Table I (Rev.1)

DS482 Resolution of comments of Belgium (revised), Egypt, Finland, France - NSGC (revised), Hungary (revised), Pakistan, Russian Federation, Slovakia, Sweden, Switzerland (revised)

DS482 – Design of reactor containment structure and systems for nuclear power plants

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Kurt COUCKUYT			Page 1 of 3				
Country/Organization: Belgium / Bel V **Belgium**			Date: 26/05/2016				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Article 2.3 (page 6 – first bullet)	Proposal to delete the additional sentence between the brackets: a dose limit of 1 mSv/year per site is usually considered for new build.	Is this limit implemented in most of the countries? A dose limit for the public of 1 mSv/year due to all industrial activities is set forward by ICRP. This can include contributions of many activities and different sites.		X		IRCP: an increase of up to 1mSv over the dose received in a year from exposure due to naturally occurring radiation sources
2	Article 3.7 (page 9)	Delete the fuel handling accident in the section of internal hazards.	It is already mentioned in article 3.6 as PIE.		X		Failure of fuel handling devices.
3	Article 3.7 (page 9)	"Breaks in systems or components containing radioactive material located in the containment"	It should be pointed out more clearly what is meant. LOCA?			X	The list provides examples of internal hazards and not only the bounding cases. Here any equipment failure with a (significant) release of radioactive materials has to be considered.
4a	Article	"… earthquake level SL2…"	It should be explained what 'an earthquake level	X			Ref.12 will be added.

	4.34 (page 31		SL2' stands for. How is this defined ? Reference to another document ?				
4b		"… in a quadratic manner…"	It should be explained what is meant with the wording 'in a quadratic manner'?				Square Root of the Sum of the Squares
4c		Reconsider the article (depending on the explanations in comments 4a and 4b above).	This recommendation might go beyond the article 5.32 on the combination of events and failures from SSR 2/1. This recommendation could be applicable for more than containment structures and systems only. Is this in line with other (draft) guidances.			X	5.32 addresses the need to combine concurrent events Table 3 deals with an other issue, and provides combination of loads to be considered for a correct calculation of the stresses. Recommendation 4.34 indicates a MS practice to calculate stresses imposed by 2 hazards.
5	Article 4.42 (page 32)	"…, in case of design extension conditions ~~t~~, depend,…."	Editorial correction		X		
6a	Article 4.2 (page 21)	"…(see Requirement 6.28~~B~~)."	There is no subdivision in SSR 2/1 6.28.			X	Reference to SSR2/1 Rev 1., Req.6.28B is correct
6b		Reconsider the reference to requirement 6.28.	In SSR 2/1 article 6.28 it is required that the				

			systems for heat removal have sufficient reliability and redundancy. There is no requirement on the implementation of non-permanent equipment. This recommendation might go beyond the article 5.32 on the combination of events and failures from SSR 2/1 (depending on the explanations in comments 4a and 4b above).				

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: **Moustafa Aziz** Page.... of.... Country/Organization: **Nuclear and Radiological Regulatory Authority , Egypt** Date:							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	**Para 3.53 page 17**	**Letter n between an , accident should be removed**		x			
2	**Para 4.32 page 28**	**Leakages from the containment are below the design value and can be correlated with the internal pressure on the bases of analysis,**	**Number 4 after design value should be removed**	x			
3	**Para 4.42 page 32**	**The second line of para 4.42 the letter (t,) should be omitted**		x			
4	**Para 4.46 page 32**	**The last word of para 4.46 interaction is one word so space between inter action should be omitted.**		x			
5							

COMMENTS BY REVIEWER Reviewer: M-L Järvinen, R. Sairanen Page.... of.... Country/Organization: STUK **Finland** Date:				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	3.29	Very unlikely events that could lead to situations beyond the capability of the ~~containment~~ safety systems installed to mitigate conditions ~~inside the containment~~ caused by design basis accidents (e.g. by a LOCA, main steam line break, etc.) Multiple failures (e.g. common cause failures in redundant trains) ~~in the containment systems~~ that prevent the safety systems from performing their intended function	DECs to be considered are those, in which multiple failures (complex sequences or common cause failures) are combined with design basis accidents. The failures should not be assumed in containment systems only, see 3.47		Very unlikely events that could lead to conditions inside the containment beyond the capability of the containment safety systems designed to mitigate conditions imposed by design basis accidents (e.g. by a LOCA, main steam line break, etc.); Bullet 2 does not need to be modified.		Guidance should be for the scope of the safety guide and not general
2.	4.2	~~Regardless~~ In addition to permanent design provisions for DBAs and for DECs, features enabling the safe use of non-permanent equipment for restoring the capability to remove heat from the containment should be ~~installed~~ considered (see Requirement 6.28B).	It is true that SSR-2/1 6.28B states that "The design shall also include features to enable the safe use of non-permanent equipment[22] for restoring the capability to remove heat from the containment." However there should be flexibility in this respect and the quality and requirements of the permanent equipment should be considered. If a plant has permanent design			X	In principle a "shall" requirement cannot be lowered by a safety guide.\ Installed Safety features for DECS bring some solutions for a limited number of

			provisions for DEC, additional non-permanent features may not be needed				multiple failures.
3.	4.42	The loads on the structures inside the containment, in case of design extension conditions~~-t~~, depend on the strategy to cope with the molten core adopted in the specific design.	misprint	X			
4.	4.179	Instrumentation should be qualified under seismic and environmental conditions that might prevail prior to or during its operation until its mission be completed. *Effects of hydrogen combustion should be considered in qualification of equipment that is meant to operate during or after a hydrogen fire*	Hydrogen fires are special conditions that deserve extra attention. Add: *Effects of hydrogen combustion should be considered in qualification of equipment that is meant to operate during or after a hydrogen fire*			X	Implicitly considered (environmental conditions that might prevail prior to or during its operation). Your proposal might unbalance the text for other hazards.
5.	4.179a	Ageing and irradiation of the instrumentation should be made before the test in accident conditions.	Add: new para. It is important to consider the ageing and radiation damages before the final tests are carried out.	X			Principles describing appropriate test sequences are indicated in SSG-39
6.	4.402	• Conditions inside the containment (containment pressure and temperatures, radiation levels, airborne activity, steam, oxygen or hydrogen concentration if relevant);	Add: steam to assess hydrogen burning potential, concentrations of steam, oxygen and hydrogen are needed	X			

7.	4.402	- Process parameters to confirm the flooding of the reactor cavity (for in vessel strategy), or the flooding of the ~~spreading area~~ core catcher (for ex-vessel retention strategy)	spreading area refers to a specific design (EPR). core catcher is general	X			
8.	A.3	The assessment for potential back fitting should utilize a holistic approach which considers the safety contributions of installed equipment, ~~mobile~~ *non-permanent* equipment, and emergency preparedness planning measures to protect the public.	Consistency with the SSR-2/1, Non-permanent is wider concept than just mobile.	X			
9.	A.7	The back fitting measures for preventing early releases or for implementing actions in the short term should not rely on the use of off-site ~~mobile~~ *non-permanent* equipment.	Consistency with the SSR-2/1, Non-permanent is wider concept than just mobile.	X			
10.	A.8	Although the use of permanent equipment for the practical elimination of large releases should be preferred (as for new plants) a more relaxed approach on the use of ~~mobile~~ *non-permanent* equipment may be acceptable provided the plant is provided with adequate connection features.	Consistency with the SSR-2/1, Non-permanent is wider concept than just mobile.	X			
11.	A.14	~~mobile~~ *non-permanent* equipment: • ~~mobile~~ *non-permanent* equipment that is relied upon to mitigate beyond design events should bestored and protected to ensure its timely availability when needed taking into	Consistency with the SSR-2/1, Non-permanent is wider concept than just mobile.	X			

		account restricted access due to external events (e.g. flooding, damaged roads etc); • Relying on ~~mobile~~ *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.					

COMMENTS BY REVIEWER Reviewer: J. JALOUNEIX , G. DANDRIEUX Page.... of.... Country/Organization: IRSN, Ministry of environment and energy/**FRANCE (NSGC)** Date: 17/05/2016				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General	There is a need to add a generic paragraph dealing with the safety-security interface.	This document should be considered as a generic interface document between safety and security.				The practice is not to detail security issues and recommendations in a Safety Guide
2	p.7 § 2.12	Add : It should be noted that additional factors are to be taken into account when designing the containment. For example, for the design basis threat (DBT) used for security purposes may conduct to additional design requirements for the containment structures.	For completeness of the list of events to take into account it should be mentioned that safety events are not the only factors to take into account during the design phase. Additional factors such as security design requirements are also to be taken into account. Malicious acts have also to be mentioned as potential events against which the containment has to be designed.		A new recommendation has been added for malicious acts		
3	p.7 § 3.2	This paragraph needs to be developed with more explanations about the interface with security issues.	See previous comment as an example		If we do not want to go in details it is difficult to tell more. Here the main message is that both should be considered in an integrated manner. A new bullet has been added		

					in 3.5		
4	p.22 § 4.3	Add a bullet: “security considerations.”	The layout of the containment should also take security issues into account.			X	I would prefer not add anything more than in 3.2 because a same comment might be done for other recommendations (e.g. for accesses to the containment)

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: **Lajos Tarczal**			Page.1. of.1.				
Country/Organization: **Hungary, Paks NPP**			Date: 20.05.2016.				
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
1.	P. 3.10.	Lightning is missing.				X	Lightning important to safety will be addressed in the SG Auxiliary systems
2.	P. 4.7.2.	"…by the *deflagration/detonation* of a combustible gas."	This phrase is often used instead of "*combustion/deflagration*".	X			Fast deflagration and detonation are very energetic phenomena which have to be avoided
3.	P.4.202.	"…specified in the Emergency Operating Procedures *or* in the Severe Accident Management Guideline."	Typos.	X			Agreement upon terminology is needed

COMMENTS BY REVIEWER Reviewer: Center for Nuclear Safety Page.1. of..2. Country/Organization: **Pakistan Nuclear Regulatory Authority** Date:30-05-2016				RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	4.182/ Page 53	Appropriate instrumentation for measurements relating to earthquakes should be installed on **and under** the basemat of the containment or on suitable floors.	The instrumentation under the basemat is used to measure containment settlement/tilt during design life of the plant. After an earthquake, the tilt and differential settlement may cause failure of seismic joints separating different buildings attached with containment structure.		X Appropriate instrumentation for measurements relating to earthquakes should be installed at suitable places (e.g. on basement, under basement, at suitable floors).		
2.	3.10/ Page 10	Caption and Table No. of the table provided after Para 3.10 may be included. In addition, the title of the first column may be modified as **"Human Induced Events"** instead of Human Origin Hazards	To maintain consistency with SSR-2/1 (Rev.1) and NSR-3 (Rev.1).				Canada request for removing the table and for making reference to NS-R 3 only.
3.	2.5 Page 6	Leaktightness of the containment is an essential element to confine radioactive material and to minimize	Containment isolation valves are also tested for specific leak rates. So these may also be included.	X			

4.		radiological releases. Leaktightness is generally characterized by specified leak rates (overall leak rate, specific leak rates for containment penetrations**,** ~~and~~ hatches**, and containment isolation valves**) which are not expected to be exceeded under accident conditions.					
	5.1.3 Page 60	Penetrations that have resilient or inflatable seals and expansion bellows, such as: — Personnel **and Emergency** airlocks**,** — Equipment airlocks, — Equipment hatches — **Fuel transfer tube** — spare penetrations with bolted closures, — cable penetrations with resilient seals, — pipe penetrations with flexible expansion bellows in the connections to the containment.	Emergency airlock and fuel transfer tube are also containment penetrations that may also be listed.		X (Personnel airlocks is plural and includes both		

COMMENTS BY REVIEWER Reviewer: Mikhail Lankin Page.1. of..1. Country/Organization: **SEC NRS** **Russian Federation** Date: 30-05-2016				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	1.4/ Page 4	The objective of this Safety Guide is to make recommendations on the implementation and fulfillment of **SSR-2/1** Revision 1	Misprint correction	X			
2	3.25/ Page 12	and the single failure[1] which has the largest impact on the performance of the safety systems. **High reliable passive structures and systems may not be considered as subject to single failure.**	Reminder that high reliable components (such as containment structures) may not be considered (p.5.40 SSR-2/1) as falling under single failure criterion.			X	Taking into account that Requirement 5.40 stresses that "any design shall take due account of the failure of a passive component unless it has been justified in the single failure analysis with a high level of confidence that a failure of that component is very unlikely…" We consider that this possibility should remain an exception. Adding your suggestion, which is not wrong, might confuse MS and result in a wrong implementation.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Peter Uhrik Page.1. of..1. Country/Organization: **UJD SR** **Slovakia** Date: 30-05-2016							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	Art. 1.6	This Safety Guide **beside recommendations on the design of containment structure** addresses **also recommendations for** the functional aspects of the major associated systems for the management of energy, radionuclides and combustible gases.	more precise text				Text of Section 1 will be fixed once the review by all MS is completed.
2.	Art. 2.1	To add a figure with the diagram illustrating containment system functions, including references to the sections in the guide, where more detailed recommendations are given (e.g. similarly as it is given in EUR 2012, Vol. 2, art. 1.2)	to provide an overview on the structure of the containment system functions			X	Taking into account the variety of reactor technology (PWR, BWR, PHWR), and the variety of NPP design for a same reactor technology, that Safety Guide was largely modified putting the emphasis on the plant state during which the operation of a system is required and less on the function accomplished by the system. It is something new but

							makes sense taking into account that design recommendations are driven by the plant state.
3.	Art. 3.1	reference is to GS-R-2 (not to GSR Part 2)				X	GSR part 2 is Okay
4.	Art 3.10	in the human origin hazards column: Explosion - should be External explosion	In accordance with the Table 2	X			Canada request for removing the table and making a reference to NS-R 3
5.	Art. 3.15	to add text … and the management of combustible gases **in the containment** during accident conditions should be … The following recommendations provide guidance **to prevent an early or a large radioactive release in order** to fulfil the Requirement 5.21A [2]	more precise text	X			For both proposals
6.	Art. 3.16	to add text: • dedicated power supply system • dedicated I&C systems • systems ensuring control room habitability • systems ensuring long term safe residual heat removal from the spent fuel pool (including	more precise text to assure complexity of SSCs in case of accidents with core melting			X	Bullet list is restricted to the scope of the Safety guide.

		systems for spent fuel removal from the containment) - in case with spent fuel pool disposed inside the containment					
7.	Art 3.17 and 3.18	Characterization of the sizes of margins recommended should be given.	recommendation in the current text of the guide doesn't provide clear message how the margin should be defined				Margins depend of various factors among them uncertainties in the site data, in the prediction of the severity of next natural hazards, of the risk at the site.
8.	Art. 3.19	…capability to limit <u>the dispersion</u> of radioactive substances to the environment … replace text to …capability to limit **releases** of radioactive substances to the environment	more precise text	X			
9.	Art 3.27	Calculation performed **for DEC** to specify the design bases…	more precise text			X	All recommendations given inn paragraph 3.5.2 are for DEC conditions
10.	Art. 3.34	Terms used in different sections of the guide needs to be unified , mainly: "multiple means" (2.7), - "dedicated design provisions", "complementary safety features", "design provisions", "specific safety features" (3.7.3), back-up of safety systems" (3.64), "safety features" (4.10), "systems implemented to cope with DECs" (5.26)	Different terms are used for the same systems. Specific terms should be defined in the guide glossary.		X		For consistency of the vocabulary, "complementary" will not be used and will be replaced by "additional". "Dedicated" or "specific" do not need to be defined and should be understood

		Terms “additional safety features” and “complementary safety features” are recommended to be used for DEC conditions.	Clear addressing of the recommendations in the guide.				as defined by English dictionary. “Multiple means” is used in SSR 2/1
11.	Art 3.37	Venting line should be equipped with filters of <u>high efficacy (e.g. HEPA filters)</u> replace text to Venting line should be equipped with filters of high **efficiency and capacity**	more precise text		X filters of adequate capacity and high efficacy		To consider other comments
12.	Art. 3.39	Limits on radioactive releases, dose limits or dose constraints **for public**, specified for operational states and accident conditions	more precise text	X			
13.	Art. 3.48	Needs for additional <u>systems or</u> safety features are reactor technology and design dependent replace text to Needs for additional safety features are reactor technology and design dependent	proposed text is in accordance with definition used in WENRA reference levels for new NPP designs (2013)	X			
14.	Art. 3.64	“…that all systems necessary for the accomplishment of a single function are assigned in the same class”	this recommendation should be described in more details, terms “accomplishment of a single function” is not defined			X	For a better understanding see reference
15.	Table 2	“Loads due to accidents” add new type of load: “Vibrations induced due to aircraft crash”	more precise text			X	Induced vibrations should be considered for large aircraft crash. But as a general rule, which and how loads should be

							defined will be in the safety guide Ref. 9
16.	Art. 4.45	In this strategy, the containment should be equipped with a structure (core catcher) dedicated to contain and cool the molten core outside of the vessel.	more precise text **Core spreading structure** was forgotten or intentionally omitted?				Core catcher is used as a synonym of core spreading area
17.	Art. 4.178	I&C systems dedicated for DiD Level 4 should be independent from I&C systems designed for lower DiD levels	new recommendation			X	Design recommendations for the architecture of I&C systems are not addressed in this Safety Guide but in Safety Guide DS 431
18.	Chapter 4.10.2.1	to add text Monitoring system with sufficient measurement range for the combustible gas should be installed.	extended recommendation			X	4.10.2.1 is only relevant for temperatures. For gases see 4202 and 4203.
19.	Art 4.200	to add new bullet - H2 concentration	extended recommendation			X	H2 concentration is indicated in 4202
20.	Art. 4.202	For the management of accidents, appropriate instrumentation displays and records should be available in the MCR **and in ERC** to allow personnel	extended recommendation			X	According to SSR 2/1 Rev 1, ECR is not required to be designed to operate the plant in accident conditions.

COMMENTS BY REVIEWER Reviewer: Kostas Xanthopoulos, Anders Hallman Page 1 of 1 Country/Organization: **Sweden**/SSM Date: 25 May 2016				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	4.12	All ageing mechanisms and anticipated synergies should be identified and taken into account in the design.	Clarification		X		I propose to remove "all" at the beginning of 4.12 and 4.22.
2	4,22	All loads (static and dynamic) that are foreseen to occur and that they do not have a negligible effect should be quantified and grouped according to their probability of occurrence, on the basis of operating experience and engineering judgement.	Clarification		X		
3	4,23	Addition: • Physical barriers that prevent simultaneous occurrence.	Completeness		X Physical barriers that protect equipment from hazard effects		

COMMENTS BY REVIEWER Reviewer: BRO/CNI Page.... of.... Country/Organization: ENSI **Switzerland** Date: 20.05.2016				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	3.10 (table p.10)	Impact of an airborne missile	An impact of an external missile is not a natural hazard and can be misunderstood.		X		Unclear. Do you mean turbine missile? In that case it is included in the category of internal hazards since originated within the site. As external hazard military missiles are not considered.
2	4.10.7. Sampling 4.203	One more bullet: • Presence of noble gases and aerosols	Important assignment of sampling system	X			Table 3 has been removed and replaced by a simple reference to NS-R 3 (Canad comment a