Table of Resolution of Committee Comments

Canada's Comments on

DS483 – Safety Guide: Severe Accident Management Programmes for Nuclear Power Plants

COMMENTS BY REVIEWER Reviewer: Country/Organization: Canada – Canadian Nuclear Safety Commission Date: May 2017				RESOLUTION			
Comment No.	Para/Line No.	**Suggested Change (*if applicable*)**	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2	Please consider a separate chapter for "Requirements"	Subtitle "Requirements" seems to be in contradiction with the chapter title "General Guidance for a Severe Accident Management Programme ".		x		Rephrased
2	Sec 2	The title of Section 2 should be changed.	The title of Section 2 is "General Guidance for SAMP". However, the first appearance is "Requirements". This indicates that clause 2.1 to clause 2.59 is all requirements, not guidance.		x		Rephrased as per comment 1.

3	2.22	Please consider adding the following: "The severe accident entry /exit criteria and the associated issues including roles and responsibilities, equipment performance and potential instrument errors should be identified and addressed."	EOP/ SAMG transition criteria are essential in ensuring activation of appropriate response.		x		All concepts except entry and exit criteria are already in the Chapter so a sentence on entry and exit criteria was added.
4	3.41	Please consider adding : "indicators that can be used to judge the success of the implemented actions during severe accident"	Indicators could help to evaluate the effectiveness of the implemented actions during severe accident.		x		Rephrased
5	3.143 to 3.153	Please consider adding: "The principal strategies and actions specified in SAMG should be assessed, e.g., by simulation or other methods, to confirm their positive and negative consequences and their feasibility and effectiveness with a understanding of the associated time windows and environmental conditions while the actions being implemented."	This verification and validation section does not cover the effectiveness of SAMG-specified actions. Need to address whether the SAMG actions are feasible or implementable, effective with certain time windows, and assessed with clear positive and negative consequences.		x		V&V consideration of positive and negative consequences was added. All other aspects already covered in the existing text. See para 3.148

Draft Safety Guide

DS483 –*Severe Accident Management Programme for NPPs* (STEP 11)

ENISS Comments

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: ENISS		Page 1 of 9					
Country/Organization: ENISS		Date: 05/05/2017					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General Comment	The guide introduces AMP objectives that are more detailed than those defined in SSR 2/1. This could be acceptable in a guide which is by nature more detailed than a requirement. However, this becomes a problem as no priority is made by the guide among these objectives and as, depending on the design, trying to fulfill some of them in any case may prevent the main objective (integrity of containment and prevention and limitation of releases) to be reached . Also the list of objectives is different at different places of the document, and additional objectives that are not in the lists can be found in the text (for instance in 3.32, to minimize quantity of contaminated water). See comments on 1.6, table 1, 2.11, 3.20					
2	General comment	In case of a severe accident, the term “controlled, stable state” seems more appropriate than “safe state” which refers specifically to fundamental safety functions of EOPs. In Westinghouse SAMG, the term “controlled stable state is preferred and is defined as “a controlled stable state is defined as one in which: a) the core is returned to a coolable state, b) the containment is at nearly ambient conditions, c) there are no ongoing significant fission product			x		Changed to long term stable and state consistent with definition in footnote.

		releases, and d) heat is being removed from the plant such that no changes in the plant conditions are expected.”					
3	1.5	Two different types of ~~operating guidance~~ documents for accident management are used, referred to as emergency operating procedures (EOPs) for preventing the escalation of the event into a severe accident and severe accident management guidelines (SAMGs) x..	1/ It is proposed to add here a short explanation for the domain of application of EOP and SAMG, and delete 1.6, which seems not appropriate 2/The term “operating guidance” is not appropriate and not useful.		x		Modified for consistency with IAEA Safety Glossary
4	1.6	~~The purpose of EOPs is to guide the main control room staff and other emergency response personnel in preventing fuel degradation while making maximum use of all existing plant equipment, including equipment that is not part of plant systems for accident conditions. The purpose of SAMGs is to guide the staff of the technical support centre (or equivalent; sometimes knowns as crisis teams) and the staff of the main control room during a severe accident.~~	This new text is not consistent with Table 1 and is already dealt with in 2.13. The term “guide” for EOPs is not appropriate. EOPs sensu stricto (for example ERG of Westinghouse) DO NOT make maximum “use of all existing plant equipment including equipment that is not part of plant systems for accident conditions”. It is possible to use non permanent equipment in EOPs, but the FLEX guidelines and EDMG which	x			

			extensively use equipment that is not part of plant systems should not be considered as EOPs. It would be better to delete it or change it deeply (making it accurate).				
5	1.7	(2)When plant conditions indicate that significant fuel degradation is imminent or in progress, priority is given to mitigating the consequences of the severe accident through: - Maintaining the integrity ~~of the reactor pressure vessel3~~ and the containment; - ~~Performing any other actions to~~ Avoiding or limiting fission product releases to the environment ~~and releases of radionuclides causing off-site contamination~~.	1/ According to SSR 2/1, safety objective in case of severe accident is to avoid or minimize releases. Integrity of confinement always goes in that direction. Maintaining integrity of reactor pressure vessel is not required by SSR, and is even not possible to be demonstrated beyond a given power level. Also trying to maintain RPV integrity may oppose to containment integrity in case this tentative is not successful. For instance, injecting water in the reactor pit of a PWR will certainly help reducing the RPV failure probability by an additional cooling. But if the RPV fails when the		x		Rephrased to accommodate some strategies that do rely on RPV integrity.

			reactor pit is full of water, this may induce steam explosion and endanger the containment. Thus, all these priorities should not be placed at the same level and, if they are all mentioned, it should be clearly indicated that if efforts are made for RPV integrity or more generally for intermediate objectives, they should not endanger containment integrity, which is top priority 2/ "Off site" and "the environment" seem synonyms in this context 3/ editorial comment: "performing any other actions to" is not a consistent formulation with previous bullet				
6	1.10	The severe accident management programme needs to involve the establishment of the necessary infrastructure to effectively prevent or mitigate the consequences of a severe accident, prevent fuel degradation, and achieve a controlled stable state ~~stabilize the unit~~ if fuel degradation does occur.	The terminology "achieve a controlled stable state" seems more appropriate than "stabilize the unit"		x		Modified as per definition in footnote.

7	Table 1	Limitation of release of radioactive material into the environment through actions preventing the uncontrolled loss of containment integrity and limiting fission product releases to the environment. ~~comprising termination of core/fuel melt progression, maintenance of reactor pressure vessel integrity, maintenance of containment integrity, preventing containment by-pass and control of releases~~	See comment on 1.7. Objectives of terminating the progress of fuel damage and maintaining the integrity of reactor vessel are intermediate objectives. Main objectives in severe accident are to maintain the containment integrity and to limit any fission product releases. So intermediate objectives are valid only if they do not prevent the subsequent ones to be achieved.		x		Rephrased to accommodate some strategies that do rely on RPV integrity.
8	2.11	Multiple strategies should be identified, evaluated and, when appropriate, developed to achieve the accident management objectives, which include, as appropriate: Preventing or delaying the occurrence of fuel degradation; Terminating the progress of fuel degradation once it has started; Maintaining the integrity of the reactor pressure vessel to prevent melt-through; Maintaining the integrity of the containment and preventing containment bypass; Minimizing releases of radioactive material from the core or at other locations where releases of radioactive material could occur; Returning the plant to a ~~safe~~	It is not useful to develop strategies that are shown not appropriate during the evaluation. Therefore, for clarity, development of all possible strategies is not necessary, notably in the case these strategies have adverse effects shown during the evaluation. In particular, objectives of terminating the progress of fuel damage and maintaining the integrity of reactor vessel are intermediate objectives		x		Rephrased to accommodate some strategies that do rely on RPV integrity.

		controlled stable state in which the fundamental safety functions can be preserved.	that in some design, cannot be demonstrated or may preclude achievement of the main objectives in severe accident. As explained before they are to maintain the containment integrity and to limit any fission product releases. 3/ see general comment 2				
9	2.42	The installation of new equipment or the upgrading of existing equipment to operate under harsh environmental conditions is not sufficient to ~~should not~~ eliminate the need for the development of accident management guidance for situations when some of this equipment malfunctions.	Some new equipment could be design to withstand severe accident and external events. Such a sentence would have a detrimental effect on tentative to qualify equipments, and constitute excessive requirement if the situation which result of the malfunction of these equipment can be demonstrated as practically eliminated	x			
10	3.1 (6) 4th bullet	• Education and training, exercises and drills ~~and evaluation of personnel skills~~ should be considered;	Removal of "evaluation of personel skills": this should be considered for NPP staff as a whole but not specifically in the frame of			x	Requirement 7 of SSR-2/2 para. 4.19 requires a periodic evaluation of the competence of

			the development of the AMP. It appears not necessary to evaluate the skills of the personnel if it is submitted to education, training, drills and exercises, as the necessary skills are ability to use the procedures and guidelines.				personnel
11	3.4	SAMGs for the mitigatory domain should address the full spectrum of challenges to fission product barriers, including those arising from multiple hardware failures, human errors and postulated hazardous conditions, including extreme external hazards, and possible consequential failures and physical phenomena that may occur during the evolution of a severe accident. ~~In the development process of SAMGs, even highly improbable failures should be considered.~~	This part is contradictory to clause 3.3 that recommends a selection of sequences from the PSA. It is difficult to understand what is expected from “highly improbable” compared to “extremely improbable with a high degree of confidence” which is a part of what is considered practically eliminated. For such situations, which are not required to be studied, it would be difficult to provide guidance and demonstrate efficiency of this guidance. Such a recommendation			x	Derived from a Fukushima lessons learned.

			seems to go beyond IAEA requirements. 3.6 is sufficient to avoid exclusion of sequences which are not practically eliminated.				
12	3.5	For determination of the full spectrum of challenge mechanisms to fission product barriers, useful input] can be obtained from the Level 2 PSA for the plant, or similar studies from other plants, engineering judgement and insights from research on severe accidents. ~~However, the identification of potential challenge mechanisms should be comprehensive to be extent possible to provide a basis for the development of guidance for plant personnel in all situations, even if the evolution of the accident would constitute a very unlikely path within the Level 2 PSA or is not identified in the Level 2 PSA at all.~~	Same comment as for para 3.4, except that the wording "highly improbable" is replaced by "very unlikely path".			x	Derived from a Fukushima lessons learned.
13	3.20	Strategies should be developed with the following objectives: ~~- Terminating the progress of fuel degradation in the reactor core and the spent fuel pool;~~ ~~- Maintaining the integrity of the~~	See general comment 1 : the objectives do not have the same importance and trying to achieve some intermediate objectives may prevent to achieve the main ones		x		Rephrased

		~~reactor pressure vessel and the spent fuel pool;~~ ▯ ~~Preventing re-criticality in the reactor pressure vessel;~~ ▯ Maintaining the integrity of the containment or any other confinement of fuel and preventing containment bypass; ▯ Minimizing or delaying any off-site releases of radioactive material; ▯ Returning the plant to a ~~safe~~ controlled stable state where the fundamental safety functions can be ensured. As far as they do not prevent achievement of main objectives, the following intermediate objectives should be used ▯ Terminating the progress of fuel degradation in the reactor core and the spent fuel pool; ▯ Maintaining the integrity of the reactor pressure vessel ~~and the spent fuel pool~~;	Prevention of re-criticality should not be an objective in itself: re-criticality (but also hydrogen detonation, …) should be avoided to fulfill the other objectives. It should consequently be removed. As a fundamental safety function, it is covered by last bullet 2/ see general comment 2 about safe state				
14	3.34	The strategies and measures selected in the previous section should be converted to guidelines for the	Missing word	x			

		mitigatory domain (SAMGs).					
15	3.58	3.58. SAMGs should contain the preferred accident management equipment that is available. Alternate methods for achieving the same purpose should be explored to take into account, where appropriate, the possible failure of this equipment, and, if available, should be included in the guidance. For example, possible equipment failures include instrumentation failure or equipment lockout, and the availability of alternative equipment should be determined	To clarify why there is a need for alternative methods if failure of the preferred equipment is credible.		x		Modified for clarity.
16	3.82	Upgrades should be considered that increase the capability of the equipment, or its margin to failure, ~~against challenges such as melt-through of the reactor pressure vessel, melt-through of the basemat by the molten core or core-concrete interaction~~ for the following functions: - Monitoring of essential containment parameters, such as temperature, pressure, radiation level, ~~hydrogen concentration~~ and water level; …	The link between the enumerated challenges and the enumerated functions in unclear. The list of challenges introduces confusion. Hydrogen concentration cannot be considered as a key containment parameter as risk of explosion depends on concentration of hydrogen, other combustible gases, but also oxygen and steam. And the risk of hydrogen explosion		x		Specific focus on containment instrumentation is a Fukushima Lesson Learned

			may be greater in rooms near the containment than in the containment itself, when it is inerted (Fukushima lesson) What is important is control of combustible gases, already addressed by 4th bullet which correctly reflects SSR 2/1 req 58 and 59, and which may need instrumentation, but not necessarily hydrogen concentration				
17	3.88	~~Maintenance, testing and inspection procedures should be developed for equipment to be used in accident management~~.	The objective of this clause seems to be fully covered by 3.150+3.151 which is more detailed. Suggest deletion If maintained, it should be consistency with 3.150 which take into account the importance of equipment. If not taken into account, this will tend to limit the use in SAMG of alternative equipment in case of failure of the preferred one (as recommended by 3.58, for instance).		x		Consistency with para 3.150.

COMMENTS BY REVIEWER Country/Organization: FRANCE /ASN-IRSN Date: 5 May 2017 pages				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	General	The guidance is confusing as: • It presents a mix of preventive domain and mitigatory domain of accident management. And yet, the title of the document and of most of the chapters is related to severe accidents reference to preventive domain ("safe state", "prevention of core melt"…) should be removed from chapter 3 and 4. • It promotes one solution to stabilize the corium but insisting on the maintenance of vessel integrity in case of severe accident: there are several relevant options (in-vessel or ex-vessel). The IAEA Safety Guide shall not promote one of them.	Confusing and unbalanced guidance.		x		Modifications have been made to improve the guidance for the preventive domain to make the Guide more balanced.

2.	1.7	**OLD** 1.7. Depending on the plant state, accident management actions are prioritized as follows: (1) […] (2) When plant conditions indicate that significant fuel degradation is imminent or in progress, priority is given to mitigating the consequences of the severe accident through: - Maintaining the integrity of the reactor pressure vessel and the containment; - Performing any other actions to avoid or limit fission product releases to the environment and releases of radionuclides causing off-site contamination. **NEW** (2) When plant conditions indicate that significant fuel degradation is imminent or in progress, priority is given to mitigating the consequences of the severe accident through: - Implementing actions needed to maintain the integrity of the containment, - Implementing actions able to stop the progression of the accident, without undue threat for the confinement function, - Performing any other actions to avoid or limit fission product releases to the environment and releases of radionuclides causing off-site contamination.	Major comment Depending on the NPP design, "maintaining the integrity of the reactor pressure vessel" may not be the first priority of severe accident management actions to protect the population. 1.7 should be written in accordance with: • SSR-2/1 : There is no such requirement in SSR-2/1 • 3.24 "maintaining the containment integrity with the highest priority"		x		As per the definition of accident management in Chapter 1 both the preventive and mitigative domains should be covered by this Guide. Some designs do include the possibility of retaining RPV integrity so the text was modified to reflect this.

3.	Table 1	**OLD** Limitation of releases of radioactive material to the environment through actions comprising termination of progression of core melt or fuel melt, maintenance of the integrity of the reactor pressure vessel, maintenance of the integrity of the containment, prevention of containment bypass and control of releases, and emergency response measures for minimizing radiological consequences. **NEW** Limitation of releases of radioactive material to the environment through actions comprising maintenance of the integrity of the containment, prevention of containment bypass and control of releases, termination of progression of core melt or fuel melt, and emergency response measures for minimizing radiological consequences.	There is no need to recommend here the maintenance of the integrity of the reactor vessel (see comment 2). The termination of progression of core melt may not be the most urgent action and should not be the first one.		x		As per the definition of accident management in Chapter 1 both the preventive and mitigative domains should be covered by this Guide. Moved text on termination of melt progression and added reference to design for the integrity of the RPV

4.	2.11	**OLD** 2.11. Multiple strategies should be identified, evaluated and developed to achieve the objectives of accident management, which include: - Preventing or delaying the occurrence of fuel degradation; - Terminating the progress of fuel degradation once it has started; - Maintaining the integrity of the reactor pressure vessel to prevent melt-through; - Maintaining the integrity of the containment and preventing containment bypass; - Minimizing releases of radioactive material from the core or at other locations where releases of radioactive material could occur; - Returning the plant to a safe state in which the fundamental safety functions can be preserved. **NEW** 2.11. Multiple strategies should be identified, evaluated and developed to achieve the objectives of severe accident management, which include: - Maintaining the integrity of the containment and preventing containment bypass; - Minimizing releases of radioactive material from the core or at other locations where releases of radioactive material could occur; - Terminating the progress of fuel degradation once it has started; - Returning the plant to a stable end state in which the fundamental safety functions can be preserved.	Major comment “severe” should be added considering the title of the chapter There is no prevention for severe accident management The order is modified accordingly		x		As per the definition of accident management in Chapter 1 both the preventive and mitigative domains should be covered by this Guide. Emphasis was added to the item on containment integrity when in the mitigatory domain.

5.		**OLD** 3.2 … Activities for developing guidance for severe accidents should take into account the following : … d)… return the plant to a safe state and/or to mitigate the… **NEW** 3.2 … Activities for developing guidance for severe accidents should take into account the following : … d)… return the plant to a stable end state and to mitigate the…	There is no requirement for an end state in SSR-2/1 after a severe accident		x		Rephrased and now consistent with definition provided in footnote.

6.	3.20	**OLD** 3.20. Strategies should be developed with the following objectives: - Terminating the progress of fuel degradation in the reactor core and the spent fuel pool; - Maintaining the integrity of the reactor pressure vessel and the spent fuel pool; - Preventing re-criticality in the reactor pressure vessel; - Maintaining the integrity of the containment or any other confinement of fuel and preventing containment bypass; - Minimizing or delaying any off-site releases of radioactive material; - Returning the plant to a safe state where the fundamental safety functions can be ensured. **NEW** 3.20. Strategies should be developed with the following objectives: - Maintaining the integrity of the containment or any other confinement of fuel and preventing containment bypass; - Minimizing or delaying any off-site releases of radioactive material; - Preventing melted fuel re-criticality - Terminating the progress of fuel degradation; - Returning the plant to a stable end state where the fundamental safety functions can be ensured.	The order is modified accordingly to 3.24, “maintaining the integrity of the containment” should the first priority, then minimizing release, then stopping the accident progression. There is no need to indicate “Maintaining the integrity of the reactor pressure vessel” here (This is technology dependent). See comment 2 This would not be efficient (for protecting population) to maintain the spent fuel pool integrity if the fuel is already melted. The sentence can be deleted. There is no requirement for an end state in SSR-2/1 after a severe accident		x		Modified to retain reference to maintaining RPV integrity as previous discussion.

7.	3.21	**OLD** Strategies may be derived from 'candidate high level actions', such as filling the secondary side of the steam generators to prevent creep rupture of the steam generator tubes, depressurizing the reactor coolant system to prevent high pressure failure of the reactor pressure vessel and direct containment heating, flooding the reactor cavity to prevent or delay vessel failure and subsequent basemat failure, mitigating the concentration of hydrogen and depressurizing the containment to prevent its failure by excess pressure or to prevent basemat failure under elevated containment pressure **NEW** Strategies may be derived from 'candidate high level actions', such as filling the secondary side of the steam generators to prevent creep rupture of the steam generator tubes, depressurizing the reactor coolant system to prevent high pressure failure of the reactor pressure vessel and direct containment heating, <u>flooding the reactor cavity to prevent or delay vessel failure (or facilitate corium spreading on a large area in case of vessel rupture)</u> and subsequent basemat failure, mitigating the concentration of hydrogen and depressurizing the containment to prevent its failure by excess pressure or to prevent basemat failure under elevated containment pressure	There are several options to stabilize the corium (in-vessel or ex-vessel). The IAEA report shall not promote one solution but insist on the importance to maintain the containment integrity.	x			

8.	3.28	**OLD** 9 Examples of such challenges include: large release at the onset of an accident; bypass of the containment; high pressure melt ejection; <u>melt-through of the core cooling system, the ultimate heat sink and the reactor pressure vessel</u> **NEW** **?**	We do not understand the footnote : this should be examples of parameters indicative of challenges to fission production barriers but in a core melt accident - the reactor vessel and RCS are not anymore a barrier to fission production (they are already in a large fraction in the containment), - the UHS is not a barrier		x		The preventative domain was reintroduced to the main paragraph so it is possible that the vessel and RCS would still be a barrier. The footnote is clarified to refer to challenges.
9.		**OLD** In addition to entry conditions to the SAMGs, exit conditions or criteria to long term provisions should be specified. A safe state should be clearly defined and provisions to maintain the safe state should be specified. **NEW** In addition to entry conditions to the SAMGs, exit conditions or criteria to long term provisions should be specified. A stable end state should be clearly defined and provisions to maintain the stable end state should be specified.	There is no requirement for an end state in SSR-2/1 after a severe accident		x		Rephrased and now consistent with definition provided in footnote.

10.	3.62	**OLD** 3.62. When containment venting is considered or directed in severe accident management, the following should be considered in the guidance: (a) Situations when all AC and DC power is lost and compressed air is not available; (b) Situations involving high radiation areas and high temperatures in areas where vent valves are located (if local access is required); (c) The notification of relevant off-site response organizations of actions involving off-site consequences. **NEW** Add : (d) Limitation of radioactive releases in case of containment venting should be ensured as far as possible (aerosol deposition, filtration,…).	It is important that IAEA guidance recommends the limitation of radioactive releases in case of containment venting.		x		Specified examples with more clarity.

11.	3.100	**OLD** Plant capabilities should be analysed in connection with the in-vessel phase of a severe accident as follows: - Hydrogen production in the vessel and its release, as input information for the design of the hydrogen treatment system; - Retention of the molten core within the vessel both by internal and external vessel cooling; - The composition and configuration of the molten core, and failure of the reactor pressure vessel, as input for the design of the core catcher; - Reliable depressurization to avoid high pressure vessel failure; - Long term release of fission products from the reactor core; **NEW** **Add** Reliable depressurization of the containment to avoid high pressure containment failure	Containment pressure shall be controlled also during in-vessel phase	x			

Draft Specific Safety Guide
DS 483: (Mode 2, 27 March 2017 of Revision of NS-G-2.15) "Severe Accident Management Programmes for Nuclear Power Plants"
Status: STEP 11: Approval by the relevant review Committees Reviewed in NSOC (Asfaw)

General comments - comparison of Safety Guide versions of STEP 8 (July 2015) and current STEP 11 (April 2017)

We welcome the significant modifications based on the comments of the member states taken for Chapter 1. As the Safety Guide is now written "neutral" with regard to an application to any NPP – existing one ore new one. The general recommendations in the first chapter are now in line with the requirements and definitions used in other IAEA safety guides (IAEA SSR-2/1, -2/2) with regard to design basis and severe accidents etc.. Comments mentioned in review step 8 (Nov. 2015) with this regard by Germany and other countries have been taken into account.
Chapter 2 contains still the main recommendations and definitions used in the Safety Guide. Just some points for clarification remained as mentioned below in the table.

On the other side the chapter 3 of the Safety Guide has undergone significant changes, as already been visible when comparing the content of the report and the chapter headlines. Now many aspects related to the preventive domain of a SAM programme have been removed from some sub-chapters of chapter 3. There is no reason visible why this has been done, why the removed recommendations with regard to the preventive domain/procedures are no longer needed or seemed to be not valid, and which country / reviewer may have requested to do so. Just one remark is visible on page 141/142 (ENISS review) in resolution table submitted with this regard. This modification is not comprehensible as the removed topics are highly relevant for a SAM programme. Furthermore the made changes leads to several inconsistencies as Chapter 3 becomes no longer conform to the recommendations and requirements of Chapters 1 and 2. We are convinced that Chapter 3 needs to adequately cover all aspects of a SAM programme as defined in chapter 1 and 2 and not just a part that is related to mitigative strategies / SAMG. We thus recommend setting Chapter 3 back to the version of July 2015 (STEP8) with regard to preventive procedures and measures. The comments below in the table provide some indication where the text of Chapter 3 was modified to be applicable only to the migratory domain, and which modifications are needed to be done to set this back. These comments are not complete and the revisions made by the IAEA from STEP8 to STEP11 with this regard should be used to set the text back to its original content, including recommendations for the preventive domain where necessary. .

	COMMENTS BY REVIEWER				RESOLUTION			
	Reviewer: **Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)** (with comments of GRS) Page 1 of 12 Country/Organization: **Germany** Date: 27.04.2017							
Rele-vanz	Comment No.	Para /Line No.	Proposed new text	Reason	Accepted	Accepted, but modified	Rejected	Reason for modification/rejec

						as follows		tion
2	1	1.2	Accident management is the taking of a set of actions in the plant during the evolution of an accident with the objective of preventing the escalation of the event into a severe accident and mitigating the consequences of a severe accident should it occur, and achieving a long term safe and stable state 2. The second aspect of accident management, namely mitigating the consequences of a severe accident, is also termed severe accident management. The return of the plant to a long term safe and stable state is also called accident recovery.	There are two different objectives to be achieved after a severe accident occurred - restore safety and guaranty stability of the plant status - which should be distinguished. It is recommended to use the same wording w.t.r. everywhere in the Safety Guide: "A long term safe and stable state should be achieved." (to be harmonized as well in Footnote 2, §2.4, §2.11, §3.20)	x			
2	2	footnote 2	A safe and stable state is a plant state following an anticipated operational occurrence or accident conditions, in which the reactor is subcritical and the fundamental safety functions are restored and can be ensured and maintained stable for a long time.	Recommended to use the same wording everywhere in the Safety Guide is recommended (see §1.2, 2.4, §2.11, §3.20) It is important to note, the safety functions have to be restored first after an accident has occurred. In case of a severe accident not all of them can be restored, as e.g. the fuel is destroyed and the core does no longer exist in its original geometry.	x			
2	3	2.4	Paragraph 5.25 in GSR Part 7 [6] requires that: "Arrangements shall be made for mitigatory actions to be taken by the operating personnel, in particular: (a) To prevent escalation of an emergency;	Recommended to use the same wording everywhere in the Safety Guide is recommended (see Footnote 2, §1.2, §2.11, §3.20)	x			

			(b) To return the facility to a long term safe and stable state; (c) To reduce the potential for, and to mitigate the consequences of, radioactive releases or exposures”.					
2	4	2.10	2.10. A structured top-down approach should be used to develop the **accident management guidance**. This approach should begin with the objectives and strategies followed by measures to implement the strategies and finally result in procedures and guidelines, and should cover both the preventive and the mitigatory domains. Figure 1 illustrates the top down approach to accident management. *FIG. 1 The top-down approach to develop accident management guidance*	The terminology „Accident Management Guidance“ is used here first. Figure 1 explains what it means; therefore the FIG.1 text should be changed accordingly.	x			
2	5	2.11	2.11. Multiple strategies should be identified, evaluated and developed to achieve the objectives of accident management, which include: • … • Minimizing releases of radioactive material from the fuel ~~core~~ or ~~at~~ from other locations where releases of radioactive material could occur;	Recommended to use the same wording everywhere in the Safety Guide (see Footnote 2, §2.4, §2.1, §3.20) In other placed the wording was changed to “releases from the fuel” not just the core to include e.g. spent fuel pool accidents.	x			

			• Returning the plant into a long term safe and stable state in which the fundamental safety functions are restored ~~and can be~~ ~~preserved~~ and can be ensured and maintained stable.					
2	6	2.31.	The severe accident management programme should be periodically reviewed and revised where appropriate to reflect the changes of plant configuration, operating experience, including major lessons identified, and new results from relevant research.	This is general requirement and §2.31 is not the best position for this general requirement; it should be linked with §2.7 ore put just behind it.	x			
2	7	2.32.	The ~~approach in accident management~~ accident management guidance should be, as far as feasible, based on either directly measurable plant parameters or information derived from simple calculations and should consider the possible loss or unreliability of indications of essential plant parameters for equipment that has not been designed against such accident conditions ~~extreme external hazards~~.	The terminology „Accident Management Guidance“ is to be used here. Move §2.32 behind §2.34 for consistency. Failure of instrumentation or equipment in a severe accident is meant here, not just under extreme external hazards. It should be changed.	x			
2	8	2.36.	Items important to safety for the prevention or mitigation of accidents should be identified and evaluated. Accordingly, existing equipment and/or instrumentation should be upgraded or new equipment and/or instrumentation should be added, if necessary	Items important to safety are not just added to improve the SAM programme, they are added to improve the plants safety through a severe accident management programme.	x			

			or beneficial for improving the plants safety through a severe accident management programme.					
2	9	2.58.	A specialized team or group of teams (referred to in the following as the technical support centre staff) should be available in an emergency to provide technical support to the operating personnel ~~in the control room~~. The …	Why just in the control room? Support is needed in any case in case of an accident. This in contrast to §2.54 where the responsibilities are defined. Delete “in the control room”.	x			
2	10	3.1	(3) Identification of plant capabilities: • For challenges to the fundamental safety functions and fission product barriers, the plant capabilities, including capabilities to mitigate such challenges, in terms of both available equipment and available personnel, should be considered. • The available or necessary hardware provisions for the execution of ~~severe~~ accident management guidance ~~strategies~~ should be considered.	The wording should be changed as the as the development steps described here are to be applied for both the prevention (EOP) and mitigation (SAMG) of severe accidents. Therefore the wording “accident management guidance” is to be used.		x		Keep strategies to allow for both preventive and mitigative domans.
1	11	3.1	(4) Development of ~~severe~~ accident management guidance ~~strategies and SAMGs~~: • Suitable ~~severe~~ accident management guidance ~~strategies and measures~~ should be developed, including the use of permanent and on-site and off-site nonpermanent equipment and instrumentation to cope with	**The wording should be changed as the development steps described here are to be applied for both prevention (EOP) and mitigation (SAMG) of severe accidents. This complies with the objective of the NS-G 2.15. In the former version of July 2015 (STEP 8) both aspects were covered. It now looks like the prevention of accidents is taken out to**		x		It is possible that erroneous information from sources other

			the vulnerabilities identified. • Development of accident management guidance ~~Strategies~~ should be supported by best estimate analyses. • Dependencies between external hazards should be considered. ~~• The possibility and consequences of using erroneous information should be considered.~~ • The means of obtaining information on the plant status, and the role of instrumentation therein should be considered, including cases in which the information provided by instrumentation is erroneous and all normal power for instrumentation and control systems is unavailable.	**some extent of chapter 3 (only) – why?** Therefore the wording "accident management guidance" shall be used instead of just "severe accident management strategies and SAMG". Second last bullet can be deleted as it is duplicated information compared to last bullet point.				than plant instrumentation could be used.
2	12	3.1	(5) Establishment of a verification and validation process: ~~• Verification and optimization of the severe accident management strategies should be performed.~~ ~~• Verification and validation~~ of the accident management guidance should be performed.	This can be shortened as the terminology "accident management guidance" includes measures and strategies. All together should be verified and validated	x			

2	13	3.1	(6) Integration of the severe accident management programme into the management system: • The lines of decision making, responsibility and authority in the teams that will be in charge of the execution of the accident management guidance ~~measures~~ should be specified. • Human and organizational factor aspects should be considered.	Term accident management guidance should be used, not just measures.	x			
2	14	3.2.	Severe accident sequences should be identified and analysed, using a combination of engineering judgement and deterministic methods and probabilistic methods. Sequences for which practicable accident management guidance ~~mitigatory measures~~ can be implemented should be identified. Acceptable accident management guidance ~~measures~~ should be based upon best estimate assumptions, methods and analytical criteria. Activities for developing accident management guidance ~~for severe accidents~~ should take into account the following:	The wording should be changed as the as the development steps described here are to be applied for both the prevention (EOP) and mitigation (SAMG) of severe accidents. Therefore the wording "accident management guidance" is to be used. See as well $3.3 where terminology is used consistently.	x			
2	15	3.5.	~~For determination of the full spectrum of challenge mechanisms to fission product~~ ~~barriers, useful input] can be obtained from the Level 2 PSA for the plant, or similar studies~~	§3.2, §3.3,and §3.4 already contains sufficient and comprehensive requirements. §3.5 duplicates some of it. It is proposed to delete this.			x	The second paragraph

			~~from other plants, engineering judgement and insights from research on severe accidents.~~ ~~However, the identification of potential challenge mechanisms should be comprehensive to be extent possible to provide a basis for the development of guidance for plant personnel in all situations, even if the evolution of the accident would constitute a very unlikely path within the Level 2 PSA or is not identified in the Level 2 PSA at all.~~					specifically refers to challenge mechanisms so it is suggested to keep as is.
2	16	3.7.	~~Severe~~ Accident management guidance ~~programmes~~ may be developed first on a generic basis by the plant vendor or plant designer or by other organization duly authorized by the operating organization, and may then be used by the operating organization for development of a plant specific ~~severe~~ accident management guidance ~~programme~~. When adapting a generic severe accident management programme to plant specific conditions, care should be taken that the transition condition from preventive domain to mitigatory domain is handled appropriately, including searching for additional vulnerabilities and strategies to mitigate these. Any deviations from plant operating requirements and generic SAMGs should be subject to rigorous review that considers the basis for and benefits of the original approach and the potential unintended	Typically accident management guidance is developed first on a generic basis, not the “full SAM programme”. Should be changed.	x			

			consequences of deviating from this approach.					
1	17	headline	DEVELOPMENT OF ~~SEVERE~~ ACCIDENT MANAGEMENT ~~STRATEGIES AND~~ GUIDANCE	If §3.1 (4) is changed as recommended, this should be changed accordingly. **The clear objective of NS-G 2.15 and DS483 was/is the development of guidance for both the prevention (EOP) and mitigation (SAMG) of severe accidents. From this point it is not understandable why aspects of prevention of accidents should not be covered in chapter 3 This is furthermore incoherent with chapter 2 were EOP and SAMG are properly addressed!** Not just "severe accident management strategies and guidance" are meant here; the preventive phase is included as well (see §3.21, §3.24) and definition provided in §1.2	x			
1	18	sub-headline	**~~Severe~~ accident management strategies**	**The clear objective of NS-G 2.15 and DS483 was/is the development of guidance for both the prevention (EOP) and mitigation (SAMG) of severe accidents. From this point it is not understandable why aspects of prevention of accidents should not be covered in chapter 3 This is furthermore incoherent with chapter 2 were EOP and SAMG are properly addressed!!** **Why requirements with regard to the prevention of accidents are taken out, like**	x			

				§3.21, §3.32, §3.35. T *§3.32 old: The strategies and measures discussed in the previous section should be converted to procedures for the preventive domain (EOPs) and guidelines for the mitigatory domain (SAMGs). The procedures contain a set of actions to prevent the escalation of an event into a severe accident. The guidelines contain a set of actions to mitigate the consequences of a severe accident according to the chosen strategies*. **Change back to "Accident management strategies" strongly recommended.**				
1	19	3.19.	On the basis of the vulnerability assessment and identified plant capabilities, as well as the understanding of severe accident phenomena, ~~severe~~ accident management strategies should be developed for each individual challenge or plant vulnerability.	Not just "severe accident management strategies are meant here; the preventive phase is included as well (see §3.21, §3.24) and definition provided in §1.2	x			
2	20	3.20.	Accident management strategies should be developed with the following objectives: … minimizing or delaying any off-site releases of radioactive material; • Returning the plant into a long term safe andstable state where the fundamental safety functions are restored and can be ensured and maintained stable.	Just for clarification. Recommended to use the same wording everywhere in the Safety Guide (see Footnote 2, §2.4, §2.1, §2.11)	x			

2	21	3.21.	Accident management strategies may be derived from 'candidate high level actions', such as filling the secondary side of the steam generators to prevent creep rupture of the steam generator tubes, depressurizing the reactor coolant system to prevent high pressure failure of the reactor pressure vessel and direct containment heating, flooding the reactor cavity to prevent or delay vessel failure and subsequent basemat failure, preventing challenges to the containment integrity due to the accumulation of hydrogen ~~mitigating the concentration of hydrogen~~ and depressurizing the containment to prevent its failure by excess pressure or to prevent basemat failure under elevated containment pressure (see Ref. [18]).	Just for clarification. Not clear what is meant by „mitigating the concentration of hydrogen". Probably challenges to the containment integrity due to the accumulation of hydrogen are meant.	x			
2	22	3.22, 3.23, 3.24, 3.26, 3.29. 3.31. 3.33.	Change "Strategies" into "accident management strategies" everywhere, so that it applies for both prevention and mitigation.	Change proposed applies for all paras.	x			
2	23	3.25	When prioritizing accident management strategies, special attention should be paid to the following:	Some words are missing	x			
2	24	3.27.	~~Severe~~ Accident management strategies should also be developed for situations when DC	Not just "severe accident management strategies are meant here; the preventive	x			

			power is lost after a long term loss of all AC power.	phase is included as well (see §3.21, §3.24) and definition provided in §1.2				
2	25	3.28	The implementation of ~~specific mitigatory~~ accident management strategies should be triggered either when certain parameters reach their threshold values or trends of significant parameters areobserved such that their reaching threshold values ~~is~~ are imminent. …	This statement is not just for specific mitigatory strategies, it is to be applied for all AM strategies.	x			
2	26	3.30	The plant control and logic interlocks that may need to be defeated or reset for the successful implementation of ~~severe~~ accident management strategies should be systematically identified. It should also be verified that the potential negative effects of such actions have been adequately characterized and documented.	Not just "severe accident management strategies are meant here; the preventive phase is included as well (see §3.21, §3.24) and definition provided in §1.2	x			
1	27	3.34	**Severe accident management guidelines** 3.34. The strategies and measures in the previous section should be converted to guidelines for the mitigatory domain (SAMGs). Procedures are also used in the mitigatory domain in some plants, especially in the early phase of a severe accident, for actions initiated from the main control room before the technical support centre is functional. SAMGs should contain the necessary information and instructions for the responsible personnel to	**The clear objective of NS-G 2.15 and DS483 was/is the development of guidance for both the prevention (EOP) and mitigation (SAMG) of severe accidents. From this point it is not understandable why aspects of prevention of accidents should not be covered in chapter 3 This is furthermore incoherent with chapter 2 were EOP and SAMG are properly addressed! Why requirements with regard to the prevention of accidents are taken out? The same § in old NS-G 2.15 reads:** *3.32. The strategies and measures discussed in*	x			

			successfully implement the strategies, including the use of equipment.	*the previous section should be converted to* ***procedures for the preventive domain (EOPs)*** *and guidelines for the mitigatory domain (SAMGs).*				
1	28	3.34 – 3.49, 3.56 – 3.58	**All requirements in the mentioned paras at least have now been linked only to SAMG, while in the NS-G 2.15/DS483 both procedures (EOP, prevention) and guidelines (SAMG mitigation) have been mentioned. The goal of this guide has not changed as chapter 1 and 2 show. Why here procedures are taken out here and left in in other sections like for instance under "validation and verification" is not comprehensible. This needs to be carefully checked and changed back!**		x			
2	29	3.72.	Requirement 33 of SSR-2/1 (Rev. 1) [2] states that "Each unit shall have its own safety systems and its own safety for design extension conditions."	Sentence seems to be incomplete.	x			
1	30	head line	HARDWARE PROVISIONS FOR ~~SEVERE~~ ACCIDENT MANAGEMENT	**The clear objective of NS-G 2.15 and DS483 was/is the development of guidance for both the prevention (EOP) and mitigation (SAMG) of severe accidents.. S**ee e.g. definition provided in §1.2. "severe Accident Management" covers only the mitigation phase, but both phases are meant here.	x			
1	31	3.78 –	**Some of the requirements in the mentioned paras of this chapter have now been linked**		x			

		3.88	**only to the mitigatory domain, while in the old NS-G 2.15 both prevention and mitigation have been covered with selected requirements. The goal of this guide has not changed as requirements in chapter 1 and 2 show. This needs to be carefully checked and probably changed back!**					
1	32	head line	INSTRUMENTATION AND CONTROL FOR ~~SEVERE~~ ACCIDENT MANAGEMENT	**The clear objective of NS-G 2.15 and DS483 was/is the development of guidance for both the prevention (EOP) and mitigation (SAMG) of severe accidents. S**ee e.g. definition provided in §1.2. "severe Accident Management" covers only the mitigation phase, but both phases are meant here. **Probably most of the text under this headline is still valid for both AM phases but needs to be checked versus STEP8 version of SG..**	x			
2	33	3.101.	For the ex-vessel phase, plant capabilities should be analysed including: • Reliable depressurization of the containment to avoid high pressure containment failure; • ~~Hydrogen~~ Sources and the distribution of combustible gases (hydrogen, carbonmonoxide) , as input information for the design of the ~~hydrogen~~ combustible gas treatment system;	In the ex-vessel phase large amounts of CO can be released into the containment in addition to H2; both should be mentioned	x			

			…					
1	34	head line	STAFFING, QUALIFICATION AND WORKING CONDITIONS FOR ~~SEVERE~~ ACCIDENT MANAGEMENT	**The clear objective of NS-G 2.15 and DS483 was/is the development of guidance for both the prevention (EOP) and mitigation (SAMG) of severe accidents. S**ee e.g. definition provided in §1.2. "severe Accident Management" covers only the mitigation phase, but both phases are meant here. **Probably most of the text under this headline is still valid for both AM phases but needs to be checked versus STEP8 version of SG..**	x			
1	35	head line	RESPONSIBILITIES, LINES OF AUTHORIZATION AND INTERFACES WITH EMERGENCY PREPAREDNESS AND RESPONSE FOR ~~SEVERE~~ ACCIDENT MANAGEMENT	**The clear objective of NS-G 2.15 and DS483 was/is the development of guidance for both the prevention (EOP) and mitigation (SAMG) of severe accidents. S**ee e.g. definition provided in §1.2. "severe Accident Management" covers only the mitigation phase, but both phases are meant here. **Probably most of the text under this headline is still valid for both AM phases but needs to be checked versus STEP8 version of SG..**	x			
1	36	head line	TRAINING, EXERCISES AND DRILLS FOR ~~SEVERE~~ ACCIDENT MANAGEMENT	**The clear objective of NS-G 2.15 and DS483 was/is the development of guidance for both the prevention (EOP) and mitigation (SAMG) of severe accidents. S**ee e.g. definition provided in §1.2. "severe Accident Management" covers only the mitigation phase, but both phases are meant here.	x			

				Probably most of the text under this headline is still valid for both AM phases, but needs to be checked versus STEP8 version of SG.				

Draft Safety Guide DS483 "Severe Accident

Management Programmes for Nuclear Power Plants"

(Draft dated 27 March 2017)

Status: STEP *11*

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

	COMMENTS BY REVIEWER				RESOLUTION			
	Reviewer: **Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)** (with comments of GRS and BfS) Page 1 of 1 Country/Organization: **Germany** Date: 2017-04-19							
Relevance	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	1	3.2 (d)	"(d) Consideration of plant design capabilities, including the possible use of; □ ~~Some~~ systems beyond their originally intended function and anticipated operational states, when the use of such systems will not exacerbate the situation;"	Sub clause already restricts the systems.	x			
2	2	3.154	"3.154. Personnel responsible for performing accident management measures should be trained to acquire the required knowledge, skills and proficiency to execute their ~~roles~~ tasks."	Tasks or Duties is more accurate.	x			

DS483 Severe Accident

Management Programmes for Nuclear Power Plants

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Jila Karimi Diba (EPReSC) Page..1.. of...1. Country/Organization: IRAN / Naional Radiation Protection Department (NRPD) Date:2017-05-05							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General Comment	Some sentences in this guide are requirements for example 3.120 and 3.121. The only difference between requirements and guides is not expressing as 'shall' or 'should' statements. "3.120. <u>The authority and responsibility for deciding on actions to be taken on the site during an accident should be assigned</u> and the relevant individual should be provided with training to promptly discharge this authority. " The above mentioned sentence is a requirement that must be met in emergency preparedness and response.				x	IAEA policy for Safety Guides does not allow for using terms such as 'shall'as these are reserved for Safety Requirements.

Japan NUSSC Comments on DS483 "Severe Accident Management Programmes for NPPs" (Mode 2, 27 March 2017)

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 7 Country/Organization: Japan/NRA Date: 9 May, 2017				Resolution			
Comment No.	Para/Line No.	Proposed new text	Reason				
1.	1.7. (2)	When plant conditions indicate that significant fuel degradation is imminent or in progress, priority is given to mitigating the consequences of the severe accident (mitigatory domain of accident management) through:	Completness.	x			
2.	1.13./L3	SCOPE This Safety Guide is not mainly intended to provide information regarding the design of structures, systems and components to address design extension conditions. For information on this topic refer to Section 5 of SSR-2/1 (Rev. 1) [2].	To keep a consistency with para. 1.13. and para. 3.78. to 3.90., which described design information for DEC SSCs.			x	In the context of IAEA SS this Guide is not intended to be used to design SSCs which is the basis of this statement.
3.	3.1. (4)	Add a bullet; • Strategies should address very low probability events.	Lessons learnt from Fukushima Daiichi NPPs accidents. Some very low probability events should be adressed in SAMG somewhere.	x			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 7 Country/Organization: Japan/NRA Date: 9 May, 2017				Resolution			
Comment No.	Para/Line No.	Proposed new text	Reason				
4.	3.1. (6) 2nd Bullet	• Human and organizational factor aspects should be considered using a systemic approach*. (Footnote)* Systemic approach is an approach relating to the system as a whole in which the interactions between technical, human and organizational factors are duly considered.	A "systemic approach" should be introduced with a footnote based upon GSR Part 2 for human and organizational factor.		x		IAEA style guidance is to minimize footnotes so no footnote was added.
5.	3.38.	Human and organizational factor aspects should include consideration of; - The performance of personnel under the contextual and adverse boundary conditions given; - The command and control structure, including information sharing and cooperation among the staff involved.	Keep consistency with the description of para 3.1 (6) / second bullet. Also sharing information and cooperation among staff is added to the description on upside down relationships (command and control) within the organization.	x			
6.	3.62.	When containment venting leading to releases of radioactive material is considered or directed in severe accident management, the following should be considered in the guidance:	Clarification for "releases of radioactive material".	x			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 7 Country/Organization: Japan/NRA Date: 9 May, 2017				Resolution			
Comment No.	Para/Line No.	Proposed new text	Reason				
7.	3.73./L1	**Severe accident management for multiple unit sites** ~~For new plants, e~~Each unit of a multiple unit nuclear power plant is required to meet Requirement 33 of SSR-2/1 (Rev. 1) [2]).	It doesn't matter whether it will be applicable for new NPPs or existing NPPs in this SAMs.		x		Current design requirements are not necessarily expected to be retroactively applied. This is a Member State decision.
8.	3.73./L2	To further enhance safety, means of allowing interconnections between units of a multiple unit nuclear power plant are required to be considered in the design (~~see~~ para. 5.63 of SSR-2/1 (Rev. 1) [2]) as well as in the severe accident management.	Lessons learnt from Fukushima Daiichi NPPs accidents. Interconnection among multiple unit are essential for design and operation.		x		Clarified to indicate that this para is only discussing AM.
9.	3.78.	~~For existing plants, c~~Changes in the design should be evaluated where the radiological consequence of challenges to fission product barriers cannot be reduced to an acceptable limit, or to reduce uncertainties in the analytical prediction of such challenges. Such evaluation should include considerations of regulatory acceptance criteria ~~or safety goals~~ if these have been defined.	It doesn't matter whether it will be applicable for new NPPs or existing NPPs in this SAM. The "safety goals" have never been discussed in this document as States practices.	x			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 7 Country/Organization: Japan/NRA Date: 9 May, 2017				Resolution			
Comment No.	Para/Line No.	Proposed new text	Reason				
10.	After 3.83.	Following sentence should be added. 3.83A Heavy machinery which remove rubbles due to extreme external hazards should be provided with consideration for bad weather conditions for using non-permanent equipment or interconnect among multiple units.	Lessons learnt from Fukushima Daiichi NPPs accidents. Some rubbles disturbed to use non-permenent equipment at the site.	x			
11.	After 3.90.	3.90A It should encourage the site personnel to use any available and interconnectable measures among units during severe accident at the multiple-unit site.	Add a positive lessons learnt from Fukushima Daiichi NPPs accidents. For instance, EDGs were successfully interconnected between unit 5 and 6.		x		Rephrased
12.	3.97./L9	INSTRUMENTATION AND CONTROL FOR SEVERE ACCIDENT MANAGEMENT Additional means (such as computational aids) or ~~alternate strategies~~ contingency plans including engineering judgment with lessons learnt should be developed for the case where such instrumentation is not available.	Lessons learnt from Fukushima Daiichi NPPs accidents. Contingency plans should be developed based upon engineering judgment for unforeseeable events.	x			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 7 Country/Organization: Japan/NRA Date: 9 May, 2017				Resolution			
Comment No.	Para/Line No.	Proposed new text	Reason				
13.	3.100.	ANALYSES FOR DEVELOPMENT OF A SEVERE ACCIDENT MANAGEMENT PROGRAMME Plant capabilities should be analysed in connection with the in-vessel phase of a severe accident as follows: • Reliable depressurization to allow low-pressure water injection and avoid high pressure vessel failure;	To clarify the purpose of depressurization technically.	x			
14.	3.101./ 2nd bullet	• Hydrogen sources and the distribution and the potential leak paths of hydrogen, as input information for the design of the hydrogen treatment system;	Lessons learnt from Fukushima Daiichi NPPs accidents. Should specify the potential leak paths of hydrogen from penetrations and flanges in containment vessel.	x			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 7 Country/Organization: Japan/NRA Date: 9 May, 2017				Resolution			
Comment No.	Para/Line No.	Proposed new text	Reason				
15.	3.140.	**Interfaces with emergency preparedness and response** Appropriate interfaces, including the communication means, between the severe accident management programme and the emergency response plans and procedures should be established for an effective and coordinated response to the nuclear or radiological emergency, both on the site and off the site.	Lessons learnt from Fukushima Daiichi NPPs accidents. It is essential to develop the effective communication means such as verbal expressions.		x		Rephrased

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 7 Country/Organization: Japan/NRA Date: 9 May, 2017				Resolution			
Comment No.	Para/Line No.	Proposed new text	Reason				
16.	3.155.	TRAINING, EXERCISES AND DRILLS FOR SEVERE ACCIDENT MANAGEMENT Decision makers should be trained to understand the consequences and uncertainties inherent in their decisions, evaluators should ensure that they understand the technical basis upon which they will base their recommendations and implementers should ensure that they understand the actions that they may be asked to take. Decision makers also should be trained so that they can cope with those situation that some actions necessary for mitigation would be decided based on loss or unreliability of indications of essential plant parameters owing to the loss of credible monitoring equipment.	Lessons learnt from Fukushima Daiichi NPPs accidents. All of information can't be always available anytime for decision makers in a severe accident condition, therefore some training for them should be clarified.		x		Rephrased

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 7 Country/Organization: Japan/NRA Date: 9 May, 2017				Resolution			
Comment No.	Para/Line No.	Proposed new text	Reason				
17.	3.163.	Accident management exercises and drills should periodically challenge responders by making unavailable information sources (such as the safety parameter display system), equipment and facilities that potentially could be damaged in an accident. Drills that purposely include sources of inaccurate or miscommunicated information to personnel can be used as a way of exercising their questioning attitude, teamwork and diagnostic skills. Also, thinking attitude should be fostered how the personnel behaves when he/she faces those unexpected situation that accident progress is not foreseeable or that some equipment could not function in severe accident conditions, ~~H~~however, caution should be applied so that misinformation does not contribute to a negative effect of the training.	Lessons learnt from Fukushima Daiichi NPPs accidents. Unexpected situation such as malfunctions of equipment can happen for training.		x		Rephrased
18.	4.4./L7	Prior to recommending or attempting to execute any action, the feasibility of the proposed action should be checked within the allowable time frame.	Completeness. Lessons learnt from Fukushima Daiichi NPPs accidents.		x		Rephrased

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 7 Country/Organization: Japan/NRA Date: 9 May, 2017				Resolution			
Comment No.	Para/Line No.	Proposed new text	Reason				
19.	4.5./L4	Actions taken should also be recorded, as well as other relevant information, such as the EOP or SAMG applicable at the time, emergency alerts for the plant and the planned releases of radioactive material.	Editorial. See the para. 3.62. and 3.101. proposed in this table. The planned releases have never been presented in the original document before para. 4.5.	x			
20.	4.9./L7	~~If the extent of off-site preparedness is not sufficient the releases may be delayed to a later time, if such a shift is compatible with the severe accident management actions foreseen. The final decision on delaying a release to a later time rests with the emergency director.~~	Redundant with para. 4.10.	x			

DS483 Sever Accident Management Programs for NPPs

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dept. of Severe Accident and Risk Analysis Page 15 of.... Country/Organization: Republic of Korea / KINS Date: 21th April, 2017							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.45	**OLD** Consequently, the guidance for the mitigatory domain, usually called SAMGs, should distinguish between what can be prescriptive in nature (because there is no doubt as to the benefit of the prescribed actions, for example depressurization of the reactor coolant system for pressurized water reactors) and what cannot be prescriptive in nature. In the latter case, the guidance should include a range of possible mitigatory actions and should allow for additional evaluation and alternative actions. **Proposed** Consequently, the guidance for	If most of uncertainties is removed through lots of analyses and addition of the dedicated facilities, there is no need to consider negative effects of a certain action. Prompt action, without delaying in order to consider other alternatives, will help ease the accident. Therefore, it is desirable to make procedures in this case rather than keeping them in the form of guidelines. In addition, the SAMG should be continually reviewed and updated to reflect the operational experiences and		x		The preference for procedures for prevention is covered in para 2.35

		the mitigatory domain, usually called SAMGs, should distinguish between what can be prescriptive in nature (because there is no doubt as to the benefit of the prescribed actions, for example depressurization of the reactor coolant system for pressurized water reactors) and what cannot be prescriptive in nature. In the former case, it is preferable to take the form of procedure. On the other hand, in ~~In~~ the latter case, the guidance should include a range of possible mitigatory actions and should allow for additional evaluation and alternative actions.	the development of technologies and knowledge in accordance with Para. 2.31, and it is desirable to change from the form of the guidelines to that of procedures in a prescriptive manner if it is provided that uncertainty is removed.				
2	2.47	OLD The guidance for the mitigatory domain should be presented in an appropriate form, such as guidelines, manuals or handbooks. PROPOSED The guidance for the mitigatory domain should be presented in an appropriate form, such as procedures, guidelines, manuals or handbooks.	Refer to Comment No. 1. With the dedicated safety features and the supporting analysis, some parts of SAMP in the mitigatory domain may be prescriptive like the form of procedures.		x		When using dedicated safety systems DS483 allows the continuation of the use of procedures for these systems into the mitigatory domain. The concept of mitigation in Table 1 refers specifically to guidelines and not procedures.

3	Page 21, 3.8.	PROPOSED 3.8. To ensure the success of the development of the severe accident management programme, <u>a development team involving several disciplines with sufficient level of expertise</u> should be involved, with support from the senior management of the operating organization.	To provide clear understanding, "a development team of experts with sufficient scope and level of expertise" should be replaced with "<u>a development team involving several disciplines with sufficient level of expertise</u>"	x			
4	Page 27, 3.38.	PROPOSED 3.38. <u>Human factors</u> aspects should include consideration of;	Generally, it is written as "human factors" when it has a similar meaning with ergonomics, not "human factor'	x			
5	Page 50, 3.157.	PROPOSED Special exercises and drills should be developed to practice shift changeovers <u>between operating shift staff</u> and technical support centre staff and information transfer between different teams. Training should cover accidents occurring simultaneously on more than one unit, accidents occurring in different reactor operating states and accidents in the spent fuel pool.	To provide clear understanding and maintain consistency with other chapters in this paper, - "operations staff" should be replaced with "(main) control room staff"			x	It is recommended to keep this as is because operating staff includes more than just the control room staff.
6	Page 50, 3.161.	3.161. Initial training as well as refresher training should be developed for all groups of staff involved in accident management. <u>Initial training for new staff assigned to the accident management duties should be</u>	To provide more clear understanding, the sentence of "new staff should be trained appropriately" should be moved before "The frequency of refresher training..." and	x			

		established and implemented appropriately. The frequency of refresher training should be established on the basis of the difficulty and importance of accident management tasks.	modified as “Initial training for new staff assigned to the accident management duties should be established and implemented appropriately.”				
7	Page 51, 3.164.	3.164. Criteria for evaluating the effectiveness of an exercise or a drill should be established. Such criteria should characterize the ability of the team participating in the exercise or drill to understand and follow the evolution of plant status, to reach well-founded decisions for various events including unanticipated events and initiate appropriate actions, and to meet the objectives of the exercise or drill (see Ref. [18]).	To provide more clear understanding, “to reach sound decisions (including decisions related to unanticipated events) and initiate well-founded actions” should be replaced with “to reach well-founded decisions for various events including unanticipated events and initiate appropriate actions”	x			

NUSSC Comments on IAEA Draft Safety Guide

" Severe Accident Management Programmes for Nuclear Power Plants" (DS483)"

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Mikhail Lankin **Country/Organization:** Russian Federation **Date:** 20 May 2017							
Comment No.	**Page / Section / Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/ rejection**
1	1.7 (1)	Add new sentence in the end of (1). Also implementing actions are aimed at securing main safety functions (e.g. confining radioactivity).	Prevention of escalation into severe stage is not the only aim at preventive domain. Also limiting of radioactive releases and securing of other main safety functions shall be addressed.		x		Rephrased
2	1.7 (2)	Add new wording to the end of second bullet : "(including returning to the extent possible NPP to controlled state where main safety functions are	Wording "performing any other actions to avoid or limit fission products releases" seems excessively general. Clarification would be beneficial.		x		Rephrased

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Mikhail Lankin **Country/Organization:** Russian Federation **Date:** 20 May 2017							
Comment No.	**Page / Section / Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/ rejection**
		secured).					
3	1.9	Remove word “cooling”	Failure of fuel cooling cannot be handled as universal reason for severe accident. Also loss of reactivity control or mechanical damage of fuel can act as causes of fuel damage.		x		Rephrased
4	Table 1. Row 1 “Objective” Column 2	Remove word “through”	Fundamental safety function on confining radioactivity has to be secured irrespectively to the aim of prevention of fuel damage	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Mikhail Lankin **Country/Organization:** Russian Federation **Date:** 20 May 2017							
Comment No.	**Page / Section / Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/ rejection**
5	Table 1. Row 4 "Role of relevant emergency response organization" Columns 2 and 3	Exclude wording "or to make decisions" and "or for making decisions"	Technical support center cannot be responsible for making decisions since decision making is responsibility of emergency director (plant manager or shift supervisor) – see previous line of the Table 1.		x		Rephrased
6	Table 1. Row 5 Use of equipment Column 2	Last part of sentence re-formulate as "advice and instructions are provided in EOP and also by staff of the technical support center"	It is important to analyze all possibilities of accident management in advance and reflect such possibilities in EOPs. On-line advices by technical support centers can be considered as "last chance" back-up.	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Mikhail Lankin **Country/Organization:** Russian Federation **Date:** 20 May 2017							
Comment No.	**Page / Section / Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/ rejection**
7	Table 1. Row 5 Use of equipment Column 3	Exclude wording " with preference given to the use of safety features for design extension conditions, if available and appropriate".	All available equipment can be used for accident management irrespective of its original designation. Giving preference to DEC equipment has no solid ground.	x			
8	p.2.6	Replace word "core" with word "fuel"	Core is not the only place where severe accident can happen.			x	It is suggest to keep CDF as this is a common term. Other releases are covered by the fission product release frequency.

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Reviewer: Mikhail Lankin **Country/Organization:** Russian Federation **Date:** 20 May 2017							
Comment No.	**Page / Section / Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/ rejection**
9	p.2.11	Add additional bullet "Avoiding reactor pressure vessel failure at high pressure"	The most dangerous severe scenario is reactor pressure vessel failure at high pressure. It shall be avoided by any means.		x		Rephrased
10	p.2.43	Reformulate last sentence as "EOPs should cover design basis accidents, design extension conditions without significant fuel degradation as well as other representative scenarios without significant fuel degradation"	EOP shall be applicable to all accident scenarios without significant fuel degradation issecpetively with their probability and their consideration in plant design (as DBA or DEC). Word "representative" means scenarios which require accident management strategy different from strategies already presented in EOP for other	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Mikhail Lankin **Country/Organization:** Russian Federation **Date:** 20 May 2017							
Comment No.	**Page / Section / Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/ rejection**
			scenarios.				
11	p.3.37	Replace by sentence "SAMG should reflects all plant modifications and changes to operating procedures and training programmes"	SAMG shall reflect actual NPP status. If it is changed – SAMG should consequently be changed.		x		Rephrased

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Mikhail Lankin **Country/Organization:** Russian Federation **Date:** 20 May 2017							
Comment No.	**Page / Section / Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/ rejection**
12	p.3.54	Replace the para by sentence "Parallel execution of EOP and SAMG or Tech Spec and SAMG shall be avoided by establishing appropriate transition rules".	Only one document shall govern accident management activity – otherwise all possible conflicts are hardly to be predicted and avoided.			x	The concept in DS483 allows for the possibility of maintaining some EOP actions into the mitigatory domain, Any conflict is addressed by establishing a heirarchy of documentation.
13	p.3.128	Add footnote "In some States, decisions can be taken only by a particular authorized person (e.g. the 'accident management chief'), while other individuals provide information and advice to this person".	The proposed footnote reflects Russian national practice. In Russia we assume that transition of responsibility to technical support center in course of accident progression is dangerous and therefore		x		Modified footnote 13.

COMMENTS BY REVIEWER				RESOLUTION			
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Comment No.	**Page / Section / Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/ rejection**
			unacceptable.				

TITLE Severe Accident Management Programmes for Nuclear Power Plants DS

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dr R Moscrop			Page x of 8				
Country/Organization: Office for Nuclear Regulation, UK			Date: 12 May 2017				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General	Comment: This version of the guidance appears to be applicable to both existing and new plants. This is a welcomed development as it describes the methodology of Severe Accident Management in general, independent of plant technology.			Not required		
2	General	Section §1.12 in chapter "OBJECTIVES" of DS483 highlight "1.12. This Safety Guide is intended primarily for use by operating organizations of nuclear power plants and their support organizations. <u>It may also be used by national regulatory bodies</u> and technical support organizations as a			Not required		

COMMENTS BY REVIEWER Reviewer: Dr R Moscrop Page x of 8 Country/Organization: Office for Nuclear Regulation, UK Date: 12 May 2017				RESOLUTION			
		reference for developing their relevant safety requirements and for conducting reviews and safety assessments". This offers a good segregation between the operators and the regulators.					
3	General	The question of application of the Safety Guide for new or existing reactors, In Chapter §1.11 "OBJECTIVES". There is a link for new reactors to SSR-2/1 and SSR-2/2; in both the requirements w.r.t. Design Extension Conditions and mitigative features of the plant (SSR-2/1, requirement 20) and to accident management in general (SSR-2/2, requirement 19).			Not required		
4	General	The guidance provides an overview on transition from EOPs to SAMG and the continued use of EOPs while being in the SAMG domain, §3.52 - 54 in chapter "DEVELOPMENT OF SEVERE ACCIDENT MANAGEMENT STRATEGIES AND GUIDANCE" of DS483; providing what needs to be considered in such a case. Whilst			x		Introduced into Chapter 3

COMMENTS BY REVIEWER Reviewer: Dr R Moscrop Page x of 8 Country/Organization: Office for Nuclear Regulation, UK Date: 12 May 2017				RESOLUTION			
		this sounds logical, further clarification is required relating to the management of transition from EOPs into OSSA.					
5	General	In addition, Chapter 4 of DS483 now described the "EXECUTION OF THE SEVERE ACCIDENT MANAGEMENT PROGRAMME". I understand that this was an Appendix in the old version of NSG-2.15 is a specific example. Considering that this is just an example, it would be appropriate to move this Chapter into an Appendix. Alternatively, if it is considered that these "recommendations are requirements" it should be integrated to one of the previous chapters.				x	The structure of the document is designed to have Chapter 3 focus on the development of Severe Accident Management Program while Chapter 4 is intended to offer guidance on the use the these documents. We feel that it would confuse the flow of the document by integrating guidance on execution into guidance on development.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dr R Moscrop			Page x of 8				
Country/Organization: Office for Nuclear Regulation, UK			Date: 12 May 2017				
6	Para 1.5b	• Suggest use of a stronger word, e.g. 'direct' or 'instruct'.	'…, the purpose of EOPs is to guide the control room staff….'. This use of the word 'guide' suggests that the EOPs are guidance – in fact they are mandated actions "procedures" that must be followed rather than guidance as evidenced by their description as being 'prescriptive in nature' and 'accident dependant' in Para 2.35a.		x		This comment is addressed by the integration of the ENISS comment and now EOPs are not associated with guidance. Para 1.5b is deleted and the text integrated with para 1.5a
7	Para 1.5b	•	More clarity is needed in the formal definition of when the transition from EOPs to SAMG is to occur and similarly to when there is a transition from the preventative domain to the mitigatory domain. Is it when fuel degradation has started as implied by Para 1.6(1)? If so, how is fuel degradation start defined? Is it in terms of breaching a temperature		x		Introduced into Chapter 3.

COMMENTS BY REVIEWER Reviewer: Dr R Moscrop Page x of 8 Country/Organization: Office for Nuclear Regulation, UK Date: 12 May 2017				RESOLUTION			
			limit e.g. typical service temperature plus 100° C? Or is it when significant fuel degradation is imminent or in progress as set out in 1.6(2)? Or should the changeover point be defined in the Accident Management Guidance as implied by Para 2.19c?				
8	Para 1.5b	• I suggest that a severe accident definition be provided – perhaps by reference to an existing definition elsewhere. Note that ONR has such a definition – see Para 664 of the ONR SAPs 2014 as a fault sequence that could lead to a release >100mSv (conservatively assessed) OR to an unintended relocation of a substantial quantity of radioactive material within the facility that places a demand on the integrity of the remaining physical barriers.	The last sentence of 1.5b implies that SAMGs purpose is to give guidance during severe accidents. However the document lacks a definition of a severe accident.		x		Rephrased and the definition of a severe accident as per the IAEA Safety Glossary is included in para 1.4

COMMENTS BY REVIEWER Reviewer: Dr R Moscrop Page x of 8 Country/Organization: Office for Nuclear Regulation, UK Date: 12 May 2017				RESOLUTION			
9	Para 3.10	• The text ought to make it clear whether or not a generic SAM programme only can be adequate or whether plant specific SAM programmes are needed on every occasion.	Text suggests that SAM programmes can be developed on a generic basis first and then adapted to a specific power plant.	x			
10	Line 522	• Suggest this requirement is made stronger by removal of 'preferably'	This will make independence of equipment from different levels of defence in depth mandatory.			x	As stated in para 1.12 this Safety Guide is not intended to address design issues specifically so it is recommended to leave this statement as is.
11	Para 2.19e	• needs rewording	meaning is unclear	x			
12	Para 2.21	• Full stop missing after '…. accident management guidance'		x			
13	Para 2.40 first sentence.	• Needs rewording	Does it require testing, evaluation during validation and then testing in drills and/or exercises? Or should it say evaluation and then testing?	x			

COMMENTS BY REVIEWER Reviewer: Dr R Moscrop Page x of 8 Country/Organization: Office for Nuclear Regulation, UK Date: 12 May 2017				RESOLUTION			
14	Section 3 – title and first sentence of 3.1	should be … a severe accident … not … an severe accident … •		x			
15	Para 3.7a	Missing full stop after 'management guidance'. •		x			
16	Para 3.29	A comma is needed after 'severe accident phenomena'.		x			
17	Para 3.32	last sentence 'document**ed**'.		x			
18	Para 3.39	Missing full stop after 'preventative domain'.		x			
19	Para 3.40	Full stop missing after 'should be considered'. Should be a new sentence 'The long term strategies ……..'.		x			
20	Footnote 10	For Example (not examples) and pool damage (not damages).		x			
21	Para 3.43	2nd sentence needs rewording – suggest '… should be written in a clear and unambiguous way so that they …		x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dr R Moscrop			Page x of 8				
Country/Organization: Office for Nuclear Regulation, UK			Date: 12 May 2017				
22	Line 489	.. for exist**ing** plants…. to identify **any** impact		x			
23	Line 491	… of support systems is **a common** practice …		x			
24	Line 492	safety standard … require**s**		x			
25	Line 498	means **to allow** interconnections ..		x			
26	Line 500	**The e**ffectiveness		x			
27	Lines 504-6	**whose** use and insert a comma and **to determine** to read 'If structures, systems and components (SSCs) **whose** use is considered for severe accident management are shared with different units**,** an assessment should be performed **to determine** whether safe shutdown is achievable on the other units.		x			
28	Para 3.130	…. technical support centre is functional **after** achieving …		x			
29	Para 3.136	line 98 support **centre**		x			

COMMENTS BY REVIEWER Reviewer: Dr R Moscrop Page x of 8 Country/Organization: Office for Nuclear Regulation, UK Date: 12 May 2017				RESOLUTION			
30	Para 3.152a	Guidance not 'The guidance '.		x			
31	Para 3.163	replace 'making unavailable information sources' by 'making information sources unavailable'.		x			
32	Para 4.2 line 13	support **centre**.		x			
33	Para 4.10 line 62	replace 'be matching with' by 'match'.		x			
34	Annex 1	the acronym LTO needs explanation. Also the meaning of 'depressurising the RCS, all being'.		x			