DS482 DESIGN OF REACTOR CONTAINMENT STRUCTURE AND SYSTEMS FOR NUCLEAR POWER PLANTS, Draft 15th_April 2017

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: T. Kordina Country/Organization: Czech Republic/SÚJB			Page 1 of 2 Date: 10.5.2017				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	3.1.	The design of the containment structure and systems important to safety should be conducted taking into account the recommendations of GS-G-3.1 [14] [~~14~~and GS-G-3.5 [15] to meet the requirements 1 to 3 of SSR-2/1 Rev.1 [2] and GSR Part 2 requirements [13].	Duplicate link.	X			
	3.6.	The following recommendations provide guidance to fulfill Requirement 16 [2].	Missing a dot.	X			
	3.26	More detailed recommendations are provided in [9 ~~[9~~].	Duplicate link.	X			
	3.85	The relevant environmental and seismic conditions that may prevail prior to, during and following an accident, the ageing of structures, systems and components throughout the lifetime of the plant, synergistic effects, and margins should all be taken into consideration in the environmental qualification [7], [11~~[11~~].	Duplicate link.	X			
	4.4.	• ~~Provision for sufficient space and shielding to ensure that maintenance and operations can becarried out without causing undue radiation exposure of personnel;~~ • Placement of the equipment and structures so as to optimize biological shielding;	The meaning of these two points seems to be the same, we propose to reduce and maintain only one point.		X		But the first one is preferable from safety perspective
	4.17.	Provisions should be taken to facilitat.	Duplicate link.	X			

		the decommissioning and dismantling of equipment, and to minimize the production of contaminated wastes (see [2], Requirement 12). Guidance on these aspects is given in [8]. ~~[8~~					
	4.28.	At the end of the analysis the number of load combinations may be reduced by grouping them appropriately. The analysis ~~will~~ should be performed only for the most demanding cases.	If the designer wants to calculate all the combinations and use the envelope method, the original text in the document prevents him from doing so.	X			
	4.205	Test sequences for equipment qualification should be consistent with well proven international practices. General principles and adequate practices are indicated in [18 ~~[18~~].	Duplicate link.	X			
	5.9.	To establish a point of reference for future in-service leak tests, the leak rate test performed during commissioning should be conducted at a test pressure or pressures consistent with the pressure selected for in-service leak tests: • At values of pressures between the pressure selected for in-service leak testing and the positive design pressure, if the in-service tests are to be conducted at a pressure lower than the design pressure; or • At the design pressure of the containment, if the in-service tests are to be conducted at this pressure. We propose additional text: Verification of the reference point should be verified min. once every	The experience of the in-service leak tests tests at the Dukovany NPP showed that the extrapolation coefficients had changed after 30 years of operation. The tests were executed before the LTO NPP Dukovany SÚJB permit was granted as a confirmation of the real conditions of containment. This is a good practice.			X	If there is a justification to change the reference, this will be part of the analysis of the variation between the initial test results and the tests results periodically performed

		20 (or 30) years of operation plants.					

COMMENTS BY REVIEWER Reviewer: ENISS RSG Country/Organization: ENISS			Page 1 of 6 Date: 16 May 2017	RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accep ted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	4.70	New text is marked in red: • The vent flow area between the drywell and the suppression pool must be sized to limit the maximum pressure during blowdown; • The amount of water in the suppression pool should be such to condensate steam released during design basis accidents (e.g. in the event of a LOCA) and to allow for the absorption of residual and latent heat from the reactor for a sufficient grace period until the normal, emergency or back-up residual heat removal systems is capable to restore a heat-balance. • The barrier separating the drywell from the wetwell should be sufficiently leak-tight to assure the pressure-suppression function during design basis accidents.	Basic design features of the suppression pool that are necessary to limit the peak pressure during a LOCA are: 1) Sufficient water volume in the pool (heat capacity) 2) Leak-tight barrier between the drywell and the wetwell. 3) Sufficient vent area.		X Second bullet has been modified as you propose. I agree with your third bullet but I thinh that the concern was already captured in the clause 4.74 (ex 4.75)		
2	4.143 (new compared to Step 8)	4.143. The number and positioning of recombiners or igniters should be justified ~~on~~	Too much prescriptive: detailed combustible gas distribution analyses might not be necessary. Those kinds				

		~~the basis of detailed combustible gas distribution analyses resulting from different scenarios of an accident with core melting~~.	of analyses might be considered but should not become a requirement. The beneficial of the analyses should be weighted in comparison with the complexity and practical feasibility of such detailed analyses usually requesting the use of CFD with detailed modelling of reactor building (very important computer capacity, validated codes).				
3	A.13	A.13 Internal and external hazards: • All internal and external hazards that are addressed in the design basis should be re-evaluated in a dedicated framework such as Periodic Safety Review on the basis of up to date methodologies meteorological and geological data;	Such a re-evaluation should not be performed on a continuous basis but in a specific frame such as Periodic Safety Review			X	Why stressing that IH or EH should be re-assessed in the frame of periodic safety review only? Such reassessment has been made after the Fukushima Dai ichi accident. So I believe that it not needed to be more precise
4	A.14	A.14 Management of challenges to containment ~~Energy management~~: • By preventing challenges - at reactor vessel melt-through; - due to corium - concrete interaction, leading to combustible gas production and basemat melt-through. • By establishing or restoring the ultimate heat sink to manage pressure and temperature in the containment; • By removing the produced heat from the corium debris	"Challenges to containment" is more appropriate than "energy" as a title for the following bullets dedicated to severe accident. The list of bullets should be consistent with future draft NS-G-2.15 (DS483, step 10, disposition 3.76a). It should not introduce some requirements such as different and diverse means, multiple means. This appendix is related to existing plants and its content should correspond to the Article 1.3 of SSR-2/1 (further enhancement of safe operation of the plant by means of reasonably practicable safety improvements). It is not necessary to add specific requirements for containment venting:		OK for the tittle and the 1st bullet has been modified		DS483 provides insights and strategies to be implemented in the event of a severe accident taking into account all the available plant capabilities. This appendix aims at identifying reasonable back fitting measures for existing plant which will expand the capacity of the plant to respond to events not considered in the existing design. Therefore the phrasing in the 2 documents cannot be the same, and here the goal is to identify potential

		to an ultimate heat sink. ~~• Conditions leading to a direct containment heating should be prevented by different means;~~ ~~• Possibilities for steam explosion arising should be identified and their effects evaluated;~~ ~~• Different and diverse means should be implemented to control the pressure build up inside the containment in the different plant states;~~ ~~• Multiple means should be implemented to remove heat from the containment in the different plant states;~~ ~~• If a containment venting system is needed for certain beyond original design basis events, it should be reliable, robust to withstand loads from hazards (e.g. earthquake), accident conditions, and to withstand the dynamic and static pressure loads existing when the containment venting line is operated;~~ ~~• Specific safety features and systems should be implemented to ensure the cooling and stabilization of the molten core.~~	these requirements are included in a general way in previous dispositions. Requiring multiple means for all the plant states is excessive; even for new plants, only one mean is provided in case of severe accident.				improvements.
5	A.15	A.15 Control of radionuclides releases to the environment: • By isolating a~~A~~ll piping penetrating the containment ~~should be isolated~~ but	The tittle should be modified as proposed. The list of bullets should be consistent with future draft NS-G-2.15 (DS483,			X	The proposed phrasing is not appropriate for this appendix which provides insights for the implementation of

		systems necessary for the mitigation of the accident conditions; • By keeping ~~T~~the containment ~~should be kept~~ leak tight to the extent possible under severe accident conditions ~~(no significant aggravation of the specified leak rate)~~; • By evaluating and identifying containment bypass ; • By reducing ~~Different means should be implemented to reduce~~ the radionuclides in the containment atmosphere ~~in the different plant states~~; ~~• Mechanisms and potential paths for unintentional containment bypass should be evaluated and identified;~~ • If venting of the containment atmosphere is necessary, it should be possible to close the containment venting line(s) reliably; • Intentional release (e.g. containment venting) in the event of a severe accident should consider filtration through filters of high efficiency prior to being discharged to the environment.	step 10, disposition 3.76a). It should not introduce some requirements such as different means and no aggravation of the specified leak rate. This appendix is related to existing plants and its content should correspond to the Article 1.3 of SSR-2/1 (further enhancement of safe operation of the plant by means of reasonably practicable safety improvements). Requiring multiple means for all the plant states is excessive; even for new plants, only one mean is provided in case of severe accident.				potential improvements
6	A.17	A.17 Instrumentation: • Operability, reliability and adequacy of instrumentation	Not necessary to indicate for the different plant states.		Deleted ~~That instrumentation~~		I believe that it is important to know which instrumentation

		should be evaluated (e.g. measurement ranges, environmental qualification, power supply) to ensure operators obtain essential and reliable information about the containment status ~~in the different plant states~~; • The containment shall be equipped with measuring and monitoring instrumentation that provides sufficient information for severe accident management ~~on the progress of core melt accidents and threats to containment integrity and by which the operator can do the necessary SAMG actions~~. ~~That instrumentation should be to the extent possible independent from the instrumentation used for the mitigation of DBAs~~; • The new instrumentation related to dedicated means for management ~~for monitoring progression~~ of severe accident should be qualified for corresponding accident conditions ~~with core melting~~.	The content should be consistent with future draft NS-G-2.15 (DS483, step 10, disposition 3.86 to 3.93). It should not introduce some additional requirements such as instrumentation that should be independent (even with the limitation to the extent possible). This appendix is related to existing plants and its content should correspond to the Article 1.3 of SSR-2/1 (further enhancement of safe operation of the plant by means of reasonably practicable safety improvements).		~~should be to the extent possible independent from the instrumentation used for the mitigation of DBAs;~~		could be available in the different plant states. In order to identify potential missing information
7	A.18	A.18 Non-permanent equipment: • Non-permanent equipment that is relied upon to mitigate beyond ~~original~~ design basis events should be stored and protected to ensure its timely availability when needed taking into account restricted	The term “original” should not be added. The content should be consistent with future draft NS-G-2.15 (DS483, step 10, disposition 3.82 to 3.85). It should not introduce some additional requirements such as a justification for sufficient time. The text of		X Modified as follows Non-permanent equipment that would be necessary to minimize the		

		access due to external events (e.g. flooding, damaged roads etc); • Non-permanent equipment needed for accident management should be staged and protected so that it could be ready for use within a predefined timeframe. ~~Relying on non-permanent equipment may be adequate provided justification that coping time to avoid the containment failure is long enough to make use of the equipment~~.	disposition 3.83 of DS 483 is less restrictive and more convenient. This appendix is related to existing plants and its content should correspond to the Article 1.3 of SSR-2/1 (further enhancement of safe operation of the plant by means of reasonably practicable safety improvements).		consequences of events that cannot be mitigated by the installed plant capabilities should be stored…		

COMMENTS BY REVIEWER Reviewer: M-L. Järvinen, Page.... of.... Country/Organization: STUK Date:				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	2.4.	The containment structure and its associated systems is primarily designed to ensure that any radioactive release from the nuclear power plant to the environment is as low as reasonably achievable, to comply with the authorized limits on discharges in operational states and the dose limits accepted by the regulatory requirements in accident conditions to achieve ensure the required a good level of protection of the people and the environment (see [2], Requirement 55): □ For operational states, the cumulative annual effective dose received by people living in the	Please consider the bullet point for normal operation, Comment: During normal operation, the releases to the environment are not limited by the containment but rather by the off-gas systems.		…to achieve the required level of protection…		Agreed, but the authorized annual radioactive release will be an essential input data for the design and performances of the off gas system. Note: The design basis of The systems operated in operational states is briefly discussed in this document (e.g. section 3/General)

		vicinity of a nuclear site is expected to be comparable to the effective dose due to natural exposition originally existing at the site (an increase of up to about 1 mSv over the dose received in a year from exposure due to naturally occurring radiation sources is recommended by [21];ICRP Comment: During normal operation, the releases to the environment are not limited by the containment but rather by the off-gas systems. Radiological releases in accident conditions are to be dealt					
	3.22.	Structures, systems and components (SSCs) ultimately necessary to prevent an early radioactive release or a large radioactive release refer in particular to the SSCs necessary to mitigate the consequences of accidents with core melting . A detailed list of these SSCs is design dependent, dependent, however, in general and for the scope of this Safety Guide it should include at least: …	Please keep the earlier version, was better that the modified below. In the event of levels of natural hazards exceeding those derived from the site hazard, the structures, systems and components (SSCs) which are ultimately necessary to prevent an early radioactive release or a large radioactive release from the containment should refer in particular to the SSCs necessary to mitigate the consequences of accidents with core melting, and to prevent conditions not considered in the design of the				

			containment structures. A detailed list of these SSCs is design dependent. The below list provides typical examples of SSCs which could be considered , however, in general and for the scope of this Safety Guide it should include at least:				
	3.38.	Design extension conditions should be identified and used to establish the design bases of containment structure and of systems necessary to meet the ~~radiation protection~~ objectives established for that category of accidents. For design extension conditions without significant fuel degradation ~~and~~ the radiological consequences should be comparable to those established for design basis accidents, and for accident with core melting, the radiological release should be such that the necessary off-site protective actions remain limited in terms of times and areas.	Please add the.			X	Not clear in your comment if you want to go back to the previous text where "*radiation protection"* existed. Radiation protections was removed to address a comment stating that Design conditions had to be considered for **multiple objectives**
	3.43	… ~~Loss of wet well / heat sink~~ Faulty pressure suppression function (BWR); …	clarity,	X			
	3.55	… Use of equipment designed to fail in a safe direction. …	typo	X			
	4.4.	The layout of the containment should be defined with account taken of several factors that are	Delete as.	X			

		dealt with in this Safety Guide and that are summarized below: □ The layout and configuration should be such ~~as~~ to facilitate the enrergy management (se recommendations in paragraph "Energy management";					
	.4.50	Considering 4.47, the structures of the cavity should be considered as items ultimately necessary to avoid large releases and consequently they should be such that design margins are adequate to deal with seismic loads exceeding SL-2.	Comment: This rationale is unclear: should the whole containment be designed to withstand seismic loads exceeding SL-2 as well?				4.50 addresses the reactor cavity and the cooling systems only. See 3.22 either (for extreme natural hazards)
	4.55.	. The ex-vessel retention structure core catcher should be considered as items ultimately necessary to avoid large releases and consequently, it should be such that design margins are adequate to deal with seismic loads exceeding SL-2.	See the comment on item 4.50.		X The ex-vessel corium retention structure		See 3.22
	4.63	.. With regard to energy management, a spray system should be designed to: □ Limit both the peak pressure maximum values and the time durations of the high pressure inside the containment in accident conditions, for .containment with a large dry space; …	typo, please add s to pray	X			
	4.133.	Threats to the containment structures are reactor technology and design dependent, but usually are caused by high pressure and thermal loads originated by a large production of non-condensable gases, and by various	typo	X			

		regimes of combustion of the combustible gases. Both should be considered, and their effects assessed. Even if it can be demonstrated that conditions for the gas mixture flammability are not met (e.g. in case of a low hydrogen concentration, or a high steam concentration or a low oxygen concentration), an over pressurization due to non-condensable gases is nevertheless relevant (e.g for inert containment the probability of hydrogen combustion is low due to the presence of inert gas and the absence of oxygen in normal power operation, and so for such a type of containment, the primar~~il~~y threat is the fast over pressurization caused by a large production of non-condensable gases in a small volume).					
	4.216	The containment atmosphere gas composition should be monitored at locations of potential high concentration.	Question: High concentration of what?		…of combustible gases		
	4.233	… Dedicated instrumentation should be implemented to allow personnel in the Main Control Room to initiate long term actions necessary to maintain the containment integrity in the event of an accident with core melting. Such instrumentation should provide information about: ♉ Process parameters to initiate the fast depressurization of the reactor coolant system (before core melting) and to confirm	depressurization valves ?	X			

		the open position of the depressurization valves; …					
	5.28.	The testing ~~method~~ of the containment integrated leak ~~rate~~ should be conducted according to proven codes and standards ~~qualified~~	clarity	X			
	A.13	Internal and external hazards: - All internal and external hazards that are addressed in the design basis should be re-evaluated on the basis of up to date ~~methodologies~~ meteorological and geological data; - Hazards not yet evaluated in the design basis that could have an impact on the containment should be considered and their effects evaluated.; - The design of containment structures and systems that may be needed in beyond original design basis conditions should be assessed to show they would be capable of performing their function with adequate margins under the new conditions; - Margins justifying that structures and components necessary to avoid releases which would require long-term protective measures and actions should be evaluated.The contents of this bullet should be reformulated.	typo, please reformulate last bullet.	X			Resistance of structures and components necessary to avoid releases which would require long-term protective measures and actions should be evaluated with regard to natural hazards exceeding the severity considered for their design
	A.15	Control of radionuclides: - All piping penetrating the containment should be isolated but that belonging to systems	please clarify, in spite of those	X			The English is correct isolated but those belonging to systems

		necessary for the mitigation of the accident conditions;. …					necessary
	PROTECTION AGAINST INTERNAL ~~AND~~ EXTERNAL HAZARDS	PROTECTION AGAINST ~~INTERNAL AND~~ EXTERNAL HAZARDS				X	Internal hazards also include hazards originated at the NPP site (e.g. Turbine missile)
	3.68, deleted.	Independence of safety features to mitigate the consequences of accidents with core melt: • Safety systems and specific safety features necessary to mitigate the consequences of an accident with core melting should be independent. • The design features to mitigate an accident with core melt should be independent to the extent practicable, of those used in more frequent accidents.	The sentence should be returned and in line with SSR-1/2. SSR-1/2 states that 5.29. The analysis undertaken shall include identification of the features that are designed for use in, or that are capable[15] of preventing or mitigating, events considered in the design extension conditions. These features: (a) Shall be independent, to the extent practicable, of those used in more frequent accidents; … The 3.68 and 3.71 are not redundant.			X	3.68 was removed because was considered as a repetition with the 2nd bullet of the clause 3.71 where independence between equipment designed to mitigate DBAs and those designed to mitigate consequences of accidents with core melting is also addressed.
	3.71	Following recommendations contribute to implement independence:	tässä on eerottelu vain BDA/vakavat,				

		□ Successive items, belonging to different levels of defense, necessary to control the pressure inside the containment or to remove energy from the containment should be identified; □ Vulnerabilities for CCF between those items should be identified and the consequences assessed. The vulnerabilities for CCF should be removed to the extent possible where the consequences for the integrity of the containment structure and for radioactive releases are judged not acceptable. In particular, dedicated safety features designed to mitigate the consequences of accidents with core melting should be independent from equipment designed to mitigate the conditions inside the containment caused by design basis accidents; □ Independence implemented between systems should not be compromised by vulnerabilities for CCF in I&C systems necessary for the safety actuation of the systems or the monitoring of the containment conditions (see paragraph "Instrumentation" for more recommendations for I&C systems and Instrumentation).	ei 3b/vakavat yhteydessä edelliseen				
	Table 2, footnote 7)	[7] DBA : design basis accident Usually, the loads of DBA and earthquake are not combined, unless the former could be a consequence of the latter.	Please add: Usually, the loads of DBA and earthquake are not combined, unless the former could be a consequence of the latter.			X	Although I can agree with you this practice is stil widely used to provide margins independently of a

							possible combination DBA and SL2

COMMENTS BY REVIEWER Country/Organization: FRANCE – IRSN/ASN Date: 09/05/2017 pages				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	3.74	Typical examples of conditions to be practically eliminated are: • Severe accident conditions that could damage the containment in an early phase as a result of a direct containment heating, steam explosion or hydrogen detonation; • ~~Severe accident conditions that could damage the containment in a late phase as a result of a basemat melt through[3];~~ • Severe accident conditions with an open containment, notably in shutdown modes; • Severe accident conditions with unintentional containment bypass. 3 These conditions should be analyzed during the identification of situations to practically eliminate. Nevertheless, their consequences could generally be mitigated with implementation of reasonable technical means.	The second bullet is not coherent with 3.73 which quotes only energetic phenomena and containment bypass. France supports the deletion of the bullet. If the comment is rejected, the footnote 3 shall not be deleted			X	Containment basemat melt through should be considered as a containment bypass The foot note was added prior to the NUSSC meeting held in June 2016 as an alternative suggested by IRSN. In the IAEA Safety Standard, the concept of practical elimination was expended over time from “early large release” to “early or large release”

COMMENTS BY REVIEWER Country/Organization: FRANCE – IRSN/ASN Date: 09/05/2017 pages				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2.	4.48	Acceptance criteria for leak-tightness and integrity given by Table 2 ~~3~~ should be met in the event of accident conditions with significant core degradation~~,~~; in case the consequences of such situations cannot be mitigated with implementation of reasonable technical means, ~~and~~ conditions for a basemat melt through should be practically eliminated for both of the design options retained for the core molten retention (In Vessel Retention or Ex Vessel Retention).	Coherence with the second bullet of 3.74 and the associated footnote (cf. comment No.1).			X	The request for the modification is not fit for the proposed recommendation. This recommendation aims at stressing the high reliability required for the retention of the corium (in or ex vessel). If not additional measures could be needed to prevent the basemat melt through which shall be practically eliminated

	COMMENTS BY REVIEWER Reviewer: **Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)** (with comments of GRS) Pages: 2 Country/Organization: **Germany** Date: 2017-05-16				RESOLUTION			
Rele-vanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1	4.63.	With regard to energy management, a spray system ~~should~~ shall be considered to: • Limit both the peak pressure maximum values and the time durations of the high pressure inside the containment in accident conditions~~, for~~	The present text version do not reflect the fact, that some existing PWR in operation have containments with large dry volumes and do not require spray systems, as			X	Your reason is ot understood. You concern is fully captured with 4.61 For containment

	COMMENTS BY REVIEWER Reviewer: **Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)** (with comments of GRS) Pages: 2 Country/Organization: **Germany** Date: 2017-05-16				RESOLUTION			
Rele-vanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			~~.containment with a large dry space;~~	these are full pressure containments.				relying on a drywell and a supression pool, the spray is not designed to limit the peak pressure
1	2	4.64	~~For containment with a large dry space,~~ The ~~a~~ spray system should be designed so that a major fraction of the free volume of the containment envelope into which the steam may escape in an accident, can be sprayed with water.	This requirement is a general one which is applicable to all spray systems independently from the type of containment. With this modification even the next §4.65 makes more sense.	X			
1	3	4.68.	~~The layout of the containment with a large dry space should be such as to ensure an adequate single free volume in the upper part of the containment to improve the efficiency of the containment spray.~~	See discussion for §4.63.	X			
1	4	4.202	For a ~~safe~~ controlled operation in accident conditions … • Detection of deviations from normal operation; • Periodic testing; • Monitoring of the availability of the containment systems; • Initiation of automatic operation of systems; • Accident and Post-accident monitoring.	Accident conditions comprises of DBA and BDBA/SA. A “safe operation” under severe accident conditions is a strange wording; may be “controlled” is more appropriate. Add Accident to Post accident monitoring as	X			The post accident monitoring

	COMMENTS BY REVIEWER Reviewer: **Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)** (with comments of GRS) Pages: 2 Country/Organization: **Germany** Date: 2017-05-16				RESOLUTION			
Rele-vanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
				examples are provided later in the Safety Guide.				systems generally includes all you need to operate the plant in accident conditions (diagnosis and operator actions)

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 4 Country/Organization: Japan/NRA Date: 15 May 2017				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason				
1.	3.22./ 5th bullet	EXTERNAL HAZARDS Systems to prevent hydrogen ~~fast deflagration or~~ detonation;	Clarity of the phenomenon. This wording should be defined in the glossary.		X …Prevent combustion regimes challenging the containment from integrity		

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 4 Country/Organization: Japan/NRA Date: 15 May 2017				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason				
2.	3.47.	**Design extension conditions** Design provisions should be implemented to prevent a containment failure in case of DEC. These provisions should aim to prevent a significant over pressurization of the containment structure, to stabilize the molten core, to remove the heat from the containment and to avoid ~~fast deflagration and~~ detonation of combustible gases.	Ditto.		X same text as above		
3.	4.12.-4.14.	**Sharing of parts of the containment system between units** Following sentence should be inserted; However, the items important safety such as standby gas treatment system (SGTS) should be independence among the multi-unit, completely separated to avoid multi-unit accident.	Inter-connection is one of the important thing but separation should be emphasized from the viewpoint of lesson learnt from Fukushima-Daiichi NPP accidents.		X Parenthesis added in 4.13 : *…(e.g.the gas treatment system including the exhaust line operated in accident condition should not be shared).*		

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 4 Country/Organization: Japan/NRA Date: 15 May 2017				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason				
4.	4.48.	STRUCTURAL DESIGN OF STRUCTURES WITHIN THE CONTAINMENT Acceptance criteria for leak-tightness and integrity given by Table ~~3~~2 should be met in the event of accident conditions with significant core degradation, and conditions for a basemat melt through should be practically eliminated for both of the design options retained for the core molten retention (In Vessel Retention or Ex Vessel Retention).	Editorial.	X			
5.	After 4.102.	**Secondary confinement** Add the sentence as follows; 4.102A Design provisions for combustible gas in the secondary structure for BWR should be taken into account. Standby gas treatment system (SGTS) for treatment of fission products inside the secondary confinement for BWR in DBA should also be described	SGTS is one of the important safety system for DBA in BWR.			X	Point 1 is briefly addressed in clause 4.138 Point 2 is briefly addressed in clause 4.106

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 4 Country/Organization: Japan/NRA Date: 15 May 2017				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason				
6.	4.135.	Delete four bullets.	Too detail and restrictive.			X	A safety Guide is published to provide guidance and insights to meet requirements. Those bullets provide relevant insights for the design of H2 recombiners/igniters
7.	After 4.142.	4.142A Regarding the provisions for combustible gas, for example, flammability control system as safety systems for DBA and passive autocatalytic recombiners or igniters as safety features for design extension conditions should be completely independent of each other in terms of defence in depth.	Clarification. Diversity and independence between DBA and design extension conditions should be ensured.			X	The number and locations should be defined on the basis of the bounding cases considering DBAs and DECs
8.	4.143.	The number and positioning of recombiners or igniters should be justified on the basis of ~~detailed~~ combustible gas distribution analyses resulting from ~~different~~ scenarios of an accident with core melting.	According to Para 4.135, detailed analyses are for areas where flame acceleration is reached. Also, bounding scenario is possible, when it is appropriately described.		X combustible gas distribution analyses adequately detailed.		

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Page of 4 Country/Organization: Japan/NRA Date: 15 May 2017				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason				
9.	4.144.	Removal means should be located considering such as ~~in~~ the neighborhood of the release location, near expected convection flow paths between inner containment rooms, the dome area as well as the containment periphery and at different heights in large rooms.	Designating locations of removal means is not needed.		X 4.144 is now merged with 4.142 An adequate number of passive autocatalytic recombiners and/or active means such as igniters should be provided and suitably distributed inside the containment with regard to their efficacy in reducing the concentration of combustible gases (e.g. in the neighborhood of the release location, near expected convection flow paths between inner containment rooms, the dome area as well as the containment periphery and at different heights in large rooms).		
10.	After 4.198.	**Covering, cushioning, thermal insulation and coating materials** 4.198. Painting and coating materials should be selected so as not to pose a fire hazard and the ECCS sump clogging from delaminated coating materials.	Describing to avoid the ECCS sump clogging from delaminated coating materials.	X			

COMMENTS BY REVIEWER Reviewer:	RESOLUTION

Country/Organization: Republic of Korea / KINS Date: May 2, 2017							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	3.93/6-7	Any edition including the newest of the Codes/Standards to be used should be approved by the regulatory body. (Addition)	It seems to be necessary to specify that the edition of the Codes/Standards should be approved by the regulatory body before use.			X	Generally new revisions of international codes are approved by Industry Standard Organization (e.g. ASME, AFCEN). But codes are generally not formally approved by the Regulators (A RB can state that he has no objection for its use…). However the second sentence should be fit for your concern. *"…another edition might be used with justification."*
2	5.24/6	Tendon monitoring program could be used instead of pressure test for verifying the structural integrity of pre-stressed concrete containment structure. (Addition)	Tendon monitoring systems are used for some pre-stressed concrete containment structures as a monitoring tool instead of pressure test.	X			The tendon monitoring is not appropriate where the pre stressing relies on tendons embedded in concrete (unbonded technology). Anyway performing

							pressure test is always preferable. After a check your comment is accepted. This alternative is for unbounded cables only.

COMMENTS BY REVIEWER Reviewer: CNS Page.1. of..2. Country/Organization: PNRA Date:12-05-2017				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	2.13/ Page 4	The containment, or the shielding structure is designed to protect structures, systems and components (SSCs) housed inside the containment against the effects of natural and human induced external hazards identified by the site hazard evaluation, and the effects of **internal** hazards **originated by failure/malfunction of SSCs installed inside the containment.**	Containment is designed against natural and human induced external hazards and internal hazards such as internal flooding, pressure, temperature and pipe breaks etc resulting from DBA.			X	2.13 deals with the protection ensured by the shielding structure which could also be the containment itself (for single wall containment). With regard to protection against the effects of hazards originated inside see paras. 3.10 to 3.13.
2.	3.17/	For each hazard, components whose operability or integrity is required during or after **the accident** should be	For more clarification, the word "accident" may be added			X	Implicitly “during the

	Page 8	identified and specified in the design basis of the component					hazard" that should not lea to an accident.
3.	4.16 Page 23	The containment may be subject to several ageing phenomena such as the corrosion of metallic components, the ~~**creep of tendons and the**~~ reduction of pre-stressing (in pre-stressed containment), the reduction of resilience in elastomeric seals, and **the creep**, shrinkage and cracking of concrete.....	The reduction in pre-stressing is due to creep and shrinkage losses of concrete and steel relaxation etc, so creep of tendons may be deleted from here and word creep should be added with concrete (creep and shrinkage are aging degradation mechanisms for concrete)			X	This text was a copy and paste of para 4.39 of the former revision
4.	4.107/page 40	If a negative gauge pressure cannot be achieved and maintained in the confinement volume, account should be taken in the calculations of the radiological consequences of the **resultant** unfiltered leakage to the environment ~~**that will result**~~.	May be rephrased for more clarification	X			

COMMENTS BY REVIEWER Reviewer: Dr Robert Moscrop Page.... of 3 Country/Organization: Office for Nuclear Regulation (ONR) Date: 16/05/2017				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
General		This well written Safety Guide covers a broad range of topics					

		relating to the containment performance in normal operations, design basis and severe accidents conditions. It also covers a number of feature and aspects of the design that are required in a wide range of operational and accident conditions.					
General	1.2, 1.6, etc	The document discusses the energy release into the containment as a result of LOCA. It would be helpful to refer to this as "Mass and Energy release". Similarly the authors may wish to consider replacing "energy management" with "energy release and management"	The containment integrity needs to be maintained from the mass of water and energy released.	X			"Release of mass and energy release" has been replaced by "mass and energy release" where appropriate. The same with "energy management"
1.0	2.2 1st bullet	Should this refer to all "reasonably foreseeable accident conditions"					This refers to all postulated plant state conditions which is the usual terminology in the IAEA Safety Standards
General	2.8 , etc	"times" could be replaced by "periods"				X	' "terms of areas and times" is the wording used in Safety Standard SSR 2/1
2.0	3.5 4th and 8th bullet points	"operational" should be enhanced by "operational and accident"				X	The clause 3.5 deals with the performances of systems designed to control operational conditions

3.0	3.29	An additional bullet points needs adding "facilitate the return of water inventory discharged from the reactor in a LOCA condition to the containment sump for recirculation.	Conservation of mass inventory.		X Conservation of an adequate coolant inventory		
4.0	3.46	Consideration should be given to two additional bullet point: "Status of the hydrogen mitigation measures" "Status of any support features in the S.A conditions".					
5.0	3.57	The authors may need to add "provision of mobile water source"		X			Addressed in 4.2
6.0	3.87 1st sentence	The authors may need to add "chemical, including the expected duration"		X			
7.0	4.49 and 4.50	The authors need to review the prescriptive nature of the in-vessel retention strategy.	This is not necessarily appropriate for all the current technologies available in GEN III+ reactors. The progression of severe accident can be arrested if late re-flood can be established without the need for the external cooling of the RPV.				
8.0	4.54	The authors need to review the prescriptive nature of the ex-vessel retention strategy.	Similarly, this is not necessarily appropriate for all the current technologies available in GEN III+ reactors. This appears to be EPR centric and may apply to all types of reactors.				

9.0	4.62	Consideration needs be given to reducing the impact of radionuclides into the sump.					Your expectation is not clear
10.0	4.67	The paragraph needs to be updated by adding in severe accident conditions.				X	This clause applies to any condition during which spraying the containment atmosphere is necessary
11.0	4.82	This paragraph needs to be clarified that the sumps can potentially be used in DBAs and SA conditions.			X The headline is completed with "in accident condition" that means in DBAs and DECs w/wo significant core degradation		
12.0	4.83	This paragraph needs to be clarified that this relates to DBAs.			X Modified as follows: With regard to the core cooling, account should be taken to the effects of debris…		

COMMENTS BY REVIEWER Reviewer: Cynthia Jones, NUSSC Member Country/Organization: USA / US Nuclear Regulatory Commission 1the reliability of the system6 May '17				RESOLUTION			
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1	3.38	Design ~~extension~~ basis conditions should be ~~identified and~~ used to establish the design ~~bases~~ extension conditions of	In order to determine design extension conditions (a term that is not used in the US, but could be equated with beyond		X Additionally to the design basis conditions,		

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		containment structure and of systems necessary to meet the radiation protection objectives established for that category of accidents.	design basis conditions) it would seem logical to first establish the design basis.		some design extension conditions should also be identified and used to establish the design bases of containment structure and of systems necessary to meet the objectives established for that category of accidents.		
2	3.43 Bullet 3	Loss of the heat transfer chain to the ultimate heat sink removing heat from the containment in the event of a design basis or beyond design basis accident;	This item appears to be focused on active plants, and is demonstrated to be a beyond design basis event for some passive plants; therefore, this item should be adjusted to be more inclusive of more plant designs.		*"Loss of the heat transfer chain to the ultimate heat sink removing heat from the containment."*		The 3 rd bullet point is an example of potential events that should be considered as a candidate for DEC (or for event beyond design basis accident) This combination cannot be considered as a DBA. since the systems conveying residual heat to the UHS are expected to be designed according to requirements similar to those which applied to safety systems. "candidate" means that it should be considered and might be selected if the reliability of the system is not considered as appropriate (majority of DECs are design dependent).

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							"in the event of a design basis accident" is deleted
3	3.72, Bullet 2	…In particular, safety features designed to mitigate the consequences of accidents with core melting should be sufficiently (by independence~~t~~ from equipment or through other means) designed to mitigate the conditions inside the containment caused by design basis accidents;	Suggesting separate systems only to deal with severe accidents is an extreme view and likely cost-prohibitive. Due to the unpredictable nature of severe accidents resulting in core damage, a more pragmatic approach is to have multiple capabilities to cope with a given event, and usage of existing systems to mitigate design basis events should be acceptable, as failure of ALL systems is extremely unlikely.		X dedicated safety features designed to mitigate the consequences of accidents with core melting should be sufficiently independent from equipment designed		Dedicated has been kept, if not dedicated the recommendation has no longer sense. Equipment should be understood as a generic and genera word.