, systems or components identified as important to safety; - fire loadings; - particular fire hazards, including the possibly~~e~~ reduced capability for fire-fighting due to external ~~events~~ hazards; - special radiological, toxic, high voltage and high - pressure hazards, including the potential for explosions; - ~~the~~ fire protection features provided (both passive and active); - restrictions on the use of specific fire extinguishing ~~agents~~ media because of concerns about nuclear criticality or other particular concerns, and the alternative extinguishing media to be used; - locations of heat and/or smoke sensitive items ~~components or equipment~~ important to safety; - location of fixed and portable fire extinguishing equipment; - water supplies for manual fire-fighting; - communication systems (not affecting items important to safety) for use by firefighting personnel.					
2	121.	A.1.30	~~A.1.30~~ A.1.41. Plant documentation should provide a clear description of the manual fire-fighting capability provided for those areas of the plant identified …	Re-ordering; former A.1.30 is new A.1.41	X			
2	122.	A.1.31	~~A.1.31~~ A.1.42. If reliance is placed on off-site response, designated plant personnel in each shift should be assigned the responsibility to co-ordinate and liaise with the off-site fire-fighting service and to establish a clear line of authority at the fire scene.	Re-ordering according to structure; editorial	X			

			Appropriate plant personnel should be designated even in situations in which the off-site response is supplementary to a primary response by a qualified on-site fire brigade.					
2	123.	A.1.32	~~A.1.32~~ A.1.43. Where full or partial reliance for manual fire-fighting capability is placed on off-site resources, there should be proper co-ordination …	Re-ordering; former A.1.32 is new A.1.42;	X			
2	124.	A.1.33	~~A.1.33~~ A.1.44. If an on-site fire brigade is established to provide a manual fire-fighting capability, the fire brigade's organization, minimum staffing level, …	Re-ordering; former A.1.33 is new A.1.43; editorial	X			
2	125.	A.1.34	~~A.1.34~~ A.1.45. Members of the on-site fire brigade should be physically capable of performing fire-fighting duties and should attend a formal ….	Re-ordering; former A.1.34 is new A.1.44	X			
2	126.	A.1.35	~~A.1.35~~ A.1.46. If manual fire-fighting represents the primary means of fire protection, it should be ensured, as far as possible, that the necessary actions …	Re-ordering; former A.1.35 is new A.1.45;	X			
2	127.	after new A.1.46 new subtitle	FIRE RELLATED TRAINING OF PLANT PERSONNEL	New sub-title added after the A.1.45 (new number, formerly A.1.35) for clarification and following the structure from IAEA NS-G-2.1 adapted accordingly	X			
1	128.	new issue A.1.47	A.1.47. All plant staff and contractors' personnel temporarily assigned to the plant should receive training in plant fire safety, including their responsibilities in fire incidents, before starting work at the plant. This training should include the following topics: - fire safety policy at the plant; - awareness of specific fire hazards (including combined hazards), including limitations on area fire loading and, where necessary, associated radiological concerns; - significance of the control of combustible materials	Since fire specific guidance from IAEA NS-G-2.1, par. 9.1 (not applicable to other hazards) is otherwise lost, a new paragraph A.1.46 covering these aspects has been added and slightly adapted according to the	X			

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			and ignition sources and its potential impact on the permissible fire loading in an area; - fire detection, alarm and reporting means and actions to be taken; - recognition of audible and visual fire alarm signals; - means for access and escape as well as emergency evacuation routes in the event of fire; - different types of fire extinguishing equipment provided and their use in extinguishing fires in the initial (incipient) stage.	state-of-the-art.				
1	129.	New issue A.1.48	A.1.48. Selection and appointment procedures for plant staff should establish minimum initial qualifications for all personnel involved in fire safety functions and activities which may affect safety. These minimum qualifications should be based on an evaluation of the necessary education, technical competence and practical experience for the job concerned.	Since fire specific guidance from IAEA NS-G-2.1, par. 9.3 (not applicable to other hazards) is otherwise lost, a new paragraph A.1.47 covering these aspects has been added and slightly adapted according to the state-of-the-art.	X			
2	130.	after new A.1.48 new subtitle	QUALITY ASSURANCE FOR MATTERS RELATING TO FIRE SAFETY	added after new A.1.47 for clarification and following the structure from IAEA NS-G-2.1	X			
2	131.	A.1.36	~~A.1.36~~ A.1.49. Fire protection features (including preventive ones) are not generally classified as hazard protection and mitigation features and thus they may not be subject to the rigorous qualification requirements and the associated quality assurance programme applied to hazard protection and mitigation features. However, fire has the potential to give rise to common cause failure and thus to pose a threat to safety, and therefore the ~~installed~~ active and passive	Re-ordering according to structure, former A.1.36 is new A.1.48; more precision	X			

			fire protection ~~measures~~ features in place should be considered as important to safety. ….					
1	132.	New issue after A.2.1	A.2.1a The potential formation of explosive atmosphere should be avoided/limited by the use of non-flammable liquids or processes (such as water-based solvents, operating contamination monitors with inert gases, recombining hydrogen emissions from battery charging).	Addition of a new paragraph after A.2.1 since this aspect of "primary" explosion protection was missing.	X			
2	133.	A.2.3 Line 1	… (such as gas detectors, blast doors, …	Adding gas detectors as an important example of primary explosion protection and preventive means.	X			
2	134.	A.2.6 Line 6	… Since flammable gases may have the potential to create explosive mixtures which can cause an explosion with ignition sources being present. ~~T~~The Guidance provided in Appendix A.1 (Internal Fires) in par. A.1.22 and A.1.27-37 is ~~provisions discussed in A.1.22-24 are~~ applicable.	Clarification and references to A.1	X			
1	135.	A.3.1	Potential missile sources are present ~~exist~~ at all nuclear power plants ~~NPPs~~. The operating organization(s)´ efforts should focus c~~oncentrate~~ on ensuring the integrity of potential missile sources and of engineered structures ~~barriers~~ is maintained so that missile generation and hazard propagation are prevented or unlikely and limited in extent, should the hazard occur and is mitigated before it affects essential plant or system functions.	See general comment.	X			
1	136.	A.3.2	Operating procedures should be developed and implemented for identified and characterized internal missile sources to prevent internal missile hazards ~~identify potential missile hazards before they occur~~ and include the following: • Regular plant area walkdowns to detect potential missile hazards; • Observation of personnel interacting with poten-	Potential internal missile hazard sources have been identified and characterised during the design in conformance with IAEA SSG-64 and have		X1		

			tial missile sources; • Rotating machinery inspections <u>including means to limit the rotational speed and monitoring and surveillance measures</u>; • Regular turbine blade inspections for turbine blade ~~fatigue~~<u>degradation</u>; • Inspection of storage areas of high-pressure gas bottles and the integrity of the gas bottles themselves~~.~~<u>;</u> • <u>Valve, bolted connection and control rod inspections.</u>	been analysed in paragraphs par. 5.1 and 5.2 of this guide. Identification of new internal missile sources should be part of the periodic updating of the operational hazard management programme as described in paragraph par. 8 of this guide. Further clarification and consistency with IAEA SSG-64.				
2	137.	A.3.5	Operating procedures after missile events should include ~~short-term and long-term~~ actions such as plant walkdowns to determine the missile impact on the <u>integrity and</u> functionality of SS~~C~~Cs important to safety.	Clarification	X			
2	138.	New issue A.3.7	<u>A.3.7. The integrity of engineered structures and barriers affected by an internal missile hazard has to be assessed.</u>	Missing paragraph has been added	X			
2	139.	A.4 new subtitle	<u>HEAVY LOAD DROP</u>	New sub-title, consistent with IAEA SSG-64	X			
2	140.	A.4.1 Line 5	… ~~Typically, t~~The prevention of structural collapses and falling objects from crane lifts is ~~largely through~~ <u>first and foremost realized by a</u> conservative design. Nevertheless, falling objects from cranes and other lifting equipment ~~should~~ <u>must</u> be considered a potential hazard.	Clarification	X			
2	141.	A.4.2	Hazard protection and mitigation measures should include <u>load following platforms, deployable de-</u>	Addition in conformance with para-	X			

			formable structures and protective dampers if applicable as well as load cells on hoists, fall zone controls, and crane and lifting equipment ~~travel~~ limit switches.	graph par. 4.182 of IAEA SSG-64.				
1	142.	A.4.3	The operating organization should establish procedures for planning hoisting and lifting activities. Planning of these activities should include risk assessments, pre-planned lifting routes, associated lifting equipment, additional supervision, defining of restrictions, and interlocking of lifting routes, as applicable. ~~In some cases where there may be unclear lifting instructions, trial lifts should be considered.~~	No lifting operations with unclear lifting instructions should be performed and no exception should be allowed because it makes any pre-planning obsolete, it is contradictory with the before mentioned guidance and bears the risk of a dropped load.	X			
1	143.	New issue A.4.7	A4.7. Disabling of or changes to active protective measures (limiters, interlocks, trips) should only be allowed in accordance with pre-planned procedures.	New paragraph added; In some cases, the prevention of dropping or swinging loads relies also on active protection measures according to paragraph par. 4.178 in IAEA SSG-64.	X			
1	144.	New issue A.4.8	A.4.8. The scheduling of load movements and lifts in specified modes of plant operation (such as shutdown modes) should be considered as a preventive and mitigative measure.	New paragraph A.4.8 is to be added consistent with IAEA SSG-64	X			
1	145.	New issue A.4.9	A.4.9. The integrity of engineered structures and barriers affected by drop of loads has to be assessed.	Missing paragraph is to be added as A.4.9	X			
1	146.	A.5.1	Pipe breaks (or pressure part failure) is associated with a variety of resulting hazard phenomena, includ-	It is proposed to restructure A.5	X			

			ing pipe whip impacts, room pressurisation, jet effects, and flooding. The extent of each of these phenomena depends on the fluid involved, and its mass, temperature and pressure. ~~The operating organization should ensure the control of plant configuration for the plant piping including engineered structures designed to minimize the impact of pipe breaks is maintained at all times i~~ In accordance with the relevant requirements 10, 14, 24, and 31 ~~in~~ of IAEA ~~Safety Standards Series No.~~ SSR-2/2 (Rev. 1) [6] the actions described in the following paragraphs A5.2 to A.5.4 should be taken preventing pipe breaks and mitigating their potential impact. ~~The ageing management programme should incorporate the appropriate aspects of pipe integrity and be included in the operational hazard management programme.~~	along the relevant requirements of IAEA SSR-2/2. This will result in a more systematic and complete set of recommendations. Sentence with "The operating organization …" is to be shifted to A.5.2. Statement about the ageing management programme should be shifted to a sepetate para – hier new A.5.4 (see coment below)				
2	147.	A.5.2	The operating organization(s) should ensure the control of plant configuration for the plant piping including engineered structures designed to minimize the impact of pipe breaks at all times. For this purpose, periodic~~ally~~ walk-downs of plant areas should be performed to confirm that the plant conditions correspond to those stated in the design, including~~;~~ identification of items that hinder or make ineffective leak detection devices, proper closure of compartment doors, and proper installation of protective covers. These periodic walkdowns should also include the identification of general pipe and piping component degradations, and steam and water leaks. Also included in these ~~NPP~~ operator walkdowns should be engineered barrier integrity, pipe whip restraints, pipe hangaers, blast doors, ~~and~~ blowout panels, and drains.	The first phrase was shifted from A.5.1 – resulting from requirement 10 of IAEA SSR-2/2 - and combined with the practical realization of the general recommendation made in this phrase.	X			

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1	148.	New issue A.5.4	A.5.4. The ageing management programme should incorporate the appropriate aspects of pipe integrity ~~and be included~~ to be considered in the operational hazard management programme. This should include operating experience feedback regarding any new information on the potential degradation of comparable piping systems.	The first phrase was shifted from A.5.1 - resulting from requirement 14 of IAEA SSR-2/2 - to form a new paragraph on the role of ageing management that is considered an important aspect of prevention. Next to the known degradation mechanisms new insight from operating experience feedback should also be taken into account – resulting from requirement 24 of IAEA SSR-2/2.		X		Suggested reordering is missing A.5.3. (This para is placed as A.5.3.)
1	149.	New issue A.5.5	A.5.5. Maintenance, testing, surveillance and inspection programmes should ensure that any degradation of piping systems is detected and corrected in a timely manner if necessary, thereby preventing pipe failures. Furthermore, engineered movable structures designed to minimize the impact of pipe breaks like valves, hangers, and dampers should be tested regularly proving they are functional.	A new paragraph – resulting from requirement 31 of IAEA SSR-2/2 – as surveillance and testing are important aspects of prevention.		X		Same as above.
2	150.	A.5.3	~~A.5.3~~ A.5.6. Apart from the operating procedures associated with preventive actions, there should be procedures related to the implementation of mitigating actions in the event of pipe break ~~pipe whip~~ impacts~~, room pressurisation, or jet effects, and~~ that should include the implementation of ~~hazard~~ coping strategies.	This is the former paragraph A.5.3 with some clarification.		X		Same as above.
1	151.	New	A.5.7. When a pipe break did occur and the plant	Additional im-		X		Same as above.

		issue A.5.7	returned to a safe state, a thorough inspection should be performed revealing any damage that might have been caused by the different impacts of the break in its surrounding. Next to the effects mentioned above in paragraph A.5.1 this should include the internal depressurization wave, high humidity, spray, and high temperature in the room concerned.	portant aspect of a hazard management programme should be a thorough inspection of possible damage caused by the impact of the hazard. Additionally, we suggest that this aspect should also be addressed in a more general way in Section 3.				
2	152.	A.6.1	Internal floods at an NPP may be caused by leakages, pipe breaks, tank breaches, open valves, or ~~operation~~ use of firefighting water. These may also be the indirect effects of challenges from external hazards such as ~~earthquakes~~ seismic or external flooding events. The operating organization should ensure the integrity of engineered structures and barriers that are designed to minimize the impact of internal flooding is maintained at any~~ll~~ time~~s~~.	Editorial for clarification	X			
2	153.	A.6.2	Enhanced operational controls during construction, maintenance or inspection ~~or construction~~ activities should be ~~put~~ in~~to~~ place during times of increased flooding risks (e.g. temporary water hoses during outage periods).	Completion and precision	X			
1	154.	A.6.4	Prevention, protection and mitigation measures against internal flooding hazards should include level detection systems, engineered drainage routes, water proofing measures to prevent flooding, and protection covers or embankments around critical structures and components to prevent water spreading to other plant areas ~~of the plant~~ in an uncontrolled manner. Mitigation of internal flooding should be achieved in part by design choices with respect to the layout of	Completion, see general comment, and		X1		

			the plant~~,~~; therefore, some flood scenarios are naturally self-limiting (for example where the flood is limited to the contents of a single tank), whereas others require short-term plant personnel actions ~~may actions by plant personnel are assumed~~.					
2	155.	A.6.6	The operating organization(s) should establish operating procedures for the detection and mitigation of internal flood~~s~~ing. Procedures should include instructions for the isolation of leaking systems and flooded rooms, and the potential use of deployable pumping equipment to drain flood ~~water~~ liquids.	Editorial for precision	X			
2	156.	A.7.2.	The operating organization(s) should establish operating procedures that ~~describe~~ characterize actions following indications of a hazardous substances releases at the site. Entry into these procedures is typically based ~~up~~on indications from a gas detection system, or from direct reports from plant personnel. The objective of the operating procedures should be ~~have the objective~~ of limiting exposure to personnel through the event and timely recovery after the release has dispersed.	Editorial for clarification	X			
2	157.	A.7.3	From an on-site release perspective, operating procedures should include isolation of damaged systems or storage tanks, ~~isolation~~ of rooms with non-habitable atmospheres, preservation of habitable atmospheres in the main control room(s), and may include a partial evacuation process for site personnel ~~staff~~. The~~re should be considerations of the~~ need for personal on-site safety equipment (e.g. breathing apparatus, protective~~on~~ clothing~~suit~~) should be considered to allow operators to move to safe plant locations places of safety.	Precision and clarification		X1		
2	158.	A.7.4	Protection and mitigation ~~measures~~ against the effects of internal release of hazardous substances is largely ensured by passive means, (e.g., redundancy of rooms or systems, administrative requirements, etc.). Operating procedures should include provisions	Clarification	X			

			to ~~shut~~ close ~~inlet~~ dampers in the air inlet path of the ventilation system to the main control room ~~ventilation system~~ if required, and may also include other controls over ventilation flows.					
1	159.	A.8.1. Line 2	… Significant sources of EMI can be eliminated by suitable ~~proper~~ design, construction, and maintenance of instrumentation and control and also of power supply systems and their components.	Consistency with other Guides; see SSG-39, Para.6 Electromagnetic qualification: ….Electromagnetic compatibility is the ability of a system or component to function satisfactorily in its electromagnetic environment without the introduction of intolerable electromagnetic disturbances to anything in that environment … … Electromagnetic interference includes radiofrequency interference and, as used in this Safety Guide, includes electrical surges, for example, voltage spikes resulting from switching transients …. … Equipment and systems, including associated cables and power supplies,	X			

				should be designed and installed to appropriately limit the propagation (by both radiation and conduction) of electromagnetic interference among plant equipment… . Any electrical or electronic equipment in the plant will contribute to the electromagnetic environment. Therefore, the need to limit electromagnetic emissions should apply to all plant equipment, not just equipment that is classified as important to safety. ….				
1	160.	A.8.4.	The EMI identification process should contain controls for portable or temporary EMI sources. These controls should include the location and timing of maintenance and construction activities, and exclusion zones or other administrative or operational controls to minimize an EMI hazard, including ~~cellular phones~~ wireless equipment used at the plant, as well as those of maintenance, repair and measuring devices ...	Consistency with SSG-39, Par. 6.124: The aspects of electromagnetic interference to be considered in the design of I&C systems and components include: Emission of, and immunity to, electromagnetic disturbances; Emission and con-	X			

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				duction of electro-magnetic disturb-ances via cables; Electrostatic dis-charge; Switching transients and surges; The emission char-acteristics of wire-less systems and devices used at the plant, as well as those of repair, maintenance and measuring devices.				
2	161.	B.1.2	The operating organization(s) should use the ~~insights given~~ information provided in Safety Series Report No. 66, Earthquake Preparedness and Response for Nuclear Power Plants [20] in the development of an earthquake response plan for pre-event and post-event actions. These ~~event~~ actions take the form of procedures that describe short-term and long-term actions and include SSC specific ~~system and compo-nent~~ walkdowns to determine the status and function-ality of hazard protection and mitigation features. Entry into these actions is based upon indications from the seismic monitoring system, information from offsite geological centres, or ground motion experienced by plant personnel. ~~Insights for~~ Recom-mendations for plant shutdown ~~is~~ are provided in ~~the~~ Safety Series Report No. 66 [20].	Clarification		X1		
2	162.	B.1.3	As a pre-event action, the operating organization should ~~maintain~~ ~~plant~~ observe the principles of good housekeeping ~~at acceptable levels~~ to ensure that earthquake damage is not propagated or increased by ~~extraneous debris~~ temporary and/or loose items. […]	Clarification of ambiguous termi-nology	X			
2	163.	B.1.4	If the plant is shut down after an earthquake event,	Clarification of	X			

			the operating organization should ensure long-term ~~shutdown operational~~ safety ~~after the safe shutdown~~ during the shutdown phase. Items to be considered are emergency diesel generator fuel supplies, ~~plant back feed power supply integrity~~ off-site power supply, auxiliary power supply, control room habitability, and the restoration or possible repair of disabled/damaged items important to safety and hazard protection and mitigation features.	ambiguous terminology				
2	164.	B.2.2	The operating organization should establish communication protocols and standards with national or local agencies to ~~have sufficient~~ receive timely and comprehensive warning of volcanic activity and the potential ~~transport~~ impact of volcanic ash and toxic gases.	Clarification of unprecise terminology		X		The warning itself is information of transport of them, not "impact".
2	165.	B.2.5	Operating procedures should be developed and implemented to monitor the differential pressures of HVAC filters and the air quality in the main control room. These procedures include cleaning or replacing the filters as required due to the deposition of volcanic ash.	Clarification of ambiguous terminology	X			
2	166.	B.2.6	Operating procedures should be developed and implemented to inspect and clean electrical insulators for SSC related power cables, ~~plant power back feed~~ auxiliary power supply cables, and switchyard connections.	Clarification of ambiguous terminology	X			
3	167.	B.2.7 Line 2	…. Special consideration should be ~~for sufficient~~ given to the available quantities of ventilation filters.	Wording	X			
3	168.	B.3.2	Since external floods by storm surge or tsunami are ~~somehow~~ predictable to a certain extent, the operating organization should establish communication protocols and standards with national and local agencies that predict such ~~these types of~~ phenomena~~on~~.	Wording	X			
2	169.	B.3.6	Prior to the flooding event, the ~~plant~~ site should be inspected for loose equipment or structures that may become flotsam and cause structural loading ~~and~~ if they impact structures or equipment during the event.	Clarification of ambiguous terminology	X			

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			If possible, these items should be removed from the site, or secured as to minimize hazard propagation during the flood. These activities should include re-straining items that may become buoyant during an extreme flooding event and block drainage outlets or access routes.					
2	170.	B.3.7	Prior to the flooding event, all operation and maintenance activities not related to the flooding hazard mitigation should be completed and ~~placed~~ equipment and systems should be brought into a safe condition ~~as soon as possible~~.	Clarification	X			
2	171.	B.3.8	During the flooding event, the operating organization should perform the following activities, with consideration of personnel safety: - Inspection and monitoring of water levels in vulnerable and/or sensitive areas; ~~should be monitored and~~ The results should be communicated ~~with~~ to the plant personnel. - ~~Also, w~~Water levels that could lead to overtopping ~~any~~of dykes, dams, or seawalls should be identified and communicated to plant personnel. - Use of heavy ~~loading~~ equipment to remove ~~large~~ debris from ~~required~~ access areas. - Isolating damaged systems and/or plant areas to minimize flooding propagation and avoid increasing the damage caused by the flooding.	Correction of layout and clarification of ambiguous terminology	X			
2	172.	B.4.2	Since external floods by extreme precipitation or rivers are predictable to a certain extent, the operating organization should establish communication protocols and standards with national and local agencies that predict such ~~these types of~~ phenomen~~a~~on ~~to ensure the flooding hazards are understood~~.	More precision provided, since local extreme precipitation is not always predictable.	X			
2	173.	B.4.3	The operating organization should establish and implement procedures that describe pre-, during and post-event actions corresponding to the expected amount of precipitation or the expected ~~time~~ duration and maximum height of	Clarification of ambiguous terminology	X			

			the ~~maximum~~ river flood ~~height~~.					
3	174.	B.4.6	The recommendation in par~~a~~. B.3.7. and B.3.8. for activities of personnel should be considered ~~for external floods~~.	Wording (B.3.7 and B.3.8 also deal with 'external floods')	X			
2	175.	B.5.3	The operating organization should regularly check the site meteorological systems to ensure consistency with measurements by specialized meteorological organizations ~~national/local predictions~~ as well as determining localized weather conditions.	As predictions are subject to uncertainties, the on-site measurements do not have to be consistent with the predictions but with the measurements of specialized organizations.	X			
2	176.	B.5.4 Line 3	… These activities should include reinforcing or removing any temporary scaffolding, securing any unstable equipment, and preparatory checks of ~~internal~~ emergency power systems.	Clarification	X			
2	177.	B.5.5	Prior to the extreme wind events, all operation and maintenance activities not related to this external hazard mitigation should be completed and ~~placed~~ equipment and systems should be brought into a safe condition ~~as soon as possible~~.	Clarification	X			
1	178.	B.5.6	Depending ~~up~~on the severity of the extreme wind hazards, the operating organization should consider evacuating all non-essential plant personnel. On the one hand, this ~~This~~ will also reduce the number of transportation vehicles in the parking areas, but, on the other hand, less personnel will be available for time-sensitive measures during and immediately after the event measures (e.g. removal of debris, implementation of emergency measures).	The downside of evacuating personnel should also be mentioned to stimulate balanced and safety-oriented decisions.		X		Personnel who will not help time-sensitive measures is "non-essential". Removing debris is not time-essential. Emergency measures important to safety will be done by essential personnel. To take balance

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								merit and de-merit, the merit part was deleted.
2	179.	B.6.2	The operating organization should establish communications protocols and standards with national and local meteorological agencies organizations to be properly warned to be forewarned of any extreme meteorological conditions, including the its possible duration. This information should be supplemented as necessary by the use of the site's meteorological systems.	Consistency with B.5.2	X			
2	180.	B.6.6	Snow or large amounts of hail can block inlets or outlets of protective safety features such as safety valves, blowout panels and HVAC intakes. These should be cleared during and after the event. Installation of electric heaters in some vital areas should be considered.	HVAC intakes in itself are typically not considered 'protective' features (also there may be protective features integrated into the air intakes).	X			
1	181.	B.6.7	The operating organization should have procedures in place for storing and moving snow at the site, if applicable. This should include clearing maintaining all of required accesses clear, as well as removal of snow from buildings so to avoid the exceedance of design loads. are not exceeded, B.6.# To ensure adequate energy supply of safety related equipment, and checks for proper diesel fuel composition should be checked and, if necessary, adjusted during periods of extreme temperature.	The check of proper diesel fuel composition has nothing to do with 'storing and moving snow'. Therefore, the idea should be addressed in a separate paragraph.	X			
2	182.	B.6.8	At sites where frazil ice can occur, the temperature of the cooling water should be observed carefully monitored before to ensure that the inlet of the cooling water circuit does not freezes. Freezing may be prevented by circulating warm water from the outlet circuit to the inlet.	Clarification of ambiguous terminology	X			
2	183.	B.7.1	- Marine/Waterborne, e.g.,	As the lists given in	X			

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		bullet list	• Jellyfish • Seaweed • Fish • Mussels - Land, e.g., • Infestation from mice, rats, rabbits, etc. • Biological debris such as fallen leaves - Airborne, e.g., • Swarms of insects and birds	the three bullets are incomplete, an "e.g." should be added to avoid mis-interpretation.				
1	184.	B.7.2	The cooling water and intake structures should be monitored continuously, to ensure that any unusual accumulation of aquatic organisms is noticed in time and measures can be taken to avoid clogging of intake structures or unacceptable degradation of cooling water quality. ~~For waterborne biologics that could overburden plant intake structures,~~ In addition, communication protocols and standards should be established with local environmental, meteorological, and waterways agencies to identify when biological hazards may be present or expected so the plant operators can take timely actions to mitigate the hazard.	Continuous monitoring of the cooling water is an essential measure to avoid clogging or degradation of cooling water quality.	X			
2	185.	B.7.4	For infestation of animals, operating organization should identify the evidence of ingress or equipment damage while performing plant walkdowns. Where evidence is found, the operating organization should make arrangements to deter animals from entering buildings or provide ~~special equipment~~ specific protection ~~from~~ against animal-induced equipment damage.	Clarification of ambiguous terminology	X			
2	186.	B.7.5	For leaves and similar debris, the operating organization should perform routine inspections and walkdowns to ensure intake structures and drainage systems or vital plant equipment remain operational.	Clogging of intake structures might cause more serious problems than clogging of drainage systems.	X			
2	187.	B.7.6	~~For insect~~ sSwarms of insects might threaten ~~the~~	Water intakes are	X			

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			~~hazard threat is to water intakes, to~~ heating, ventilation, and air conditioning equipment, or ~~to the~~ emergency diesel generators by restricting airflow, thus limiting the operational capability of the equipment. ~~Thus~~Therefore, the operating organization(s) should perform inspections and cleaning of the affected equipment when this hazard occurs.	not particularly susceptible to clogging by insects.				
1	188.	B.8.2	~~Prevention of ship collisions, large debris, and large amounts of waterborne debris should be by measures implemented by navigation and coast guard authorities.~~	This paragraph seems to refer to design aspects (prevention without influence by NPP operation) which are not within the scope of this Safety Guide. Moreover, design provisions against effects of ship collisions etc. important to safety do exist (e.g., redundant intake structures/buildings, etc.). Therefore, this paragraph should be deleted.		X1		This para is not about design but operational co-operation with coast guards etc. The text was clarified.
2	189.	B.8.4	Operating procedures should be developed and implemented for the deployment of floating booms or curtains to intercept oil spills, or surface skimmers to keep any oil ~~from~~ at a safe distance from water intake structures. This will prevent damage to ~~existing~~ plant equipment and ~~to~~ facilitate ~~safe hazard~~ recovery actions.	Clarification	X			
2	190.	B.8.5	Operating procedures should be developed and implemented for ~~actions to identify~~ the identification of potential debris accumulation ~~at~~ in water intake structures and subsequent cleaning. ~~This will aid in the~~	Clarification	X			

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			~~plant's safe hazard recovery actions~~.					
2	191.	B.9.2	~~Because s~~Solar flares may ~~damage~~ impact the electrical grid potentially resulting in ~~with a potential for~~ a loss of plant internal power systems~~,~~. In order to prepare for a loss of off-site power a sufficient amount of emergency fuel ~~oil~~ should be in place at the site.~~obtained or maintained in preparation for loss of off-site power.~~	Clarification and precision				
1	192.	B.10	In principle, guidance provided in Appendix A.1 of this Safety Guide for internal fires is also valid for external fires. Additional Guidance specific for external fires is provides in the following paragraphs.	Please add this important general text.		X		The "In principle" is removed. Not all A.1 are applicable for external fire.
2	193.	B.10.1	Communication protocols and standards should be established with offsite agencies and organizations when ~~movements or~~ activities involving combustible or explosive ~~with explosive or flammable~~ materials ~~will~~ take place. Because of the potential increase of the risk of external ~~fires the hazard increases~~ during these activities ~~times~~, ~~it is imperative that~~ off-site organizations involved in these activities in relevant proximity to the site should ~~within the site characterization boundaries~~ timely notify the operating organization(s) before the start of such activities of the type and duration of the intended activities ~~plant operators and emergency managers when offsite activities with flammable and explosive materials occur (i.e. transport or movement of these materials)~~. This allows the plant operators to prepare for an accident that could involve ~~highly flammable~~ combustible or ~~and~~ explosive materials, or inadmissibly impair SSCs important to safety and impact the site's external fire ~~hazard~~ mitigation strategies.	More comprehensive and precise text	X			
1	194.	B.10.3	Communications from external organizations should include the notification of the operating organization(s) ~~plant operators when~~ of the occurrence but also the successful suppression of fires external to,	The aspect of fire occurrence has been added, more precision was given	X			

			but in close proximity to the site boundary~~, are being extinguished by local fire officials~~.					
2	195.	B.10.4	In case of a notification on either the potential or the occurrence of an external fire by any offsite organization (see B.10.1-3) ~~If notified of offsite fire potential (e.g. during extreme droughts),~~ the operating organization(s) should ~~consider~~ notify~~ing~~ the on-site fire brigade and emergency response personnel of the potential hazard. This includes the early deployment of emergency on-site response and fire-fighting equipment to a standby readiness condition.	Clarification of misleading text		X		"by any offsite organization" is removed considering the case of forest fire.
2	196.	B.10.5	If there is an external fire with the potential to inadmissibly affect the site, the on-site fire brigade should be ~~placed~~ in readiness. This includes performing necessary equipment and personnel preparations.	Precision, wording	X			
2	197.	B.10.6	Response to external fires ~~this hazard~~ will typically require a response from on-site and off-site emergency personnel. As such, the operating organization(s) should conduct regularly scheduled training, drills and practical exercises with off-site organizations to ensure coordination and response actions are understood by all emergency personnel.	Completion	X			
1	198.	B.10.7	The operating organization(s) should regularly inspect, ~~and~~ maintain and repair, if necessary, all ~~installed~~ engineered structures and barriers (e.g., earth mounds, dykes, walls, surrounding building structures, etc.) in place designed to prevent as far as possible spreading of external fires to the site and to mitigate ~~this hazard~~ fires of site-external origin, as appropriate. ~~This includes the inspection and maintenance of protection walls or earth mounds (dykes) and outer walls of buildings.~~	Completion and clarification	X			
2	199.	B.10.8	In order to minimize the impact of external fires from inadmissibly affecting the plant site, the operating organization(s) should regularly inspect and assess ~~the build up of combustible material~~ permanently and temporarily present combustibles at the site or in	Completion and precision	X			

			close proximity to ~~near~~ the site boundary.					
1	200.	B.10.9	Due to the potential for toxic gases and hazardous fumes from external fires this hazard, operating procedures should be in place ~~established and implemented~~ to ensure proper use of air monitoring equipment, isolation or realignment of buildings plant area ventilation systems for personnel habitability, cooling purposes and operability of emergency diesel generators. These procedures should be updated on a regular basis and in case of any plant modifications of relevance for this aspect.	The missing aspects of air monitoring (cf. B.12.7), of cooling by ventilation and operability of EDGs have been added.	X			
2	201.	B.11.1	The recommendation in par~~a~~. B.10.1 for communication with offsite ~~agencies and~~ organizations for external fires should also be considered for external explosions.	Clarification	X			
2	202.	B.11.2	In case of a notification ~~If notified~~ of potential offsite explosions or shockwaves, the operating organization(s) should consider notifying the on-site fire brigade and emergency response personnel of the potential hazard. This includes the deployment of emergency on-site response and firefighting equipment to a standby readiness condition.	Clarification	X			
2	203.	B.12.1	~~Accidental aircraft crashes are rare. Nevertheless,~~ The operating organization(s) should establish and maintain ~~O~~operating procedures and communications with national or local air traffic control organizations. ~~should be established and maintained~~ functional. ~~As appropriate, c~~Communication protocols with air traffic control should be established for immediate and/or redundant event notifications as appropriate.	Clarification	X			
2	204.	B.12.2	~~Since NPP sites are generally regarded as "no-fly zones,"~~ T~~t~~he operating organization(s) should review and understand the site-specific requirements ~~of the site~~ regarding and report any violations of "no-fly zones" to national or local air traffic control ~~agencies~~ organizations.	We suggest deleting the first part of the sentence, since this is not valid in all countries. Rewording was done accordingly.	X			

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2	205.	B.12.3	Aircraft crashes ~~This hazard~~ will most likely involve the use of off-site fire-fighting and emergency response personnel. Thus, the operating organization(s) should establish ~~and implement~~ and maintain communication protocols to ensure efficient response by required off-site personnel.	Clarification	X			
2	206.	B.12.4	Response to ~~this hazard~~ an aircraft crash will typically require a response from on-site and off-site emergency personnel. As such, the operating organization(s) should conduct routine training, drills and practical exercises with off-site organizations to ensure coordination and response actions are understood by all emergency personnel.	Clarification, completion for consistency	X			
2	207.	B.12.5	The operating organization(s) should perform regularly scheduled inspections and maintenance to preserve the integrity and functional availability of all engineered structures and barriers designed to mitigate this hazard.	Addition for precision: Moreover, we propose to move this text with mentioning the hazard type to the main body of the Guide and delete it here as well as similar texts in the Appendices for other hazards.	X			
1	208.	B.12.6	~~As aircraft accidents are rare, t~~The operating organization(s) should consider deployment of on-site fire-fighting ~~staff~~ personnel and equipment when notified of this hazard. ~~As appropriate, this~~ This includes the prompt ~~dispersment~~ … of equipment and personnel from any central location to prevent a inadmissible ~~large~~ loss of emergency response capability.	The state that "aircraft accidents are rare" provides no guidance and is not always correct. It was therefore deleted. The word "dispersment" is an unknown term and should be replaced by proper wording (removal of, separa-		X1		

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				tion from…). Precision has also been given				
1	209.	B.12.7	Since an aircraft accident on site may include the generation of ~~toxic~~ hazardous substances ~~gases and fume~~s, emergency response staff should consider the recommendations provided in Section B.13. This includes the use of air monitoring equipment.	Completion for reasons of consistency	X			
2	210.	B.12.8	If sufficient time is available prior to an aircraft crash, the operating organization(s) should make preparations to bring the plant into and maintain it in a safe shutdown state ~~the plant~~.	Clarification and addition		X1		
2	211.	B.12.9	The operating organization(s) should consider the evacuation of non-essential (with respect to nuclear safety) plant personnel in case of an accidental aircraft crash ~~for this hazard~~.	Clarification		X1		
2	212.	B.13 Title	Release of hazardous substances ~~(Asphyxiant and toxic gases, corrosive and radioactive fluids)~~ (Toxic, radioactive, flammable, corrosive and asphyxiant chemicals and their mixtures in air)	cf. changes in DS498 Step 11: It should be distinguished between the water path (UHS, see B.8) and the air path in B.13. The proposed order reflects the importance of the different properties: Toxic and radioactive chemicals may show harmful effects on ppm-level; flammable chemicals form explosive mixtures on several % levels, asphyxiant gases show harmful effects on larger %	X			

				levels.				
1	213.	B.13.2	…. to properly monitor hazardous substances in air, isolate … to ensure personal habitability, cooling purposes and operability of emergency diesel generators.	The missing aspects of air monitoring (cf. B.12.7), of cooling by ventilation and operability of EDGs have been added.	X			
1	214.	C.1	The operating organization(s) should identify and take into account combinations of hazards that could reasonably be expected to occur at the site and at the plant under consideration. The goal of the operational hazard management programme is to ensure that ~~the operation of~~ the plant can withstand ~~the reasonable~~ the impact of any credible combination of hazards and their various effects.	Completion in order to address not only combinations of external hazards. The added text ensures that also plant-specific aspects, i.e. those relevant for internal hazards, are covered.		X1		
1	215.	C.2	The operating organization(s) should follow a systematic process to identify and categorize hazard combinations. ~~and should then screen those hazards on the basis of the significance of effects on the plant and occurrence frequency.~~ A performance-based approach is recommended. This approach, irrespective of the specific methods or criteria being used, should be comprehensive and systematic. The objective is to identify which hazard combinations need to be considered and which design features are necessary to address these combinations. The basis for screening a hazard combination for further consideration, as well as for screening out combinations of hazards, should be clearly defined and documented.	Addition of texts to be consistent with IAEA SSG-64.		X1		
1	216.	C.3	In principle, three types of hazard combination could be considered. The following paragraphs ~~paras C.4., C.5., C.6., C.7. and C.8. below describes~~ characterize different types	Internal hazard aspects should be included, i.e. the characteristics of the		X1		

			of combinations of hazards that may be applicable to the site and plant under consideration and should be considered in the operational hazard management programme.	plant itself.				
1	217.	after C.3 new subtitle	CONSEQUENT (SUBSEQUENT) EVENTS	Please add sub-title for categorization of different types of combinations	X			
1	218.	C.4	An initial event, e.g. an external or internal hazard, results in one or more other events, e.g. external or internal hazards. Examples are e.g.: - a seismic event and subsequent tsunami; - a seismic event and subsequent internal explosion; - an internal fire and subsequent internal flooding. ~~One or more hazards that affect the plant and occur as the result of a separate event that also affects the plant (causal event).~~ ~~Example Combination (): An earthquake that causes a tsunami.~~ Operational aspects are for the examples: ~~Operational Aspects: In this case,~~ ~~i~~ - If an earthquake occurs, the operating organization(s) should focus their initial response on ensuring the plant is adequately protected against the tsunami (for example, closing ~~shutting~~ flood protection gates being in place ~~gates if applicable~~). This should take precedence over the detailed assessment of ~~assessing~~ the earthquake damage itself, which can be done after the risk from the tsunami has passed. – In case of a plant internal fire event the operating organization(s) should keep in mind that a successful firefighting may cause an internal flooding inadmissibly affecting items important to safety (e.g., measuring converters on the bottom level of the reactor annulus). Measures to prevent adverse effects from such consequential floodings should be foreseen and	New text more partly taken from IAEA SSG-64 and the examples more consistent with IAEA SSG-64. An earthquake that is strong enough to initiate a significant tsunami might also cause safety relevant damages (including the potential initiation of accident sequences). Therefore, an immediate quick assessment of potential safety relevant earthquake effects needs to be performed.		X1		

			taken depending on the event sequence					
1	219.	after C.4 new subtitle	CORRELATED EVENTS	Please and add subtitle for categorization of different types of combinations		X1		
1	220.	C.5	~~One or more hazards that affect the plant at the same time frame due to persistence or similar causal factors (coincidental events).~~ ~~Example Combination: Meteorological conditions such as storms that~~ ~~intrinsically involve the combination of several phenomena such as rainfall, wind, and storm surge.~~ Two or more events, which occur as a result of a common cause. The common cause can be any anticipated event including an external hazard or might be due to an unanticipated dependency. The two or more events connected by this common cause could occur simultaneously. Examples include - meteorological conditions such as storms that intrinsically involve the combination of several phenomena such as rainfall, wind, and storm surge; - freezing conditions or persistent rain that can affect drainage conditions during subsequent rainfall - a tsunami as the common cause for external flooding, internal flooding and internal fire as three potential correlated events; - a rupture of a vessel containing fluids of high internal energy might cause missiles and internal flooding. The internal flooding might lead to a short-circuit and an internal fire as a tertiary event. Operational aspects are for the fisrt example: - In this case, the operating organization(s) should use their judgment to determine whether emergency response equipment such as aqua dams should be put	'Coincidental' implies a random combination by chance. The example seems to imply a totally different situation, i.e. two hazards that are caused by the same phenomenon. This type of combination is normally called 'correlated'.		X1		

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			in place ~~deployed~~ –. The decision ~~this~~ will be based on whether the risk from storm surge is estimated to be higher than ~~outweighs~~ the risk from extreme rainfall (an aqua dam could prevent drainage of rainwater from draining away from the site, aggravating ~~exacerbating~~ the effects of the hazard). ~~Example Combination: Freezing conditions or persistent rain that can affect drainage conditions during subsequent rainfall.~~ ~~Example Operational Aspects:~~ –The operating organization(s) should ensure that ~~installed~~ drains in place have been properly cleared to prevent this type of compound effect.					
1	221.	C.6	~~C6. One or more hazards may exacerbate other hazards.~~ ~~…~~	This paragraph does not describe a separate type of combination, but a subcategory of the combinations addressed under C.4, C.5 or C.8. Therefore, the paragraph should be deleted.		X1		
1	222.	after C.6 new subtitle	UNRELATED (INDEPENDENT) EVENTS	Please add new subtitle for third category of events	X			
1	223.	C.7	~~C.7. One or more sequential hazards that affect the plant.~~ …	This paragraph does not describe a separate type of combination, but a subcategory of the combinations addressed under C.4, C.5 or C.8. Therefore, the paragraph should be deleted.		X1		
1	224.	C.8	~~C.8.~~ C.6. An initial event, e.g. an external or internal	Combinations of		X1		

			hazard, occurs independently from (but simultaneously with) another hazard without any common cause. Examples are: - a seismic event and independent extreme outside air temperature; - external flooding and an independent internal fire. ~~Realistic combinations of randomly occurring independent events can affect the plant simultaneously. Example Combination: Earthquake and extreme outside air temperature~~ Operational aspects are for the examples: ~~Example Operational Aspects:~~ –In ~~this~~ these examples, there is no causal relation ~~link~~ between the two events. ~~an earthquake and extreme air temperature outside~~. ~~Therefore, it would be overly conservative to include extremes of these external hazards occurring together in the operational hazard management plan.~~ Only, if the duration of one of the events (in the examples, the extreme outside air temperature or the external flooding) is very long, the frequency of the two events occurring simultaneously is high enough that this event combination cannot be screened out. However, it should be evaluated whether the combination of more frequent independent events (e.g., two events with a mean return period of hundred years each might have effects on the plant beyond those of the individual events). Furthermore, the operating organization(s) should maintain situational awareness when responding to hazards and use their judgment based on the conditions in which they are operating at the time of response.	events may affect a plant in a different way than the individual hazards. Therefore, combinations of independent events should be taken into account, if their combined exceedance frequency is on the level of the exceedance frequencies of design basis events. E.g., if design basis events have an exceedance frequency of 10^{-4}/a, combinations of independent events with exceedance frequencies of 10^{-2}/a (or even 10^{-3}/a and 10^{-1}/a) should be taken into account.				
2	225.	C.9 Line 4	~~C.9.~~ C.7. … ~~Then, i~~If a severe rainfall event ~~were to~~ occurs ~~before damage from~~ during the repair period after the seismic event ~~had been repaired~~, the consequences of the rainfall event could be more severe ~~significant~~. This aspect of hazard combinations	Clarification		X1		

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

			should be considered in the operational hazard management programme.					
2	226.	C.10	~~C.10.~~ C.8. Combinations of hazards may be screened out if it can be justified that they do not pose a significant risk to the plant, or the consequences of the hazard combination do not exceed the consequences of one of the elements of the combination (~~S~~see e.g. IAEA SSG-64, Appendix I ~~in DS494~~ [1]).	Clarification		X1		
1	227.	C.11	~~C.11.~~ C.9. The operational hazard management programme should consider that some hazard combinations can affect the plant by undermining the diversity of systems – for example, an earthquake that causes loss of off-site power (LOOP) combined with a beyond design basis tsunami that causes loss of emergency power supply, ~~as was the case for the Fukushima Dai-ichi event~~.	Emergency power supply should never be lost due to a design basis external event. Therefore, the example should be modified. Moreover, the unnecessary text was deleted providing no additional guidance.		X1		
1	228.	C.12	~~C.12. The operational hazard management programme should consider that some hazard combinations can affect a single system via the production of an additional load. An example of this would be an extreme snow load on the roof of a building that should also resist loading from an extreme wind event.~~	The paragraph should be deleted according to the following reasons: (a) What is addressed here is a normal combination of loads as it will occur with many hazard combinations. Therefore, it is not necessary to mention this case separately. (b) A vertical load (snow load) on a roof does not necessarily impair the	X			

				capacity of the building w.r.t. horizontal loads.				

PROTECTION AGAINST INTERNAL AND EXTERNAL HAZARDS IN THE OPERATION OF NUCLEAR POWER PLANTS
(DS-503)

COMMENTS BY REVIEWER **Reviewer**: India **Country/Organisation** : India			**Pages: 5** **Date**: 28.05.2020	**RESOLUTION**			
Comment No.	**Page/ Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification / Rejection**
1.	10/ 2.6	Hazards caused by (or occurring at) different NPPs at the same site should be considered depending on their location (or their distance) and potential impact; and such effects should be documented ~~hazards depending upon which is the operating organization of the different NPPs~~.	The consideration of hazards from other plants at multi-unit sites should be based on their potential impact on the NPP and irrespective of whether they are operated by same operating organization or a different one. In any case, event in Multi unit site would be an Internal Hazard or External Hazard for other NPPs at that site depending whether it is within plant boundary or outside and is irrespective of the operating organization.		X See modified para 2.6.(new 2.5)		**Other comments are reflected.**
2.	11/2.10, 4th line	In accordance with the concept of defence in depth (the first level of defence in depth), protection against hazards is provided in general by ensuring quality and reliability of SSCs. This should be done by environmental qualification of the SSCs, by application of principles of redundancy, diversity, by	Fail safe design can also be a feature for protection against hazards.	**X**			

		physical separation, functional independence, fail safe features and through design of appropriate barriers. Therefore, the protection against the effects of hazards is an iterative process, integrating the needs of protection against several hazards. Proper surveillance and in-service inspections should be implemented for coping (and, if possible, detecting) with hazards.					
3.	13/ 3.7	The operational hazard management programme should include a combination of personnel from the various site sections or organizations such as engineering design, technical support, operations, maintenance, and emergency response.	Technical support has important role in hazard management.	**X**			
4.	13/3.11	The hazard management programme should include ~~personnel and industrial~~ safety ~~for~~ of those personnel responsible for implementing hazard mitigating measures and coping strategies.	The term 'safety' may be more appropriate and all encompassing.	X			
5.	13/ 3.14,	Separate procedures should be available for different hazards / type of hazards, and the procedures should give clear instructions for plant operating personnel on actions in the event of precursors and indications of hazards.	Separate procedures for different type of hazards will be useful in avoiding execution errors.	**X**			
6.	15/ 3.21 4th para under first bullet	Hazard coping and mitigation strategies may require additional emergency equipment which may be stored off-site (sufficiently away from site) and require transport organizations to deploy them to the site. In the context of hazards, this may include equipment such as drainage pumps. Sections 5 and 6 of this safety guide give further examples.	To avoid potential common cause failures.	X			
7.	16/section 4.3	The operating organization should achieve the objectives of defence in depth through a combination of: siting, design, installation,	For a nuclear installation, 'siting' and the related		X See modified		The suggested text was

		and operation of hazard protection and mitigation systems and hazard coping strategies, supported by the operational hazard management programme described in Section 3.	assessments are important in achieving and maintaining the Defence in Depth objectives, throughout the lifetime.		para 4.3.		deleted by other comments.
8.	26/ Para 9.2/ Bullet point 2	Ensuring loose materials (especially metallic objects) are cleared away or tied down as they can ~~affect the~~ create potential airborne missiles in the eventual hazard	Sentence can be reworded for completeness and clarity.	**X**			
9.	54/ B6.3,	In cases of extreme ambient air or water temperatures (both hot or cold), analyses or testing of equipment including calibration of testing instruments; or systems such as pumps, fans, cooling circuits such as emergency cooling, HVAC cooling circuit etc., should be performed to ensure the equipment is working properly and determine if there is sufficient operating margin.	Testing is valid and results are reliable if the instruments are calibrated. In this context, the calibration aspect is added.			X	It should be recommended generally but it is not specific for meteorological hazard, nor hazard management.
10.	General comment on Hazard combinations	**Suggestion:** Appendix-A and Appendix-B gives aspects related to specific hazards. Hazards like drought, hail storm are not covered. Do we cover COVID-19 like long term persisting & large-scale situations also along with other hazards like earthquake/flood etc., under this guide for giving guidance on readiness of hazard management program w.r.t safety, security and emergency planning aspects? Such conditions may affect existing hazard management program, so this DS-503 can cover this aspect under hazard combination as one of the possible combination in Appendix-C.	.		X See modified para 1.12, 4.6, and 5.12.		Clarified that this guide discusses hazards which cause physical impact for nuclear safety, but the lists of hazards are not exhaustive.

Note: The Proposed Additions are provided in Red Colour font with yellow highlight. The proposed removal is ~~struck off in red colour in yellow highlight~~.

Japan NUSSC comments on DS503 "Protection against Internal and External Hazards in the Operation of Nuclear Power Plants"

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	2.2. 2.3.	2.2. This safety guide provides recommendations and guidance for the operational management aspects of preparing for, mitigating and coping with hazards at a NPP, to fulfil the relevant requirements of IAEA Safety Standards Series No. SSR-2/2 (Rev. 1) [6], Safety of Nuclear Power Plants: Commissioning and Operation [6], and in particular Requirements 18, 19, 22, 23, 28, 31, 32, and 33. 2.3. The above requirements of SSR-2/2 (Rev. 1) [6] are of particular interest in the operational management of nuclear power plants for hazards. The requirements are as follows: Requirement 18: Emergency preparedness Requirement 19: Accident management programme Requirement 22: Fire safety	Add statement regarding relation among Operational Hazard Management Program in this guide, Emergency Plan in SSR-2/2 (Rev. 1) Requirement 18, and Accident management programme in SSR-2/2 (Rev. 1) Requirement 19.	X			
2.	2.3. the last para.	Provisions that ensure plant safety in the event of hazards should be maintained for each stage of decommissioning, taking into account the progress of the situation. Specific	In the decommissioning phase, the object of protection differs from the operating phase and is different at each stage. The	X			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
		applicable paragraphs are Para 9.1, 9.2, 9.3, 9.4, and 9.6.	nature of the risk also changes from radiation exposure for works.				
3.	2.6.	Hazards caused by (or occurring at) ~~different~~ one NPP~~s~~ at ~~the same multi-unit~~ a site should be considered as external hazards ~~for~~ to another NPP at or adjacent to the site ~~depending upon which is the operating organization of the different NPPs~~, which should be taken into consideration, regardless of operating organization of the affected NPP.	Clarification.		X		See the modified text 2,5.
4.	2.11.	An appropriate management system should be applied to all hazard protection and mitigation features, including those that were not ordinally installed or designed as safety systems or features, such as embankments, spillways, in order to reduce the potential for common cause failure and thus pose a threat to safety. Throughout this safety guide, the word hazard protection and mitigation feature ~~imply~~ include safety systems and features, and also these items that were not ordinally installed or designed as safety systems or features, unless where specifically noted.	Suggested to describe explicitly the definition of "hazard protection and mitigation features" specific to this document.	X			
5.	3.1. / L3	Requirements and guidance on	Missing a word.		X		The para was

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
		Leadership and Management are given in other IAEA Safety Standards, including IAEA Safety Standards Series No. GSR Part 2, Leadership and Management for Safety, IAEA Safety (2016) [9] and IAEA Safety Standards Series GS-G-3.5, The Management System for Nuclear Installations (2009) [10].					deleted by other comments.
6.	3.11.	The hazard management programme should include personnel and industrial safety for those personnel responsible for implementing hazard mitigating measures and coping strategies.	Clarification of "personnel".	X			
7.	3.14.	Procedures should give clear instructions, for plant operating personnel on actions in the event of precursors and indications of hazards. These actions should be primarily directed to ensuring the safety of the power plant ~~including~~ and personnel. In some cases, strengthening of staffing, walkdown in and around the plant, as well as, shutdown or power reduction of the plant may be necessary.	Clarification. "including" looks associated matter. Safety of the personnel should be respected as equally as safety of plant. Some measures may be necessary concurrently with power adjustment. For example, para 9.2 describes "Plant walkdowns should be performed on a regular schedule, at times when external hazards have been forecast."	X			
8.	4.2.	Requirement 4 of the SSR-2/1(Rev. 1) [8] states that "the fundamental safety functions for a NPP "shall be ensured	Typo.		X		The para was deleted by other comments.

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
		for all plant states: (i) control of reactivity; (ii) removal of heat from the reactor and from the fuel ~~storage area~~ store; and (iii) confinement of radioactive material, shielding against radiation and control of planned radioactive releases, as well as the limitation of accidental radioactive releases".					
9.	5.4.	The operational hazard management programme will help in defining roles in controlling actions following hazards. The plant operators should have a role in initiating some installed protection ~~systems~~ measures, in reducing the extent of some hazards by plant realignment, or by initiating local actions as part of hazard coping strategies to address plant challenges from the hazard (such as local firefighting or the deployment of local flooding protection).	To avoid confusion with “reactor protection system”.	X			
10.	5.7.	Change the order of description of items to be consistent with the order of DS494, as follows; · Internal fires · Internal explosions · Internal missiles · Pipe breaks · Internal flooding · ~~Collapse of structures and falling objects~~ Heavy load drop	To keep a consistency with DS494 (SSG-64), with the same order using identical subtitles	X			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
		~~· Pipe breaks~~ ~~· Internal floods~~ · Electromagnetic Interference · Release of hazardous substances ~~· Electromagnetic Interference~~ · Site specific or design specific internal hazard as appropriate					
11.	5.7. / L3	For all credible internal hazards, the general recommendations given in ~~sections~~ paras 5.1 through 5.6 are applicable.	Correction.	X			
12.	6.3.	Notification protocols between appropriate external organizations and the operating organizations of periods of enhanced risks from third-party activities should be considered crucial and established in advance.	Please show examples like the description in para 5.3 for internal risks, Para5.3 " … in periods of increased risk (for example, outages or modification implementation), in order to ensure that …."	X			Examples are; opposition protests, demonstrations, rally groups, etc.
13.	6.3. /L3	These protocols should allow timely preparation to be taken by the plant organization to mitigate potential external hazards resulting from these third-party activities. The protocols should also avoid confusion in implementing post-event actions if the potential of a deliberate event is considered.	Clarification.	X			
14.	6.5.	The operational hazard management programme should enhance the external hazard mitigation measures in specific period. (~~See para 5.3.~~for example,	The sentence should be completed without referring to another paragraph.	X			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
		outages or modification implementation)					
15.	6.13.	· Seismic Hazards ~~· Volcanic Hazards~~ · External Floods including Tsunami and Storm Surge · External Floods from Rivers or Extreme Precipitation · Extreme Winds including Tornados, Tropical Cyclones, Hurricanes, and Typhoons · Other Meteorological Hazards (including Extreme Temperatures) ~~· Biological Phenomenon~~ ~~· Collisions of Floating Bodies with Water Intakes and Ultimate Heat Sink Components~~ · Volcanic Hazards · External Fires and Explosions · Accidental Aircraft Crash · Electromagnetic Interference (including Solar Storm). · Biological Phenomenon · Collisions of Floating Bodies with Water Intakes and Ultimate Heat Sink Components	To keep a consistency with DS498, with the same order using identical subtitles	X			
16.	7.1.	The effects of combined hazards (i.e. two or more hazards whose effects occur simultaneously or within a specified or short timeframe) and mitigation strategies against them should be considered in the operational	Proper expression for Guide publication.		X		The part was deleted by other comment.

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		hazard management programme. The hazard combinations that should be considered depend heavily on the location of the site and the general plant design. Clearly, combinations involving a variety of external hazards, (natural hazards such as tsunami, blizzard, sand storm, but also human induced ones, such as explosion pressure waves) are not applicable to all sites. Therefore, it is not feasible or necessary to identify a set of hazard combinations from first principles that are applicable to all plants. Instead, ~~a screening process is required to determine~~ a set of those hazards ~~that should~~ to be taken into account for a particular site should be determined through credible screening process.					
17.	7.5. 2nd sentence	For example, hazard mitigating equipment for a certain hazard may be stored in an area that is affected by another hazard ~~so that~~ and then the equipment cannot be used for its original purpose.	Clarification.	X			
18.	7.6. 8.3. 11.5.(d)	Replace “safety case” with “safety analysis report”.	The term “safety analysis report” should be used for NPP, as the term ”safety case” is not used usually.		X Safety “assessment”		Safety case is on the IAEA glossary. And suggested “analysis” seems more familiar. However, other MSs suggested “assessment”, referring the safety

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
							glossary 2018. *Safety analysis* is often used interchangeably with *safety assessment*. However, when the distinction is important, *safety analysis* should be used as a documented process for the study of *safety*, and *safety assessment* should be used as a documented process for the evaluation of *safety* — for example, evaluation of the magnitude of hazards, evaluation of the performance of *safety measures* and judgement of their adequacy, or quantification of the overall radiological impact or *safety* of a *facility* or *activity*. These parts do not mean a specific document.
19.	7.6.	If a combined hazard event occurs that has not been anticipated ~~as part of the safety case~~ in the safety analysis report, then the precautionary conservative decision-making principles should apply.	To describe approximately.		X		Same as above
20.	8.2. and 8.5.	The operational hazard management programme should be taken into account in theinitial plant design. It should be reviewed and updated a) if additional hazards have been identified	Para 8.2 and 8.5 are very similar so the changes are proposed to combine two paras to one.	X			

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		after the plant was constructed, during the operating stage, or as part of a re-licensing application, or for a periodic safety review (IAEA Safety Standards Series No. SSG-25, Periodic Safety Review for Nuclear Power Plants [17]), or, b) if new information shows the existing design bases (or if applicable for existing nuclear power plants, design extension conditions) may be inadequate (See para 1.9.), or when the severity or vulnerability to a hazard has not been previously recognised.					
21.	8.4.	Although DS494 [1], DS498 [2] and DS~~498~~490 [3] are intended as safety guides for new NPPs, these SSGs should be used for existing plants as a benchmark for comparison when designing plant modifications, and for gap analysis when carrying out a PSR in accordance with requirement 12 in IAEA Safety Standards Series No. SSR-2/2 (rev.1) [6].	Typo.	X			
22.	11.4./3rd bullet	- The different types of portable or resilience equipment provided and their use in mitigating hazard effects in the initial stage. This may include fire-fighting equipment, aqua dams and dam boards, and special communication equipment such as satellite phones.	Clarify what “dam board” means.	X			Dam board is a kind of flood barrier like sand bags. “Flood board” seems more general.
23.	11.3.	Training should be sufficient to ensure that individuals understand the	Training program should include record keeping.	X			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
		significance of their duties and the consequences of errors arising from misconceptions or lack of diligence. Records of training and qualification should be maintained. Also, training materials should be maintained current and reflect the current plant configuration and hazards.	Also materials for training should be updated based on plant configulation and hazard information.				
24.	11.6. /L3	Some examples of these types of additional risk are provided in paras ~~11.8~~11.7 and 11.8 below.	Typo.	X			
25.	Section 11 After 11.8.	EXERCISES and DRILLS 11.9 Training, including periodic exercises and drills, should be sufficiently realistic so that the personnel have capability to cope with and respond to situations that may occur in the event of hazards. Drills should extend over a time period long enough to realistically represent the plant response and should be developed to practice shift change and associated information transfer. Especially for external hazards, caution should be paid to that hazards may affect simultaneously at all units at the site. 11.10. Training should address the implementation of response actions under adverse environmental conditions, including conditions resulting from hazards with potentially high radiation levels, and under the	Almost all of the recommendations described in this section are focused on “awareness”, resulting to lack of description on training of actual response activity through drill and/or exercise, such as manual firefighting. Furthermore, Req.22 para 5.24. of SSR-2/1 (Rev. 1) states “Periodic joint fire drills and exercises shall be conducted to assess the effectiveness of the fire response capability”, but this draft does not address this associated requirement as basic training programme, even though para A1.29 describe importance of routine classroom training		X 7.9 Procedures, trainings, drills, and exercises for hazard coping and mitigation strategies and measures should be periodically or each time validated and consistent with updated design assumptions or design bases from safety assessments or safety analysis. Also, changes in		Change of procedures and feedback from the trainings are reflected to section 7. Section 4 was deleted and the paragraph number were changed.

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
		influence of stress on the anticipated behaviour of staff. 11.11. Changes in the procedures or in the use of the procedures should be communicated to all personnel involved and reflected in the training programme. 11.12. An exercise or a drill should ensure the ability of the personnel to understand and follow the evolution of the plant status, including unanticipated evolution of the hazards. Results from exercises and drills should be systematically evaluated to provide feedback for the improvement of the training programme and, if applicable, the procedures and instructions. 11.13 For fire hazards, Requirement 22 para 5.24 of SSR-2/1 (Rev. 1) states "Periodic joint fire drills and exercises shall be conducted to assess the effectiveness of the fire response capability." Drills or exercise should be performed with participating site personnel and , as appropriate, the staff of off-site fore agency (see A.1.30 – A.1.33).	and in actual fire drills at the plant. In this context, some aspects of actual training against hazards suggested. The most of them are coming from SSG-54.		the procedures or in the use of the procedures should be communicated to all personnel involved and if necessary, reflected in the training programme. 10.9 Periodic exercises and drills should be sufficiently realistic so that the personnel have capability to cope with and respond to situations that may occur in the event of hazards. Exercises or drills should extend over a time period long enough to realistically		

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
					represent the plant response and associated information transfer, and if necessary, it should be developed to practice shift change to simulate the hazard coping strategies. Especially for exercises of external hazards, it should be considered hat hazards may affect simultaneously, or sequentially at multiple units at the site. 10.10. Training should address the implementation of response		

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
					actions under adverse environmental conditions and if necessary, under the influence of stress on the anticipated behaviour of staff. 10.11. Results from exercises and drills should be systematically evaluated to provide feedback for the improvement of the training programme and, if applicable, the procedures and instructions.(See para. 8.9.) 10.13. For fire hazards, Requirement 22 para 5.24 of SSR-		

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
					2/1 (Rev. 1) states "Periodic joint fire drills and exercises shall be conducted to assess the effectiveness of the fire response capability." Drills or exercise should be performed with participating site personnel and , as appropriate, the staff of off-site fire agency (see para A.1.30 - A.1.33).		
26.	11.7. (b)	(b) The stipulations of the work permit system, specific situations in which a fire watch is necessary, and the ~~significance~~ risk of introducing potential ignition sources into fire areas containing components identified as important to safety	Significance of introducing potential ignition sources is described in bullet (c), and then "risk" is suitable in this sentence.	X			
27.	B.1.2.	The operating organization should ~~use the insights given in Safety Series Report No.66, Earthquake Preparedness and Response for Nuclear Power Plants [20] in the development of~~ develop an earthquake response plan for pre-event	Those information described in Safety Series Report should be treated as supplementary information, as they are not consensus information among Member	X			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
		and post-event actions (*1). These event actions take the form of procedures that describe short-term and long-term actions and include system and component walkdowns to determine the status and functionality hazard protection and mitigation features. Entry into these actions is based upon indications from the seismic monitoring system, offsite geological centres, or ground motion experienced by plant personnel.~~- Insights for plant shutdown is provided in the Safety Series Report.~~ footnote *1 Some examples are shown in Safety Series Report No.66, Earthquake Preparedness and Response for Nuclear Power Plants. *Delete [20] from reference list.*	States.				
28.	B.2.1. B.3.1. B.4.1. B5.1. B6.1.	To ensure this external hazard is completely included in the operational hazard management programme, the operating organization should consider and include the guidance given in IAEA Safety Standards Series DS498 ~~[3]~~ [2].	Typo.	X			
29.	B.2.3.	Operating procedures should be developed and implemented for the inspection and removal of volcanic ash on or near SSCs. Special considerations should include equipment (such as emergency diesel generators) affected	When volcanic ash falls, it is highly possible that off-site power will be lost. Due to the loss of off-site power, the emergency DG will operate, but it is	X			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC Member Pages: 13 Country/Organization: Nuclear Regulation Authority (NRA) Date: 27 May, 2020				RESOLUTION			
		by volcanic ash deposition impacting ventilation and structural loading.	expected that the intake filter will be blocked by volcanic ash. The operating organization should consider preparing enough intake filter for replacement of the emergency DG and familiarize yourself with the replacement work.				

DS503, Protection against Internal and External Hazards in the Operation of Nuclear Power Plants (Revision of NS-G-2.1) (Step 7)

COMMENTS BY REVIEWER Reviewer: Page 1 of 6 Country/Organization: Republic of Korea / Korea Institute of Nuclear Safety (KINS) Date: 07/05/2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.2 / Lines 1~2	To ensure safety, it is necessary that the operating organization of ~~a~~ an NPP recognizes that the personnel involved in (A) should be cognizant of the demands of safety, …	The first pronunciation of 'NPP' is a vowel. Something seems to be missing in (A). Correction may be needed.		X		The para was deleted.
2	1.4 / Line 7	…, Seismic Design of Nuclear Installations~~,~~ ~~IAEA Safety Standards~~ (Under revision, DS490) …	Expression duplicated	X			
3	1.5 / Lines 1~4	The objectives of this publication are to provide …, and in the provision of technical support, as well as regulatory body of Member States, …	It is hard to understand which word in the sentence is connected by the phrase, "in the provision of technical support, as well as regulatory body of Member States." Correction may be needed.		X		The sentence modified by other comments.
4	1.10 / Line 4	… guidance on these ~~are~~ is covered by IAEA guidance …	Typo	X			
5	2.2 / Lines 2~4	… mitigating and coping with hazards at ~~a~~NPP an NPP, to fulfil the relevant requirements of IAEA Safety Standards Series No. SSR-2/2(Rev.1) ~~[6]~~, Safety of Nuclear Power Plants: Commissioning and Operation [6], …	Typo Ref. no. duplicated	X			
6	2.3 / Line 1	~~23.~~ 2.3. The above …	typo	X			
7	2.3 / Line 7	Specific applicable paragraphs ~~is~~ are …	typo	X			

COMMENTS BY REVIEWER Reviewer: Page 2 of 6 Country/Organization: Republic of Korea / Korea Institute of Nuclear Safety (KINS) Date: 07/05/2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
8	2.3 / Line 28	(Requirement 31) **"The operating organization shall ensure that … and implemented."** In the activities of maintenance, …	The original text of Requirement 31 described using bold letters should be separated with the followed explanation for maintaining consistency with other paragraphs in 2.3.	X			
9	2.3 / Line 37	(Requirement 32) Enhanced ~~preparing~~ preparation for mitigating and coping with hazards …	typo	X			
10	2.3 /Lines 44~45	(Requirement 33) Provisions that ensure plant safety in the event of hazards should be maintained for ~~each~~ the stage of decommissioning.	The stage of decommissioning is one of several stages during plant life (see para 2.5)	X			
11	2.6		The meaning of this paragraph is not clear. Additional explanation may be needed for clear understanding		X See modified 2.6 (new 2.5)		Modified by other comments.
12	2.9 (c) / Line 4	.. plant personnel should be able to access equipment in order to perform local actions.	It is hard to understand the exact meaning of the expression, 'perform local actions.' Examples of the expression should be added.		X		The para was deleted.
13	2.10 / Line 4	… by application of principles of redundancy~~,~~ and diversity, by physical separation~~,~~ and functional independence, and …	Typo	X			
14	2.11 / Line 2	… including those that were not ~~ordinally~~ ordinarily/originally (?) installed or designed as …	Typo	X ordinarily			

COMMENTS BY REVIEWER Reviewer: Page 3 of 6 Country/Organization: Republic of Korea / Korea Institute of Nuclear Safety (KINS) Date: 07/05/2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
15	3.1 / Lines 5~6	… IAEA Safety Standards Series No. GSR Part 2, Leadership and Management for Safety~~, IAEA Safety~~ (2016) [9] and IAEA Safety Standards Series GSG-3.5, The Management System for Nuclear Installations (2009) [10].	typo A missing word added.		X		The part was deleted.
16	6.3 / Lines 1~2	Notification protocols between appropriate external organizations and the operating organizations ~~of~~ in (for ?) periods of ~~enhanced~~ increased risks from third-party activities …	It is hard to understand the meaning of this phrase. Correction may be needed (see para 5.3).	X			
17	6.9 / Line 6	… items that could prevent proper site drainage (in the event of heavy rainfall, storm surges, etc.).	Clarification of the meaning	X			
18	7.1 / Lines 7~9	Therefore, it is not feasible or necessary to identify a set of hazard combinations from first principles that are applicable to all plants.	It is hard to understand the exact meaning of the expression, 'first principles.' A correction may need to be made for clear understanding or brief explanation be added.		X -		The sentence is deleted.
19	7.6 / Line 4	… on the basis of ~~the operating organization performing~~ the operational decision-making process performed by the operating organization.	Clarification of the meaning	X			
20	Ref.[20]	[20]. INTERNATIONAL ATOMIC ENERGY AGENCY, …, Safety ~~Series~~ Report Series No. 66, IAEA, Vienna (2011).	typo	X			

COMMENTS BY REVIEWER Reviewer: Page 4 of 6 Country/Organization: Republic of Korea / Korea Institute of Nuclear Safety (KINS) Date: 07/05/2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
21	App. A & B	APPPENDIX A – ~~EXAMPLE~~ RECOMMENDED ELEMENTS OF THE OPERATIONAL HAZARD MANAGEMENT PROGRAMME FOR INTERNAL HAZARDS APPPENDIX B - ~~EXAMPLE~~ RECOMMENDED ELEMENTS OF THE OPERATIONAL HAZARD MANAGEMENT PROGRAMME FOR EXTERNAL HAZARDS	It is stated in para 1.12 that Appendix A and B provide recommendations relevant to internal and external hazards, while the titles of the appendices are "Example of …" Therefore, it is recommended that the titles should be modified consistently with the statement of para 1.12 (e.g. 'Recommended elements …').		X APPPENDIX A/B - TECHNICAL ASPECTS TO BE CONSIDERED IN THE OPERATIONAL HAZARD MANAGEMENT PROGRAMME FOR INTERNAL/EXTERNAL HAZARDS		Para 1.12 is also modified to make consistency.
22	B.1.1 / Lines 3~4	IAEA Safety Standards Series DS490, Seismic Design ~~and Qualification~~ for Nuclear ~~Power Plants~~ Installations [3]	The title has been changed.	X			
23	B.1.2 / Lines 1 & 8	Safety ~~Series~~ Report Series	typo	X			
24	B.1.2 / Line 7	offsite geological monitoring centres	The same terminology should be used as the one in para B.1.5.	X			
25	B.2.1, B.3.1, B.4.1, B.5.1, B.6.1	IAEA Safety Standards Series DS498 [~~3~~2].	typo	X			
26	B.2.2 ~ B.2.8	B.2.2~B.2.8 → B.2.3~B.2.9	The numbers in page 51 of the paragraphs should be corrected.	X			

27	B.3.2 / Line 3 B.4.2 / Line 3	these types of ~~phenomenon~~ phenomena	typo	X			
28	B.3.8		Left alignment of the paragraph is needed.	X			

COMMENTS BY REVIEWER Reviewer: Page 5 of 6 Country/Organization: Republic of Korea / Korea Institute of Nuclear Safety (KINS) Date: 07/05/2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
29	B.7.1 / Line 2	The operating organization should consider these ~~as appropriate~~ appropriately in the operational hazard management programme.	'appropriately' seems to be more adequate in meaning than 'as appropriate.'	X			
30	B.8.2 / Line 2	Prevention of ship collisions, large debris, and large amounts of waterborne debris should be accomplished (?) by the (?) measures implemented by navigation and coast guard authorities.	The sentence seems to be incomplete.	X			
31	B.8.5 / Line 2	Operating procedures should be developed and implemented for actions to identify potential debris accumulation at water intake structures and to do the (?) subsequent cleaning.	The sentence seems to be incomplete.	X			
32	B.10.1 / Line 2	Communication protocols and standards should be established with offsite agencies and organizations to notify the operating organization when movements or activities with explosive or flammable materials will take place.	Clarification of the meaning (see para B.10.2.)	X			
33	B.10.2 / Line 1	Communications protocols and standards should be established with offsite agencies and organizations …	The same expression should be used as in para B.10.1.	X			
34	B.13.1 / Lines 2~3	… activities with asphyxiants, toxic gases, and corrosive and radioactive fluids …	Missing conjunction 'and' added.	X			

35	B.13.1 / Line 6	when offsite activities with asphyxiants, toxic gases, and corrosive and radioactive fluids occur	Missing conjunction ‘and’ added.	X			

COMMENTS BY REVIEWER Reviewer: Page 6 of 6 Country/Organization: Republic of Korea / Korea Institute of Nuclear Safety (KINS) Date: 07/05/2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
36	B.13.2 / Lines 1~2	Operating procedures should be developed and implemented to properly isolate the affected buildings, areas, or ventilation realignments to ensure personnel habitability.	It doesn’t seem that the verb ‘isolate’ matches the object ‘ventilation realignments’ in meaning. Correction may be needed.	X			
37	C.13 / Line 5	An example of this is outside freezing conditions (…) that may reduce fire-fighting capability (…) of an internal fire (…).	Missing word added.	X			

Protection against Internal and External Hazards
in the Operation of Nuclear Power Plants
DS 503
DRAFT SAFETY GUIDE
Revision of NS-G-2.1 and enhanced scope

COMMENTS BY REVIEWER Reviewer: Camilla Matteoli, Ginevra Delfini Country/Organization: The Netherlands, ANVS Date: 29/05/2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General comment	*This safety guide gives guidance for the operational management aspects of preparing for, mitigating and coping with hazards at a NPP. This guidance is however based on the set up of an "Operational Hazards Management Programme". This programme is never mentioned in SSR 2/2 rev 1. This means that this programme is not included in any safety requirement and therefore no licensee is "obliged" to set it up. The entire guide gives tips on how to set up a programme that is not described anywhere in the requirements. This issue should be addressed.* *However, it should be clearly explained where the information that must be collected and researched for an efficient operational hazard management, should be documented and stored.*		X			Operational Hazards Management Programme were replaced to hazard management

		This means creating a much broader overview of the information usually contained in other programs and add information to these programs that will allow for an efficient operational hazards management. (See also the next comment, on the overlap of the operational hazard management programme with other NPP programs.)					
2	General Comment (in particular section 2)	*The proposed Operational Hazards Management Programme has an overlap and an interface with other programmes set up at NPPs: Ageing Management, Surveillance, Accident Management.* *An overview of the information contained in other programmes should be given, and which additional information will allow for an efficient Operational Hazards Management (Programme).* *In section 2, where general considerations are made, it should be explained what an Operational Hazard Management Programme exactly is, why is it important to set it up, what kind of interfaces does the program have with already existing programs or other programs that will be set up at a NPP, and where these interfaces are addressed in the guideline (if they*		X			Operational Hazards Management Programme were replaced to hazard management The connection to SSG-54 is clarified.

		are). *In particular the interface/overlap with SSG-54 is relevant.*					
3	1.1	This Safety Guide was prepared under the IAEA programme for establishing standards for nuclear power plants (NPPs). This publication is a revision of the IAEA Safety Guide on Fire safety in the operation of NPPs issued in 2000 as IAEA Safety Standards Series No. NSG- 2.1. **However, in the present safety guide differs from NS-G-2.1: the topics addressed in NS-G-2.1 are covered partially and from another point of view and additional hazards are considered**	The introduction should better describe what the draft guide contains, and it could also be advisable to add some explanation about the choices made, where fire safety is addressed, and other hazards.		X See modified 1.1. and 1.2		
4	2.2	This safety guide provides recommendations and guidance for the operational management aspects of preparing for, mitigating and coping with hazards at aNPP, to fulfil the relevant requirements of IAEA Safety Standards Series No. SSR-2/2(Rev.1) [6], Safety of Nuclear Power Plants: Commissioning and Operation [6], and in particular Requirements 22, 23, 28, 31, 32, and 33. **Requirement 2 is also relevant because the Operational Hazards Management Programme should be integrated in the management system.**	The Operational Hazards Management Programme should be integrated in the management system. Reference to Req. 2 (SSR 2/2 (rev 1) is therefore useful.	X			
5	2.3	Paragraph number **2.3**	Typographical Error (23	X			

			instead of 2.3)				
6	2.11	"ordinally" is probably a typo for "**originally**"	Typographical Error?	X			
7	General comment Par 4.3 (and several other paragraphs too, including the General Considerations, par 3.5, 3.6, etc.)	*The terms "Hazard Coping strategy" and "Hazard protection and mitigation" are used, but not clearly defined.* *At least reference to chapter 5 should be made, where more is said about what is meant, and what these strategies should include. Also a reference to Appendix A should be made if there sufficient examples of these strategies are given. If not examples should be added.*	Such important terms should be clearly defined in the guideline.	X Hazard coping strategies are defined in section 3 Hazard --- measures are defined in section 2			
8	8.7	*The meaning of this paragraph is unclear, in particular the term "low margin to external hazards mitigation".* *We suggest to rephrase or substantiate.*	The meaning of the paragraph is unclear	X The operating organization should recognize and implement design and procedural recomm			

				endations based on initial and periodic safety assessments, where conditions of low margin to external hazard mitigation and cliff edge effects can be identified.			
9	9.2	Plant walkdowns should be performed on a regular schedule, at times when external hazards have been forecast, and after external hazards are experienced. **The implementation of plant walkdowns should be advised in the Operational Hazards Management Programme and the results of the walkdowns should be properly documented.**	This addition should be in line with what the guideline suggests a Hazards management programme should include (if the programme stays in the guideline after review).	X			

		General examples are listed below. Some of these actions are of particular importance at times when an external hazard (such as extreme winds or flooding) is forecast, but proper housekeeping should be in effect at all times:….					

TITLE
DS503 (version June 12th, 2020)

COMMENTS BY REVIEWER Reviewer: G. Delfini Page.... of.... Country/Organization: ANVS – The Netherlands Date: 24th June 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General	The scope of the guide and its somehow exceptional character should be clarified: this is a high level guide, with more detail in the appendix (in particular for fire safety).		X			The footnote was added in section 1.
2	General	Talking about a "management programme for hazards" is confusing because it suggests the existence of a specific IAEA requirement, whereas such a requirement does not exist; for comparison, a specific requirement (nr. 14) in SSR-2/2 exists to implement an "ageing management programme". Also, "programme" refers to a specific systematic arrangements etc. which are not intended here. Different wording should be considered. If the word "programme" is kept, then a clear explanation at the very beginning of the document of what is meant in this guide with the word "programme" (something like the definition at the end of 3.6) could help. *Here below I add a few definitions of the concept of "programme" as found in some IAEA documents (to help clarify the possible misunderstanding).*		X			Management programme for hazards were replaced to hazard management or hazard management measures.
3	General	The definition of "management programme for hazards" is clear (see		X			Definition for the

		par 3.6) but it is not consistently used in the draft; consider move the definition earlier in the draft, to increase clarity					hazard management was described in section 2.
4	General	The relationship between the "management programme for hazards" and the other "operation programmes" in place at a plant should be given. In particular the relation to Accident management programme (SSG-54) [SSG-54 supersedes NS-G-2.15]		X			Managemet programmes were not be recommended for hazard and wordings in the entire chapter 3 were modified in more flexible form. 3.6 were deleted. And the examples of measures in each programmes were moved to footnote in Section 2. We checked the STUK documents and cofirm other member states situation, we concluded that the overview of a set of management programmes are differ from the regulation and also different from hazards. Instead to put the high-level example, we put the specific example for the extreme wind in B.5.7. to

							describe how the management programmes were required to activated to cope with a hazard. We hope this help the understanding of member states. These remarks in 3.6 were moved to the footnotes. For the modification management, the some texts were added to express that entire plant modification programme may be appreciable for the hazard management.
5	General	Editorial check and thorough check on internal consistency would be beneficial and would help increase clarity.		X			The entire documents were checked again.
6	1.10	consider merging 1.10 and 1.13 [see also 7.2]	Avoid doubling and increase clarity	X			Merged and reduced some texts.
7	2.3 *(and also elsewhere in the guide)*	Insert reference to SSG-54 (accident management programme) in connection with req. 19 of SSR2/2	The relationship between the hazard management easures and accident management should be considered (in particular the "mitigation" fase)	X			The SSG-54 were added to some other parts.
8	2.3	Include req. 26 (operating procedures) in SSR-2/2 (**Operating procedures shall be**	The hazards management measures should (or could) be part of the operating	X			Added.

		developed that apply comprehensively (for the reactor and its associated facilities) for normal operation, anticipated operational occurrences and accident conditions, in accordance with the policy of the operating organization and the requirements of the regulatory body.)	procedures; the relationship between them should be clarified.				
9	2.6	The reference to design effects of combinations of hazards is not clear. Consider deletion of this bullet or further clarification.	Increase clarity	X			Deleted.
10	2.8	the first part of this paragraph (until "…assessed using a graded approach") refers to design; suggestion to shorten it and focus on the operational aspects (second part of the paragraph)	Increase clarity and focus	X			The first part were deleted.
11	2.12	Check reference to SSR-2/1 (rev. 1)	Possibly a mistake (SSR-2.1 deals with design not operations)	X			Both SSR-2/1 and 2/2 were included.
12	3.5	The entire processes for hazard prevention, protection and mitigation measures and hazard impact coping strategies should be incorporated in those programmes based on the safety assessment[1] [4] [7] **and be consistent with SSG-54**	Inclusion of reference to SSG-54 increases clarity		X		The consistency with SSG-54 were added in Section 2. (This part is general recommendation for forming plant management.)
13	3.6	The last sentences of this paragraph are very important for the understanding of this guide: *The operating organization should create an overview document of the processes contained in those programmes and add appropriate information to these programmes that*	Please consider moving this part to an earlier spot in the guide.		X		The first part about the creating an overview document was moved to the footnote because a comment suggested that IAEA should

[1] The structure of management programmes for other hazards can be determined based on graded approach depends on the degree of safety significance of the site specific hazards, and other factors, such as the extent and difficulty of the efforts required to implement an protection activity against those hazards, the number of related processes, the overlap of the processes and the resource optimization (see 3.4 and Fig. 1 in GSR Part 4 (Rev. 1) etc. [7]).

		will allow for an efficient management for hazard protection. *Throughout this guide the collective term "management programmes for hazards" imply these various operational management programmes which including processes for prevention, protection and mitigation measures and impact coping strategies against any internal, external hazards and these combinations.*					not require the specific document by the Safety Guide. The last part about the terminology is moved to para 2.1.
14	3.9 and 3.14	Move to chapter on organization (i.e. 3.1 to 3.3)	Par 2.4 and 3.14 deal with organization not with the programme	X			Moved.
15	3.20	3.20 refers only to external hazards (whereas 3.18 and 3.19 refer to decision making in general); please clarify	Increase clarity	X			The texts were corrected and some paragraphs were moved.
16	4.2 *(and other par's too)*	This hazard analysis will form the underpinning of **management programmes for hazards** ~~protection against internal hazards~~	consistency with definition and terminology of 3.6;	X			Corrected.
17	4.1 – 4.6	Add a par similar to 5.4	Consistency between chapters	X			The paragraph was added.
18	Chapter 4 and chapter 5	check unnecessary differences (bv 4.6 and 5.6, no equivalent of 5.4 in chapter 4, etc.…)	Increase consistency	X			Some paragrapghs were added and wordings wre also fixed to reduce unnecessary differences.
19	6.2	it is not clear what it is meant by "site evaluation" in this context. Please clarify	Increase clarity	X			Site evaluation was deleted
20	6.3	why is "performance based" only considered for combinations of hazards? Should this not be added to chapter 3 ("management programme for hazards")?	Increase clarity	-			DS494 Appendix I recommend performance-based approach for hazard combinations. Operational guides also followed it. This recommendation

							was kept in Section 6 as it is not common recommendation for single hazard in DS494.
21	6.6	…and Safety Standard Series No.SSG-**54**~~32~~, Accident Management Programmes in Nuclear Power Plants [15].	reference to SSG-32 should be corrected to SSG-54 this is the only reference to SSG-54 and, as suggested, ref to this guide should be inserted also elsewhere	X			Corrected
22	7.1	It is not clear what this paragraph means (in particular the underlined parts). Pease clarify. The understanding of hazards and their potential effects on the plant and maintaining the fundamental safety functions should be obtained by the completion and routine updating of plant performances based on each management programme throughout the lifetime of the plant. This routine monitoring, maintaining and improving performances is consistent with the guidance given in IAEA NS-G-2.4 [16].	Increase clarity	X			The texts were modified.
23	7.2	The wording "consistent with initial design" is not consistent with other parts of this draft guide (see e.g. 1.13 and 7.11)	DEC's or backfitting are not parts of initial design (DEC's sometimes could be) but should be considered	X			The texts were modified.
24	8.2	Wordings ("Operational hazards management programme") should be made consistent with adopted definitions etc. (par 3.6)	Increase consistency	X			Corrected
25	10.5	"including the above" should clearly refer only to the first section "for all hazrds", not to all sections	Editorial check in order to increase clarity	X			"including the above" were deleted from all parts.
26	10.7	Consider merging with 10.5	10.7 deals with fire hazard	X			Merged.

			as 10.5				
27	Appendix A (subtitle)	This Appendix provides recommended elements of management programmes **for** ~~to mitigate and cope with~~ specific internal hazards. General recommendations for mitigating and coping with internal hazards are provided in Section 4	Editorial	X			Corrected
28	Appendix A	Please clarify why the section on fire as a different structure than other sections (on other hazards)	Increase clarity	X			The footnote #1 was added for the explanation.
29	Appendix A1 (fire)	Almost the same text as in NS-G-2.1 – but sometimes different. Why?	Increase clarity and justification of different wordings	-			The texts were rewritten and made some consistency with other part and other IAEA guides. e.g.; "staff"->"personnel" "mitigatory"-> "mitigation" "operational"- >"operating" "measures"- >"means" "---"->"SSC" "exit"->"escape" etc. Some recommendations for barrier integrity, combustible management, and detailed exercise were also added. Other modifications were also added by

							reviewers.

Examples of definition of "programme":

GSR-part 3
Requirement 24: Arrangements under the radiation protection programme. Employers, registrants and licensees shall establish and maintain organizational, procedural and technical arrangements for the designation of controlled areas and supervised areas, for local rules and for monitoring of the workplace, in a radiation protection programme for occupational exposure.

Glossary (2016)
radiation protection programme
Systematic arrangements that are aimed at providing adequate consideration of *radiation protection* measures. [see SSR-6 (Rev. 1), Regulations for the Safe Transport of Radioactive Material 2018 Edition]

SSR-2/2 (rev.1)
Requirement 14: Ageing management
The operating organization shall ensure that an effective ageing management programme is implemented to ensure that required safety functions of systems, structures and components are fulfilled over the entire operating lifetime of the plant.

The ageing management programme shall determine the consequences of ageing and the activities necessary to maintain the operability and reliability of structures, systems and components. The ageing management programme shall be coordinated with, and be consistent with, other relevant programmes, including the programme for periodic safety review. A systematic approach shall be taken to provide for the development, implementation and continuous improvement of ageing management programmes.

SSG-54
2.8 Concept of accident management programme

An accident management programme consists of all activities and processes developed and undertaken by an operating organization to meet the requirements set out in paras 2.1–2.7 for the prevention and mitigation of accidents. Severe accident management programmes are focused solely on the mitigation of severe accidents. More detailed recommendations on severe accident management programmes are provided in Section 3 of this Safety Guide.

Protection against Internal and External Hazards in the Operation of Nuclear Power Plants DS 503

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Paweł Domitr Country/Organization: Poland / National Atomic Energy Agency			Page 1 of 2 Date:23.04.2020				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.6	The meaning of the sentence is not clear. I can't propose new text as I don't understand what is the message of this point.	Please clarify this sentence.		X		See modified 2.6 (new 2.5)
2	3.8	3.8. The operational hazard management programme should include procedures to cope with ~~For~~ hazard impacts that are of sufficient duration (e.g., heavy snow fall, hurricane, etc.). The operating organization should utilize all available resources to cope with the hazard impact and not allow the impact of the hazard to propagate, become more severe, or jeopardize the fundamental safety functions	This recommendation should be reflected in the operational hazard management programme		X		The part was deleted by other comments.
3	3.12	3.12 Defined roles and responsibilities of site staff involved in the establishment, implementation, and administration of the operational hazard management programme should be documented and maintained ~~current~~ up to date.	Wording		X		The part was deleted by other comments.
4	8.3	8.3. The comprehensive operational hazard management programme should be considered an important part of the overall safety ~~case~~ documentation for the plant	Wording Safety case is the term used only in several Member States		X Safety "assessment"		Safety case is on the IAEA glossary. And suggested "analysis" seems more familiar. However, other MSs suggested "assessment", referring the safety

							glossary 2018. *Safety analysis* is often used interchangeably with *safety assessment*. However, when the distinction is important, *safety analysis* should be used as a documented process for the study of *safety*, and *safety assessment* should be used as a documented process for the evaluation of *safety* — for example, evaluation of the magnitude of hazards, evaluation of the performance of *safety measures* and judgement of their adequacy, or quantification of the overall radiological impact or *safety* of a *facility* or *activity*. These parts do not mean a specific document.
5	8.8	8.8. The operating organization should consider and address, in the periodic updating of the operational hazard management programme, SSCs important for hazard mitigation including portable emergency equipment and passive design features. The effect of ageing of SSCs should be taken into account.		X			
6	11.6	11.6. Because certain activities may lead to additional risk involving internal or external hazards, training for personnel who initiate or authorize these activities should be provided. Some examples of these types of additional risk are provided in paras ~~11.8~~ 11.7 and 11.8 below.		X			

Сводка отзывов DS503 с комментариями ОУВВ

DS503 - Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Page 1 of 6 Country/Organization: Russian Federation/SEC NRS Date: May 2020							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	6.2	With the external hazard impacts characterized in the operational hazard management programme, potential hazard mitigation should be identified for each hazard that will increase the viability of a hazard coping strategy deployment for external hazard conditions. **Continuous periodic monitoring of external hazards shall be organized, especially at the NPP site selection stage.**	It is essential to organize continuous periodic monitoring of external hazards at the earliest stages of NPP life circle		X Shall -> Should site selection stage -> the early stage of lifetime of the plant Move to 8.2 (reassessment of the hazard impact) The crosslink to Section 8.2 in Para 6.2 is provided.		We cannot use “shall” for guide. SEC NRS: **accepted** The scope does not include siting. There is more appropriate para in section 8. SEC NRS:
2	6.11	Depending upon the expected severity of the external hazards, the operating organization should consider evacuating all non-essential plant personnel. **In addition, it is recommended to estimate correctly the personnel relocation from the emergency zone.**	It is necessary to define the measures on a part of NPP personnel relocation on the basis of the developed logistic evacuation schedule.		X Evacuation schedule should be correctly estimated, if necessary.		This clause is mainly about design base event. SEC NRS: **accepted**
3	6.13	“…The following is a list of common external hazards consistent with DS490	1. Since the protection of a NPP and		X Maximum		This para is not for the monitoring

		[3] and DS498 [2]:…" • Seismic Hazards • Volcanic Hazards • External Floods including Tsunami and Storm Surge • External Floods from Rivers or Extreme Precipitation • Extreme Winds including Tornados, Tropical Cyclones, Hurricanes, and Typhoons • Other Meteorological Hazards (including Extreme Temperatures, **maximum annual precipitation, daily precipitation and ice thickness**) • Biological Phenomenon • Collisions of Floating Bodies with Water Intakes and Ultimate Heat Sink • Components • External Fires and Explosions • Accidental Aircraft Crash • Electromagnetic Interference (including Solar Storm). • **Landslides and Collapses, Mudflows;** • **Formation of a Layer of Ice on Electric Wires.**	timely elaboration of measures depends on the evaluation and observation results for the processes of development and forecasting of landslides and collapses (if any occur) that evolve as a result of weakening of soil, liquefaction of soil, river bank caving as a result of floods or during heavy rains in a proximity to a NPP over a period of lifetime of a NPP. (This is stipulated, for example, by Annex 3 to NP-04-17). 2. Maximum annual precipitation, daily precipitation and ice thickness shall be added to extreme temperatures indicated in brackets in "Other Meteorological Hazards"		annual… -> deleted. Landslides -> the following para is added. B.1.5. If the plants surrounded by mountains or hills, operating organization should consider the post event monitoring for the condition of slopes, or sedimentation level of dams which built to protect the facility from landslides, and prepare measures if the unacceptable condition is observed. B.4.8. The recommendation in para B.1.5 should be considered for extreme precipitation.		items. Extreme precipitation is already existing. During operating phase, landslide is considered within monitoring of sedimentation level of dams or slope condition. This should be associated with earthquake and extreme precipitation "Formation…" is classified in other meteorological hazards. SEC NRS: **accepted**

					Formation of… -> the following para is added. B.6.11. When the ice storm (combination of high wind and super cooled rain) is predicted in the area of the power grid from NPP, the operating organization should be prepared for the loss of external power caused by the rapid building up an ice layer on overhead line conductors.		
4	6.1-6.13	Probability (limits) for external hazards consideration should be established in a design.	It is suggested to mention that probability (limits) for external hazards consideration should be established in a design			X	The scope does not include design phase. SEC NRS: **accepted**
5	Appendix B	**New:** **B.14 Protection from Landslides and Collapses**	It is recommended to add a new sub-paragraph on Protection from Landslides and Collapses (See comment #3)		X (see resolution #3)		Landslides is reflected to B.1 and B.4. SEC NRS: **accepted**

6	Appendix B.1 «Seismic Hazards»	**New:** **B 1.6 "Assessment of appropriate ground vibration levels for MDE and DE has to take into account the analyses based on deterministic and/or probabilistic methods in accordance with SSG-9".**	It is suggested to add a new sub-paragraph on Assessment of appropriate ground vibration levels for MDE and DE (with a reference to SSG-9)		X (see resolution #1)		The scope does not include siting and design, however the periodical reassessment of impact from external event including earthquake should be described. The monitoring and reassessment of design earthquake can be read by modified 8.2. SEC NRS: **accepted**
7	Appendix B.1 «Seismic Hazards»	The operating organization should use the insights given in Safety Series Report No. 66, Earthquake Preparedness and Response for Nuclear Power Plants [20] in the development of an earthquake response plan for pre-event and post-event actions. These event actions take the form of procedures that describe short-term and long-term actions and include system and component walkdowns to determine the status and functionality hazard protection and mitigation features. Entry into these actions is based upon indications from the **seismic**	It is suggested to clarify in sub-paragraph 1.2 what kind of a seismic monitoring system is mentioned: a network of seismic stations located within 5-30 km of an NPP site, a system of industrial automatic protection or state regional and national seismic systems. It is preferable to provide a reference to the IAEA document that covers recommendations on	X The selection of seismic monitoring system is added in B.1.			It is not the scope of this guide to reveal system details. SEC NRS:

		monitoring system, offsite geological centres, or ground motion experienced by plant personnel. Insights for plant shutdown is provided in the Safety Series Report.	installation and functioning of the mentioned seismic monitoring system.				
8	Appendix B.3 "External floods including Tsunami and storm surge"	3.8 During the flooding event, operating organization should perform the following activities, with consideration of personnel safety: • Inspection of water levels in vulnerable and/or sensitive areas should be monitored and results communicated with plant personnel. Also, water levels overtopping any dykes, dams, or seawalls should be identified and communicated to plant personnel. • Use of heavy loading equipment to remove large debris from required access areas. • Isolating damaged systems and/or plant areas to minimize flooding propagation and avoid increasing the damage caused by the flooding. • **Organization of work to conduct monitoring of ice phenomena in order to exclude its impact on extreme water level rise and formation of catastrophic floods**	It is suggested to add a new sub-paragraph in B.3.8		X B.3.9. For sites in the higher latitudes, operating organization should monitor regional ice conditions (e.g. coverage, thickness, duration, etc.) in seas and estuaries to minimize the impact by the flooding.		3.8 is consideration during the event. The recommendation is clarified referring SSG-18" Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations" and NS-G-3.5 "Flood Hazard for Nuclear Power Plants on Coastal and River Sites" (supersede by SSG-18) SEC NRS: **accepted**
9	Appendix B.4: "External floods (riverine	B.4.4. Prior to the flooding event, site water levels should be monitored. Status of water-tight doors, bulkhead openings and water intake structures should be checked as appropriate. Deployment of	It is suggested to add a new sub-paragraph in B.4.4		X B.4.6. The recommendations in para B.3.7.		The repetitive description is avoided. SEC NRS:

	flooging or floods due to extreme precipita-tion)	dam board and aqua dams, for example, for specific buildings should be considered. The recommendation in para B.3.5. for drain and waterproofing measures also should be considered. **Organization of work to conduct monitoring of ice phenomena in order to exclude its impact on extreme water level rise and formation of catastrophic floods**			B.3.8. and B.3.9. for activities of personnel should be considered for riverine floods.		**accepted**
10	Appendix B.6 "Other meteorolog ical Hazards (including Lightning strikes, extreme temperatur es)"	B.6.4 In cases of extreme ambient air temperatures (**maximum annual precipitation, daily precipitation and ice thickness**), procedures should be developed and implemented to enhance area or equipment heating or cooling. Simple measures include opening/closing doors, dampers, adding additional heating/cooling, etc. The operating organization should ensure these measures do not invalidate the plant's safety analysis for the subject areas or equipment.	It is reasonable to add extensions (in brackets) to sub-paragraph B.6.4.			X	This para is about heating or cooling considering extreme temperature. SEC NRS: **accepted**

Protection against Internal and External Hazards - DS 503

COMMENTS BY REVIEWER Reviewer: W GUBELA Country/Organization: SOUTH AFRICA Date: 21 MAY 2020				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Appendix B	**The document is well written and covers hazards extensively but for completeness would it be possible if some of the hazards are expanded instead of being too generic namely, seismic hazard.**	**We are aware that there are natural and anthropogenic ones, some countries are prone to natural whilst others like RSA which is located in a stable continental region is highly susceptible to the anthropogenic ones due to mining activities. In the past this has been highly overlooked as it has been assumed that the natural events envelopes the anthropogenic ones whilst in the case of RSA this is not the case.**		X		The Agency recognize that although some recommendations are applicable to human induced seismic events, and also this guide does not discriminate human induced hazards (See very beginning of para. 2.1.), our first opinion was that it may not be appropriate at this stage to expand it to cover those events. Considerable effort would be required to adequately address human induced earthquake in this document. The experiences and the form for the human induced

COMMENTS BY REVIEWER Reviewer: W GUBELA Country/Organization: SOUTH AFRICA Date: 21 MAY 2020				RESOLUTION			
							seismic events in member states are vary. According to the safety report series No. 86, "Safety Aspects of Nuclear Power Plants in Human Induced External Events: General Considerations", it is true that we need to identify and describe some conditions to apply the defence in depth approaches for those events from design and operational perspective. Instead to reflect in seismic hazard, considering your comment and the different condition for external hazard of each member state, I would like to add

COMMENTS BY REVIEWER Reviewer: W GUBELA Country/Organization: SOUTH AFRICA Date: 21 MAY 2020				RESOLUTION			
							the red underlined sentence in the beginning of para. 6.1. as follows: The operational hazard management programme for external hazards should be based on identification of site-specific external hazards and plant vulnerabilities. These are identified, for example, in connection with site evaluation, plant design, periodic safety reviews, evaluation of operational experiences, and if applicable, external hazards Probabilistic Risk Assessment. For those external hazards considered

COMMENTS BY REVIEWER Reviewer: W GUBELA Country/Organization: SOUTH AFRICA Date: 21 MAY 2020				RESOLUTION			
							applicable to a particular site, the focus should be on the proper consideration of the hazard challenge presented and documented in the appropriate hazard analysis. Specifically, the operational hazard management programme should be fulfilled for levels of hazards more severe than those considered for design derived from the evaluation for the impact of these hazards.

DS503 - Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Fahad Al Blooshi Page.... of.... Country/Organization: UAE / Federal Authority for Nuclear Regulation Date:06.05.2020							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Page 15 Security aspects	Suggest to reconsider term “offsite security”	Comment: in the domain of EPR, its well-known we call offsite response organization this time they have mentioned offsite security organization or law enforcement, this might cause confusion to MS.		X The entire para is modified to avoid confusion, and to clarify the interface of the security and safety.		
2	17	ENSURING SAFETY AGAINST INTERNAL HAZARDS IN THE OPERATION OF NPPS ..... 17 RECOMMENDATIONS FOR SPECIFIC INTERNAL EVENTS	The interface between safety and security should be addressed in details internal event	X			See modified 1,14 and 1.15. After our security section (NSNS) and our team discussed, we added articles about interface with physical protection arrangement. The added recommendations are; i) any management programmes for hazards should develop and modified under the

							communication with physical protection staff, and ii) if applicable hazards occurred (especially; fire hazard), notification for physical protection staff should be required. [See 3.6, 3.20, A1.19, A1.40] NNS-4, 13, 27-G, 35-G is referred.
3	20	ENSURING SAFETY AGAINST EXTERNAL HAZARDS IN THE OPERATION OF NPPs ..... 19 RECOMMENDATIONS FOR SPECIFIC EXTERNAL HAZARDS	The interface between safety and security should be addressed in details external event		X (See No.2)		Same as above.
4	49	APPPENDIX B - EXAMPLE OF THE OPERATIONAL HAZARD MANAGEMENT PROGRAMME FOR EXTERNAL HAZARDS	EXTERNAL HAZARDS need to be added: The global pandemic has required dramatic action to be taken in all aspects of life worldwide. Operations are being halted at some facilities where necessary or deemed appropriate to prevent the spread of the virus and protect workers.		X		See 1.12. We clarified that this guide discusses hazards which cause physical impact for nuclear safety, but the lists of hazards are not exhaustive. And see 3.7. Regarding the pandemic and other situation, the consideration of the number of staff was added. However, this guide

							is dealing with physical hazards with impact on structures, systems and components (flooding, fire…). Pandemic must be considered among the "safety related" hazard, and affect only through humans. This will be discussed in the new revision of NS-G-2.4 "The Operating Organization for Nuclear Power Plants" and DS503 will keep it separated from other external challenges.
5	49	APPPENDIX B - EXAMPLE OF THE OPERATIONAL HAZARD MANAGEMENT PROGRAMME FOR EXTERNAL HAZARDS	EXTERNAL HAZARDS need to be added:Cyber attack			X	Initiators caused by wilful or malicious actions either by on-site personnel or by third parties are outside the scope of this document.

DS 503 Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Country/Organization: ONR/UK			Page..1. of.5... Date: May 2020				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.9	This Safety Guide provides the operating organizations of NPPs the latest practices for their hazard management programmes. It will be possible to implement these practices to the fullest extent in new NPPs where the design has been developed with an intent that a modern hazard management programme will be implemented. For plants designed with earlier standards, it is expected that in the safety assessments of such designs a comparison will be made with the current standards, to determine whether the safe operation of the plant could be further enhanced by means of reasonably practicable safety improvements: see para. 1.3 of SSR-2/1 (Rev. 1) [8]. This Safety Guide can therefore be used by the operating organisations of existing plants as part of the continuous improvement of their hazard management programmes.	It is stated that this safety guide is targeted primarily at new NPPs and SSR2/1 is referenced. However, whilst this guide complements guides on designing for internal and external hazards (see para 2.4) which rightly refer to SSR2/1, given its title, isn't this guide focused on operational NPPs? Section 2 refers at length to SSR2/2 and not SSR2/1.		X See modified para 1.9 (new 1.13).		
2		Change the format of this paragraph to a bulleted list	To improve the presentation/readability of text		X		

3	2.6	Hazards caused by (or occurring at) different NPPs at the same site should be considered hazards within the hazard management programme	Current text is unclear. Suggest altering the wording to make clearer	X			See revised 2.6.
4	2.8	….one of the objectives of an operational hazard management program is to ensure that hazards do not trigger an accident **condition** whenever practicable. (e.g. avoidance of Station Black Out caused by a seismic hazard).	When it is stated "one of the objectives of an operational hazard management program is to ensure that hazards do not trigger an accident whenever practicable", is accident meant as any unintended event with consequences (or potential consequences) which are not negligible as per the IAEA Safety Glossary for "accident", or a deviation from normal operation that is less frequent and more severe than an AOO (ie the glossary's definition for "accident condition")?	X … trigger a more severe plant states (accident condition) whenever…			
5	Section 4	Retain 4.1 Revise 4.2 to: Requirement 4 of the SSR-2/1(Rev. 1) [8] states that "the fundamental safety functions for a NPP "shall be ensured for all plant states: (i) control of reactivity; (ii) removal of heat from the reactor and from the fuel storage area; and (iii) confinement of	What is the objective of this Section (as opposed to what other guides say about defence in depth and what guides on designing for hazards would say)? There is something useful that could said about	X			See revised section 4.

		radioactive material, shielding against radiation and control of planned radioactive releases, as well as the limitation of accidental radioactive releases". **Hazard coping strategies and mitigation measures are important to ensure that fundamental safety functions are maintained for all plant states. Operational hazard management programmes (as described in Section 3) are therefore also important to ensure that defence in depth provision provided in the original design and safety case is maintained throughout the lifetime of the plant.** Delete 4.4	hazard protection contributing toward maintaining defence in depth, and therefore the operational management programme is important for maintaining defence in depth in all plant states and throughout the lifetime of the plant. However, the current text is quite generic on defence in depth. Para 4.4. identifies an old reference for defence in depth, on issues more to do with design and analysis than operational management programmes. Para 4.4 could be deleted.				
6	5.3	In 1st sentence add in 'housekeeping' after material.	To make reference to housekeeping given its importance of reducing the effects of hazards, during periods of increased risks e.g. outages (also complements section 9)	X			
7		*Add an appropriate statement that list is not exhaustive*	We would suggest adding that the list of common internal hazards is not exhaustive.	X			

8	9.2	In 1st sentence add after schedule, 'this also includes……'	As the first sentence is currently written, it could be read that plant walkdowns should only be performed when external hazards have been forecast or after an external hazard.		X The operational hazard management programme should include specific plant walkdown procedures for periodic, pre-event, and post-event.		Clarified.
9	9.7	Suggest altering sentence after NPP. to 'This includes periods of increased risk (for example during outages or modification implementation).	As sentence is currently written, it could be read that enhanced controls do not apply during the outage.	X			
10	11.4	Suggest altering 3rd bullet to make reference to internal hazards so after specific add, 'internal hazards events (for example fire) or external……'	The change is proposed to make the statement applicable to both internal and external hazards			X	This 3rd bullet is written for external hazards. Predictable internal hazards are not usual.
11	A.1.3	Additional statement after the first sentence that the three principal objectives are in a hierarchy	To highlight the importance of adopting objectives higher up the hierarchy, it would be useful to indicate the principles are provided in an order of preference.			X	We understand the point and the comment is right from the view of operators' responsibility, however, basically the each principal objectives should be equally prepared following the concept of defence

							in depth. Therefore, we don't write the hierarchy here.
12	A.4	In the second to last sentence, suggest that after falling object that 'impacts' should be added from cranes should also be considered	This hazard should also make reference to impacts from cranes as well as falling objects from cranes, as there is a lot of OPEX related to impacts from cranes, it is not just limited to falling objects from cranes	X			
13	A.8 and B.9	Add mention of solar storms into Section A.8 and/or refer back to A.8 from Section B.9.	Solar storms are only mentioned in B.9 in terms of the EMI effects on the grid. However, they also lead to ground level solar energetic particles which can affect I&C equipment. This should be included in the definition and plan.		X B.9.1. … to affect the electrical grid and instrumentation and control systems.		Solar storm itself is external hazard, but it has potential to affect I&C.
14	Appendix C	Add examples of combined internal hazard events e.g. water to extinguish a fire can lead to water spray / flooding event, pressure part failure giving rise to pipewhip and flooding	All the examples given for combination hazards are related to external hazard events. Suggest adding some examples for combined internal hazards	X			Flooding after fire, release of hazardous substances after pipe break, and fire after earthquake are added C.4.

DS503 Draft Safety Guide "Protection against Internal and External Hazards in the Operation of Nuclear Power Plants" (Step 7)

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: SSTC NRS Country/Organization: Ukraine			Page 1 of 4 Date: 27 May 2020				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.5	The objectives of this publication are to provide the operating and other organizations involved in design, manufacture, construction, modification, maintenance, operation, safety assessment and decommissioning for NPPs, in analysis, verification and review of operational hazard management programmes, and in the provision of technical support, as well as regulatory body of Member States, with recommendations and guidance on …	The definition of term "operating organization" as defined in IAEA Safety glossary (2018) does not cover all activities listed in para. 1.5 of DS503.		X See modified para 1.5 (new 1.9)		Other comments are reflected.
2	2.5	Provisions that ensure plant safety in the event of hazards should be provided by the design of the plant and maintained for each all other stages of plant life, from design to construction and to commissioning, plant operation and through decommissioning	The recommendation to maintain provisions that ensure plant safety is not relevant to the design stage		X See modified para 2.5. (new 2.4)		Other comments are reflected.
3	2.6	-	The recommendation can not be understood clearly	X			See modified para 2.6.(new 2.5)
4	3.6	The operational hazard management programme should consider and include procedures for:	Paras. 3.14, 3.15 introduce requirements to the procedures on staff actions in the case of precursors and indications of hazards, but the relation between operational hazard management programme and the mentioned procedures is not defined.	X			

			The proposed change indicates that procedures shall be a part of the overall hazard management programme.				
5	3.9	The operational hazard management programme should be maintained applicable and relevant throughout the entire plant lifetime. The programme shall be reviewed periodically and updated as necessary to ensure that the changes in the actual plant state taking into account plant modifications, changes in the site characteristics, results of research and development, new scientific knowledge, lessons learned, and best practices from industry operating experience are properly accounted. The results of the review shall be used to identify and implement in a timely manner the practicable design modifications and changes in the hazard management arrangements including organization, strategies and measures.	It is necessary to indicate importance of accounting changes in site characteristics (in particular, those associated with the expected hazard intensity), new scientific knowledge, research and development, as well as importance of timely implementation of measures to ensure plant safety. Thus, for example, re-evaluation of seismic hazard and of associated tsunami height indicated the necessity to improve Fukushima-Daiichi NPP tsunami protection few years before the accident.	X			
6	3.11	The hazard management programme should include provisions to ensure personnel and industrial safety for those personnel responsible for implementing hazard mitigating measures and coping strategies	Editorial	X			
7	3.12	-	Para. 3.12 repeats some of the requirements of para. 3.1 and can be deleted	X			
8	3.17	Appropriate measures should be taken for radiation protection for personnel from operating organization and external organizations (e.g. fire fighters and	It is needed to indicate necessity to ensure radiation protection of personnel not only from external organization, but also from operating organization.	X			

		other staff carrying out plant response or casualty recovery).					
9	6.13	… The following is a list of common external hazards consistent with DS490 [3] and DS498 [2]: • Seismic Hazards • **Geotechnical hazards (not associated with seismic loads)** • Volcanic Hazards • External Floods including Tsunami and Storm Surge • External Floods from Rivers or Extreme Precipitation • Extreme Winds including Tornados, Tropical Cyclones, Hurricanes, and Typhoons • **Dust and sand storms** • Other Meteorological Hazards (including Extreme Temperatures) • Biological Phenomenon • Collisions of Floating Bodies with Water Intakes and Ultimate Heat Sink • Components • External Fires and Explosions • Accidental Aircraft Crash • **Release of hazardous substances (Asphyxiant and toxic gases, corrosive and radioactive fluids)** • Electromagnetic Interference (including Solar Storm).	It is necessary to align with a list of external hazards provided in para 1.11 of DS498 (e.g. the hazard "Release of hazardous substances (Asphyxiant and toxic gases, corrosive and radioactive fluids**)**" is considered in Appendix B of DS503. Other two external hazards ("Geotechnical hazards" and "Dust and sand storms") seem to be important for more detailed consideration in Appendix B of DS503.		X See modified para 6.13 (new 5.13.)		Other comments are reflected. It is clarified that the list is not exhaustive.

10	8.4	Although DS494 [1], DS498 [2] and **DS490** [3] are intended as safety guides for new NPPs …	Editorial mistake	X			
11	Appendix B	Add external hazards "Geotechnical hazards (not associated with seismic loads)", "Dust and sand storms" to examples of the operational hazard management programme.	Please see p. 1 of this table. Using provisions of IAEA Safety Guide NS-G-3.6 "Geotechnical Aspects of Site evaluation and Foundations for Nuclear Power Plants" is recommended for Geotechnical hazards.		X		See comment #9
12	B.1.2	… Insights for plant shutdown are provided in the Safety Series Report ***No… Title … […]***	It is necessary to indicate the mentioned Safety Series Report with appropriate reference	X			Footnote is added.
13	B.3.8	It seems that numbering of para 3.8 and inside bullets should be corrected	Improvement of document quality	X			

TITLE: DS-503 - Protection against Internal and External Hazards in the Operation of Nuclear Power Plants

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: US Nuclear Regulatory Commission							
Country/Organization: US Nuclear Regulatory Commission			Date: 06/02/2020				
Comment No.	Para/ Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
					X1: see the modified text. This para was already modified by other comments from other revieweres are already reflected (including the case that the entire part commented was deleted). We recognize that the comment or parts of comments was "indirectly" reflected.		

1	General	The phrase “plant operating organization” is used throughout the Guide, but it’s meaning seems to be shift and its never very clear. In some instances, it appears to be an entire corporate structure (e.g. a large utility like EDF) while in other instances it appears to be the operator of a single site.	Needs clarification.	X			IAEA Safety Glossary 2018 is added as reference for undefined terms. *“Any organization or person applying for authorization or authorized to operate an authorized facility or to conduct an authorized activity and responsible for its safety” (This includes, inter alia, private individuals, governmental bodies, consignors or carriers, licensees, hospitals and self-employed persons.)* (The term, used throughout IAEA standards, This guide does not specify the magnitude or structure of the organization)
2	General	The terms “hazard” and “impact” are not used consistently in the guide. In many places hazard is used when hazard impacts should be used.	A hazard may be present, but, because of protection measures, there is no impact on operation of the plant. When protection features/procedures are absent or inadequate, the hazard may impact the plant. Then mitigation and coping measures come into play.	X			“impacts” were added for some parts, especially for “hazard impact coping strategies”

3	1.2	To ensure safety, it is necessary that the operating organization of a NPP recognizes that the personnel involved in the operation(s) should be cognizant of the demands of safety, should respond effectively to these demands, and should continuously seek better ways to maintain and improve safety.	Need to specify what the personnel are involved in. I'm guessing that operation is what the authors had in mind. If not, supply the appropriate wording.		X1		
4	1.11	In dealing with interfaces between nuclear safety and nuclear security, it must be borne in mind that nuclear safety and nuclear security are ~~likewise~~ equally important, and measures to be taken must be mutually acceptable in both areas.	Improved wording.	X			
5	2.3	The section is mislabeled as 23. It should be 2.3. Some ~~of~~ actions are particularly important ~~of particular importance at times~~ when an external hazard is forecast, but proper housekeeping should be in effect at all times.	Improved wording.	X			
6	2.6	~~Hazards caused by (or occurring at) different NPPs at the same site should be considered hazards depending upon which is the operating organization of the different NPPs.~~	This statement makes no sense.		X1		

7	2.10	Therefore, ~~the~~ designing protection against the effects of hazards is an iterative process, integrating the needs of protection against several hazards.	Design is an iterative process. Once designs have been implemented (i.e., SSCs fabricated and constructed), it is very difficult to iterate.	X			
8	2.10	Proper surveillance for detecting hazards and in-service inspections for maintaining protection and mitigation features should be implemented ~~for coping (and, if possible, detecting) with hazards~~.	Coping does not make sense in this context.		X1		
9	2.11	An appropriate management system should be applied to all hazard protection and mitigation features, including those that were not ~~ordinally~~ originally installed or designed as safety systems or features, ~~such as embankments, spillways,~~ in order to reduce the potential for common cause failure and thus pose a threat to safety.	1) ordinally is not the correct word 2) embankments and spillways **are** designed and installed as safety features, so not a good example of the concept presented here.	X			

10	3.3	Responsibilities for deploying protective measures should be ~~realized~~ executed by plant management and plant operating personnel in a timely manner when hazardous conditions are forecasted ~~a hazard is predicted~~ (e.g, severe storm).	1) executed is better word choice here 2) a hazard cannot always be predicted, but hazardous conditions can be forecasted (e.g., convective weather outlooks can provide forecasts for conditions conducive to severe thunderstorms and tornados, but it is not feasible to predict where and when a tornado may strike)	X			
11	3.6	The operational hazard management programme should consider and include: - The prevention of avoidable hazards that can affect nuclear safety, - Protection features and procedures for unavoidable hazards or credible combinations thereof that can affect nuclear safety; - Mitigation measures in the event that ~~for~~ hazards or credible combinations of hazards exceed protection levels, and - Strategies for coping with hazard impacts ~~Hazard coping strategies~~.	As written, the text does not reflect that protection should come first, and that mitigation measures are employed when protection fails or the hazard intensity exceeds designed protection level.	X			

12	3.8	~~For hazard impacts that are of sufficient duration (e.g., heavy snow fall, hurricane, etc.),~~ ~~t~~The operating organization should utilize all available resources to cope with ~~the~~ hazard impacts and not allow ~~the~~ impacts ~~of the hazard~~ to propagate, become more severe, or jeopardize the fundamental safety functions.	This should be a general requirement, not tied to vague criteria such as "sufficient duration".	X			
13	3.10	Hazard impact coping strategies within the operational hazard management programme should be developed accounting for the physical and social infrastructure around the plant.	Hazards and hazard impacts are not the same thing	X			
14	3.10	The programme should also identify relevant external organizations, such as local government and emergency services, and specify the type and amount of support local external organizations can be relied on for, as well as the points of contact and methods of communication.	Durable agreements, points of contact and specified communication channels are key elements.	X			
15	3.11	The hazard management programme should include personnel and industrial safety for those personnel responsible for implementing hazard mitigating measures and coping strategies. MOVE THIS to 3.7	This text should be included in 3.7 for a complete description in one place.	X			

16	3.12	Defined roles and responsibilities of ~~site~~ staff involved in the establishment, implementation, and administration of the operational hazard management programme should be documented and maintained current.	For most organizations, this will include more than just site staff.		X1		
17	3.15	The procedures should set out the roles of plant operating personnel in relation to the roles of any external organizations (e.g. local authority fire brigades). COMBINE WITH 3.10	This is very closely related to concepts in 3.10.		X		3.13(old 3.10) is about Hazard impact coping strategy. So we bring this para as 3.12 prior to 3.13.
18	3.20	When a ~~hazard~~ hazardous event has occurred or hazardous conditions have been forecasted, decision making should be performed by the operating organization to ensure:	Decision making needs to begin well in advance of the hazard actually affecting the plant in many cases	X			
19	3.20	- That the fundamental safety functions required for the appropriate plant operating mode will be maintained ~~are not or will not be threatened~~.	Whether or not key safety functions are threatened is subjective. The point is that they must continue to work.	X			
20	3.21	The operating organizations should put in place processes to ensure that meteorological forecasts are monitored and that the appropriate actions are taken when weather-related hazardous conditions are forecasted ~~external hazard is predicted to occur~~ (for example coastal flooding, severe storms ~~tornadoes~~, etc)	As written, this is not consistent with how forecasts are developed, and watches and warnings are issued.	X			

21	3.21	The operating organization should then prepare and activate the organization as required to protect against potential hazards, and to be prepared to implement mitigation measures and/or impact coping strategies if protection fails ~~minimise the effects of a predicted hazard on the NPP, and implement hazard mitigation measures and coping strategies.~~	There is a sequence to be followed: protection, mitigation, coping. Protection comes first. If protection is working well there is no need to implement mitigation or coping: there is nothing to mitigate and no impacts to cope with. Mitigation and coping should be readied but implemented only as needed.	X			
22	3.21	~~There are well-established arrangements for emergencies in which a radiological release may occur, but the NPP operating organization should review what arrangements are appropriate for hazard initiator events which, if managed appropriately, will not lead to a radiological release.~~	This isn't very meaningful or actionable. In theory, no event that is "managed appropriately" should lead to a radiological release. In reality, the severity of the event, unanticipated combinations of events or concurrent random failures make it almost impossible to be definitive about this.	X			

23	4.1	Thus, ~~hazard coping strategies and mitigation measures~~ hazard mitigation measures and hazard impact coping strategies should be provided as part of the defence in depth concept and the operational hazard management programme to control hazard impacts.	Corrects confusion about mitigation and coping		X1		
24	4.2	Thus, hazard mitigation measures and hazard impact coping strategies ~~hazard coping strategies and mitigation measures~~ should ensure that the fundamental safety functions are maintained for all plant states.	Same as previous comment	X			
25	6.1	Specifically, the operational hazard management programme should ~~be fulfilled for~~ consider levels of hazards more severe than those considered for design, derived from the evaluation for the impact of these hazards. It should also consider the potential impact of external hazard levels lower than the design basis, buts in combination with other hazards or random protection or equipment failures.	A hazard below the design basis level in combination with other hazards or with random failures can have safety implications.	X			
26	6.3	~~The protocols should also avoid confusion in implementing post-event actions if the potential of a deliberate event is considered.~~	I have no idea what this statement is trying to convey.		X1		

27	6.5	The operational hazard management programme should enhance the external hazard ~~mitigation measures~~ protection features/procedures, mitigation measures and impact coping strategies ~~in~~ during specific periods and activities.	Protection and coping should be included, not just mitigation. These will be specific to the activities being performed (e.g. maintenance of a specific SSC vs. a refueling outage)		X1		
28	6.6	- Development and implementation of an operational strategy for responding to events with warning, e.g., procedures required to support anticipatory actions (this should recognize the seasonal patterns of frequency and/or magnitude of certain natural external hazards),	Operation of the plant should be cognizant of seasonality for certain natural external hazards. Some man-made hazards also have seasonal aspects.	X			
29	6.6	–Development and implementation of a plant strategy for responding to events without warning e.g., response actions that may be required for a particular hazard such as debris removal following a ~~tornado or~~ seismic event,	Tornado is not a good example because convective outlooks can forecast conditions favorable for severe storms and tornados.	X			

30	6.9	There is a very wide range in the forecast skill for external hazards. Some external hazards such as seismic events, aircraft crashes, and industrial accidents are generally unpredictable and the hazard management programme should assume that there will be no warning. For others, there is a range of forecast skill depending on the phenomena and the forecast lead time. For example, floods on certain large river systems can be forecast with considerable skill days to weeks in advance. Coastal flooding due to tropical and extratropical cyclones can be forecast with considerable skill hours to days in advance. Conditions favorable for formation of sever storms and tornados can be forecast with considerable skill hours in advance, but the precise location and intensity of such storms come with very little warning. The hazard management program should consider the forecast skill for each credible external hazard and develop protection, mitigation, and coping strategies that are consistent with the respective skill. ~~While the initiation of external hazards is generally unpredictable, conditions may~~	As written, the statement is overly general and does not appreciate that there are wide differences in the ability to forecast conditions conducive to hazardous events.		X		"skill" sounds the ability of someone, therefore it was replaced "capability" or "availability".

		~~occur where the potential for a hazard may increase (e.g., storm warnings, tornado warnings, extreme drought, movement of hazardous materials), and sufficient time is available to initiate mitigation measures.~~					
31	7.3	The hazard combination approach for hazard mitigation measures and coping strategies should be performance-based which defines a desired outcome and clear, measurable criteria to determine whether that outcome has been reached. ~~This approach does not prescribe specific steps that should be taken as the potential combination of hazards is potentially limitless.~~	There are certain hazard combinations that are well understood and for which specific steps can be developed. For example: (1) combined storm surge and astronomical tides, (2) storm surge and high winds, (3) storm surge and wind-generated waves, etc.		X1		
32	8.7	The operating organization should recognise and address conditions of low margin to external hazard protection or mitigation, taking into account cliff edge effects	Not just mitigation. If the margin of protection is small, this should influence mitigation and/or coping strategies.	X			

33	B.3.2	Since external floods by storm surge or tsunami ~~are somehow predictable~~ can be forecasted to some extent, the operating organization should establish communication protocols and standards with national and local agencies that provide forecasts, where available ~~predict these types of phenomenon~~. The hazard management program should consider the skill level and available lead time in these forecasts differ significantly (e.g., storm surge vs. tsunami and far-field tsunami vs. near-field tsunami.	There is a significant difference in the forecast skill for storm surge vs. tsunami. There is considerable difference in warning time for near-field tsunamis vs. far-field tsunamis		X1		
34	B.4.2	Since external floods by extreme precipitation or rivers are predictable to varying extents, the operating organization should establish communication protocols and standards with national and local agencies that predict these types of phenomenon to ensure the flooding hazards are understood. The wide range in forecast skill for riverine flooding on large rivers vs. flash flooding on small watersheds vs. local intense precipitation on the site should be considered.	There is a wide range of forecast skill for riverine flooding on large rivers vs. flash flooding on small watersheds vs. local intense precipitation on the site.	X			
35	B.5	B.5. Extreme winds (including Straight-line Winds, Tornadoes, Tropical cyclones, Hurricanes, Typhoons)	Straight-line winds should be included	X			

36	B.9.2	~~Because solar flares may damage the electrical grid with a potential for a loss of plant internal power systems, sufficient emergency fuel oil should be obtained or maintained in preparation for loss of off-site power.~~ Add LOOP discussion to Section 6	LOOP considered here, but not in other sections of Appendix B. It's really a general concern that should be addressed in Section 6.			X	It is not possible to expand the guide scope to cover the issues which was not identified in DPP at this stage. We could not identify sufficient knowledge bases such as any IAEA Safety reports or TECDOCs for suggested "LOOP" which can refer from Safety Standard.
37	B.10.2	Communications protocols and standards should be established with offsite agencies to notify the operating organization when environmental and/or population conditions are such that external fires could occur (i.e. dry conditions, high winds, ~~extreme droughts,~~ local festivals).	Extreme drought is not necessary for elevated external fire risks.	X			
38	B.10.4	If notified of offsite fire potential ~~(e.g. during extreme droughts)~~, the operating organization should consider notifying the on-site fire brigade and emergency response personnel of the potential hazard. This includes the early deployment of emergency on-site response and fire-fighting equipment to a standby readiness condition.	Extreme drought is not necessary for elevated external fire risks.		X1		

39	B12.5	The operating organization should perform regularly scheduled inspections and maintenance to preserve the integrity of all engineered structures and barriers designed to mitigate this hazard. MOVE TO Section 6	This is a general concept that should be moved to section 6.		X1		Moved to section 10
40	C	~~It also provides a potential classification system that could be used for combinations of hazards and gives examples to illustrate how to consider these types of combinations as part of the operational hazard management programme~~	The classification system here is not logical. Many of the classes overlap, because they do not consider relations between mechanisms There are three logical classifications: (1) coincident mechanisms, (2) concurrent correlated mechanisms, and (3) concurrent induced mechanisms.		X1		
41	C.3	~~The following paras C.4., C.5., C.6., C.7. and C.8. below describes different types of combinations of hazards that may be applicable to the site and should be considered in the operational hazard management programme.~~	See previous comment. Five classes are not needed. They overlap in fact.		X1		
42	C.4	One or more hazards that affect the plant and occur as the result of a separate event that also affects the plant (~~causal~~ concurrent induced event).	The subsequent events are induced by the initial event.	X			

43	C.4	~~Example Operational Aspects: In this case, if an earthquake occurs, operating organization should focus their initial response on ensuring the plant is adequately protected against the tsunami (for example, shutting flood gates if applicable). This should take precedence over assessing the earthquake damage itself, which can be done after the risk from tsunami has passed.~~	Disagree with this as a general recommendation. The precedence should consider the lead time for the tsunami to reach the plant and the severity of seismic damage to the plant.		X1		
44	C.5	One or more hazards that affect the plant at the same time-frame due to persistence or similar causal factors (~~coincidental~~ concurrent correlated events).	As described, these are correlated due to the common cause.		X1		
45	C.6	~~One or more hazards may exacerbate other hazards.~~	This is true in general, which is why we consider combined events. The example is just coincident events		X1		
46	C.7	~~One or more sequential hazards that affect the plant~~.	This is not a separate category. The example is concurrent correlated.	X			
47	C.8	Realistic combinations of randomly occurring independent events (coincident events) can affect the plant simultaneously.	These are coincident events	X			
48	2.10/line#4	Suggest adding “operability” after “physical separation”	Ensure reliable operation	X			

49	3.3/line#3	Suggest adding to read as "organization should have protocol and a plan which should be able to identify"	Proper protocol and plan need to be identified	X			
50	3.10/line#6	From 3.10 The programme should also identify relevant external resources and agencies at the local, state, and federal level. ~~organizations, such as local government and emergency services, and specify the amount of support local external organizations can be relied on for.~~	Pool up the resources for better handling		X1		

51	B.5.3	None. Clarification needed.	Is the system being checked after an event to compare actual recorded conditions to predictions, or is the system expected to predict an event? NRC guidance (RG 1.23) does not require a site's meteorological monitoring program to be equipped to predict severe weather events. However, the program should provide information on current and past localized weather conditions. Other countries may have different guidance.	X			

52	B.6.2/Line 2	None. Clarification needed.	What type of supplemental information is needed? NRC guidance (RG 1.23) does not require a site's meteorological monitoring program to be equipped to forewarn of extreme meteorological conditions. Supplemental information would be limited to current and past localized weather conditions. Other countries may have different guidance.	X			

53	A. 4.1	Typically, the prevention of structural collapses and falling objects from crane lifts is largely through conservative design **Para xxx of Safety Guide xxx provide Identification, Characterization, Prevention and Mitigation of collapse of structures.**	'Collapse of structures' is described in a very general term without providing any context to 'structures' and "collapse' and the cause of structural collapse. An engineering definition of 'Collapse' of structure should be provided. Reference to a specific design guide is required for operational management of internal hazard program regarding identification, characterization, prevention and mitigation of collapse of structures.			X	The term "collapse of structures" is consistent with para 5.16. of SSR-2/1 (Rev.1) and para 4.170-4.183 of SSG-64 (DS494). DS494 has been referred from this paragraph (and also added by next comment.) It is not appropriate to add more (design related) references from this operational guide.
54	A.4.1	Nevertheless, falling objects from cranes and other lifting equipment should be considered a potential hazard. **Para 4.170-4.183 of Safety Guide DS-494 provide Identification, Characterization, Prevention and Mitigation of heavy load drop.**	Applicable reference to the Information required for operational management of internal hazard program specific to identification, characterization, prevention and mitigation of heavy load drop should be provided.	X			

55	A.4.3	**Add the following:** **The operating organization should verify that (i) calculations for crane and special lifting devices satisfy the codes and standards referenced in applicable licensing and design bases, and (ii) the procedures used to implement load testing or visual testing, dimensional testing, nondestructive examination of major load carrying welds, and critical areas for the special lifting devices satisfy the codes and standards referenced in applicable licensing and design bases.**	Para 5.7 states that Appendix A describes in more detail specific recommendations that should be incorporated into the operational hazard management program for the "Collapse of structures and Falling Objects' internal hazards. The proposed addition provides more detail specific recommendation for the heavy load drop and is consistent with the objectives of operational management of internal hazard program specific to identification, characterization, prevention and mitigation of heavy load drop. The specific recommendations are informed by the NRC information Notice IN-2004-12 - inspection findings of crane and its components not designed to withstand the design loading conditions- and its safety implication.		X The management programmes can ensure that in appropriate timings after these activities, or periodically, the following items are consistent with design documents such as the code or standards referenced in licensing or design bases; (i) calculations for crane and lifting devices, or (ii) procedures used to implement inspections such as load testing, visual testing, dimensional testing, non-destructive testing of major load carrying welds, and critical areas for the lifting devices.		According to the IN-2004-12, there is no specific requirement to do so, and two items are introduced as suggestion.

			Detailed specific recommendation for the identification, characterization, prevention and mitigation of collapse of structures should also be provided.				

56	A.4.6	The operating organization should establish operating procedures for performing regular walkdown and inspection of areas and structures where collapses and falling objects may occur, especially for those areas which are located outside plant buildings **because xxxx**	The purpose of 'regular walkdown and inspection' of areas located outside plant buildings for the operational management of internal hazard program specific to 'Collapse of Structures and falling objects' is not provided. An explanation should be provided for the purpose of walkdown and inspection of areas located outside the plant building and why it is required for meeting the objectives of operational management of internal hazard program specific to identification, characterization, prevention and mitigation of collapse of structures and falling objects.	X			

57	**A.4.7 *(New-proposed)***	**The operating organization should establish to review aging management procedure of lifting equipment and verify a fatigue analysis is performed in the design of lifting equipment and evaluated during operation consistent with the number of load cycles during the lifetime of the lifting equipment.**	Para 5.7 states that Appendix A describes in more detail specific recommendations that should be incorporated into the operational hazard management program for the "Collapse of structures and Falling Objects' internal hazards. The proposed addition provides an additional detail specific recommendation that is consistent with the objectives of operational management of internal hazard program specific to identification, characterization, prevention and mitigation of heavy load drop. The proposed specific recommendation is informed by the Nuclear Energy Agency Committee on Nuclear Regulatory Activities report (NEA/CNRA/R (2017) 4 regarding – 'Heavy Load Accidents in Nuclear Installations', prepared by its	X			

			Working Group on Operating Experience, and by the NRC Information Notice IN-2009-20 that determined fatigue to be a common cause of wire rope damage in nuclear plant fuel handling applications. An appropriate reference to the aging management program for structures should also be provided for identification, characterization, prevention and mitigation of collapse of structures.				

58	General	We recommend addressing hazards due to Pandemic situation that could happen and potentially impact operation due to shortages of qualified operators, as well as other factors such as communications, and limited transport impacting necessary supplies and inspections.	This is a current issue that could cause significant operational hazards due to spread of virus or common disease.		X1		See 1.12. We clarified that this guide discusses hazards which cause physical impact for nuclear safety, but the lists of hazards are not exhaustive. This guide is dealing with physical hazards with impact on structures, systems and components (flooding, fire…). Pandemic must be considered among the "safety related" hazard, and affect only through humans. This will be discussed in the new revision of NS-G-2.4 "The Operating Organization for Nuclear Power Plants" and DS503 will keep it separated from other external challenges.

59	General	In order to minimize internal hazards, we suggest DS503 add a section or Para regarding use of new technologies for internal remote monitoring of operations of systems and components as well as remote external hazards security monitoring to monitor external hazards remotely. These technologies could be assets to inspection and regulatory controls.	Use of advanced remote technologies to monitor function of systems and operation could be helpful to minimize internal hazards.			X	We could not identify sufficient knowledge bases for these areas which can refer from Safety Standard. Although it is considerable suggestion, it is not possible to expand the guide scope to cover these issues. (The contents should be covered any Safety reports or TECDOCs) (The selection of the appropriate seismic monitoring systems is added in Appendix B1.)

60	General	We recommend adding an Annex or a Section addressing lessons learned of actions taken based on record inspections or IRRS review that supported identification and early mitigation of internal/external hazards.	Completion		X		We checked IAEA's database of IRRS experience, however, there were no variable data to reflect on this revision. Most data are focusing on more high-level issues or written requirement in other IAEA standards for siting or design. Despite, some of contributors for drafting this guide have much regulatory experiences. Therefore, this guide has already reflected their lesson learned (including Fukushima accident). (Adding the new annex or section is out of DPP.)
61	General	DS503 lacks certain aspects of hazards specific to radioactive waste and spent fuel (SF) management. For example, onsite storage of liquid radioactive waste may require additional attention to leakages and potential hazards to workers or to the environment	Completion to address potential internal/external hazards resulting from storage of SF and/or radioactive waste.			X	Appendix B.13 contains the protection against radioactive substance, although the source is not identified.

62	Para 2.4	Add the following text after Para 2.4: For new NPPs, the design should consider dismantlement and decommissioning aspects to minimize hazards due to access to, or removal of large components.	Minimize hazard at the design stage to reduce hazards from dismantling, or access to, large components.			X	This is specific guide for operation. The guide for design is out of the scope.