DS 481, step 11a: Design of the Reactor Coolant System and Associated Systems in Nuclear Power Plants

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Pieter De Gelder Country/Organization: Belgium/Bel V			Page 1 of 1 Date: 13/10/2017				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	3.137 and 3.138	Merge the two articles into one	After the colon in 3.137, the text should continue with the text of 3.138	X			
2	3.138	"Each unit of a multiple unit nuclear power plant shall have its own safety systems and **shall have** its own safety features for design extension conditions."	The quotation of Requirement 33 of [1] is incomplete and the missing words are important, because they separate safety systems from safety features, so that the words "for design extension conditions" apply only to safety features (safety systems are for DBA).	X			

COMMENTS BY REVIEWER **Reviewer: Moustafa Aziz** **Page.... of....** **Country/Organization: Egypt** **Date:**				**RESOLUTION**			
Comment No.	Para/Line No.	**Proposed new text**	**Reason**	**Accepted**	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	**Page 5 para 3.7**	**The function(s) to be performed by the structure, system or component;**	**There is (s) letter after The , should be omitted**			X	A Single SSC may be designed to accomplish several functions
2	**Para 3.18 page** 7	**3.18. Paragraphs 3.19–3.26 provide recommendations on meeting Requirement 17**	**Word on meeting is repeated two times**	**X**			
3	**Para 3.34 page 10**	**3.34. Design basis accident (DBA) conditions should be identified and calculated for the RCS in order to specify adequate performance of the safety systems.**	**The word performance should be written with the same font like the text**	**X**			
4	**Para 3.58 page 14**	**Alternative means to shut down the reactor and to maintain sub criticality,**	**(and) is used instead of (or) to assure that all are**			X	"or" seems like to be here correctly used.

		and to accomplish residual heat removal and heat transfer to the ultimate heat sink in the different plant states should be implemented within the defence in depth approach.	**required**				We mean that a defence in depth is expected to be implemented for these three functions

	Reviewer: **Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)** (with comments of GRS) Pages 1 Country/Organization: **Germany** Date: 26.10.2017				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	5.97	5.97. The design of RCS pumps should be such that adverse thermal-hydraulic conditions in the RCS or pump malfunctions do not result in the generation of missiles. Alternatively, provision should be made to protect SSCs important to safety from any such missiles. Provisions should be made to detect a crack of a RCS pump shaft and to stop pump running.	The additional requirement is based on operating experience. In the case of a pump shaft crack the pump motor runs without providing coolant flow. This operation mode must be avoided for thermal-hydraulic reasons.			X	This issue is covered by the monitoring of vibrations (see 5.98)

COMMENTS BY REVIEWER Reviewer: Country/Organization: Republic of Korea/Korea Institute of Nuclear Safety Date: 27. Oct., 2017				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.12/2	"sink" is modified to "Sink".	For consistency, editorial	X			
2	2.1/2	Delete one period(.)	Editorial	X			
3	2.5/2	Delete one period(.)	Editorial	X			
4	4.123	Add the following statement: Requirements and Guidance on the management system for site selection and characterization of disposal facility is provided in SSR-5[7], SSG-14, and SSG-29. The Site characterization programme should include a management system for ensuring the quality and long term usability of data, as well as their availability.	To describe the relationship the site characterization activity with the management system using the references in IAEA documents and the aim of management system for the site characterization.			X	This Safety Guide provides recommendation for the design of the SSCs and not for the operation of the NPP (see SSR-2/2)
5	5.3/12	In third bullet, replace a semicolon in place of a comma.	For consistency, editorial	X			
6	5.23/2	Delete one period(.)	Editorial	X			
7	5.25/1	Delete a period(.) in front of "should". Add a period(.) at the end of the sentence.	Editorial	X			
8	5.62/3	In first bullet, add a semicolon.	For consistency, editorial	X			
9	5.65/3,4	Replace a semicolon in front of "Typically" to a period.	For consistency, editorial	X			
10	5.101/1	Delete two periods(..)	Editorial	X			
11	8.30/2	Replace a period in place of comma.	Editorial	X			
12	8.47/4	Delete a reverse slant.	Editorial	X			
13	Page 84/	"Scram" is modified to "scram".	For consistency, editorial	X			

	line 4						
14	Page 85/ line 14	“Pressure Boundary” is modified to “pressure boundary”.	For consistency, editorial	X			

COMMENTS BY REVIEWER Reviewer: Tauqeer Hussain (CNS)Country/Organization: Pakistan/PNRADate:26-10-2017				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Section 5.16/Page 37	Design provisions should be implemented for monitoring, display and control of the key RCS parameters (coolant pressure, coolant temperature, coolant inventory, *Coolant flow……*	Design provisions should also include Reactor Coolant Flow for monitoring, display and control. As Reactor Coolant Flow is key parameter for controlling DNBR			X	Coolant flow rate is not monitored for all reactor technologies (e.g. not for PWR)
2	Section 5.103 to 5.117/ page 50-50	The flow pattern in the steam generators should be optimized to prevent the occurrence of areas of stagnant flow and to *ensure pre - heating of feed water*……..	Feed water flow in Steam Generator should be in such a way to ensure preheating of feed water to avoid thermal stress and increase thermal efficiency of plant.			X	Feed water is already heated prior to going into SG. Auxiliary feed water is generally not and stresses are minimized by different measures (elevation of the water ingress, design of the J-tubes, etc. Difficult to mention just one preventive measure
3	Section 5.103to 5.117/Page 50-51	Specific design aspects of Steam Generators should include *effective moisture separation means*	Efficient moisture separation is necessary for Steam Turbine life. Moreover, it is helpful to enhancing plant thermal efficiency			X	Yes but not safety oriented Primary intention of an IAEA Safety Guide is not to deal with operational issues
4	Section 5.35 to 5.39/ Page 57	Flow requirements of RHR pumps for different modes should be defined	As Residual Heat Removal System is required to operate during different pant modes with different flow requirements.			X	RHR mode: See 6.30 and 6.31, 6.35 ECCS mode: For DBAs see 6.46

							For DECs see 6.47 See also 6.51
5	Section 5.35 to 5.39/ Page 57	The minimum net positive suction head (NPSH) for a normal operation of the RHR pumps should be ensured at any time during operation	Continuous operation Residual Heat Removal Pumps is required to operate during different plant modes to avoid fuel failure.				Comment not understood
6	Section 5.35 to 5.39/ Page 57	Over pressure protection should be provided in RHR system	Over pressure transient may occur in RHR system because a. Pressure surge in Reactor Coolant system in cold shutdown conditions b. Back leakage of Reactor Coolant System to RHR through connecting vales.			X	A0 is considered in For a) see 5.19 For b) See 6.61
7	Section 6.60 to 6.68/Page 60	Flow requirements of ECCS Pumps for different modes should be defined	As ECCS System is required to operate during different pant modes with different flow requirements.			X	See comment No4
8	Section 6.103/Page 65	*Acid boric* concentration should be sufficient to compensate for the moderator effect at any time during the RCS cooling	Acid Boric should be replaced with Boric Acid to make it more easy to understand	X			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: ENISS			Page 1 of 2				
Page Country/Organization: ENISS			Date: 02/11/17				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	3.28	Accident conditions should be used as inputs for determining capabilities, loads and environmental conditions in the design of the RCSASs structures and systems. Accident conditions to be considered for RCSASs include design basis conditions and design extension conditions ~~but not necessarily limited to:~~ ~~• Loss of coolant accidents (LOCA);~~ ~~• Reactor coolant leakages to the secondary side (PWR and PHWR);~~ ~~• Main steam/SG feed water piping break (PWR and PHWR);~~ ~~• Loss of residual heat removal in shutdown conditions;~~ ~~• Reactivity and power distribution anomalies;~~	It is more logic to list the DBA conditions in the relevant paragraph 3.34.			X	This list is very generic and depending on failure(s) a PIE is categorized as a DBA or DEC
2	3.34	Design basis accident (DBA) conditions should be identified and calculated for the RCS in order to specify adequate performance of the safety systems. DBA conditions to be considered for RCSASs include but not necessarily limited to: • Loss of coolant accidents (LOCA); • Reactor coolant leakages to the secondary side (PWR and PHWR); • Main steam/SG feed water piping break (PWR and PHWR); • Loss of residual heat removal in shutdown conditions; • Reactivity and power distribution anomalies;	List of DBA conditions provided initially in §3.28			X	To be consistent with comment 1
3	3.36	Paragraphs 3.37–3.42 provide recommendations on meeting Requirement 20 of SSR-2/1 (Rev. 1) [1] only for	Requirement 20 of SSR 2/1 deals with Design extension conditions without **or with**	X			

		conditions without core melting.	core melting				
4	3.36 to 3.42	Add paragraphs for accidents **with** core melting	Requirement 20 of SSR 2/1 deals with Design extension conditions without **or with** core melting. In fact, RCSAS should also be designed to mitigate the consequences of accident with core melting (example of design provisions: IVR (§5.79), fast depressurization (§6.92)			X	Provisions for DECs with core melting are indicated in DS 482 (Design of containment and the associated systems) because all aim at maintaining the integrity of the containment . One exception is the fast depressurization that is addressed in this SG
5	4.6	Short and long term capacity of the UHS should be preferably achieved by the use of the inexhaustible natural bodies of water, or the atmosphere where access to an inexhaustible supply of water at the site is not available~~:~~.	Clarify that the 3 bullets paragraphs of the §4.6 are linked with the UHS that uses atmosphere with no access of an inexhaustible supply of water.		X Short and long term capacity of the UHS should be preferably achieved by the use of the inexhaustible natural bodies of water, or the atmosphere. Where access to an inexhaustible supply of water or the atmosphere at the site is not available:		
6	4.6	Deletion of foot note 6	Criterion of 7 days is not justified. Less autonomy can be possible if make-up system is available for example. This can be the case especially if several UHS are available on the site (in link with §4.7)			X	Foot note is not part of the guide

COMMENTS BY REVIEWER Reviewer: Markova Page 1 Of 2 Country/Organization: SÚJB Czech Republic Date: 3.11.2017				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	3.42.	~~Mitigation~~ Managing of design extension conditions (DECs) should be accomplished by permanent systems to the extent possible. Short term actions should be implemented by permanent equipment.	In case of DEC without significant fuel degradation the event/conditions should be "managed" not only "mitigated". Mitigation is appropriate only for severe accidents.			X	Mitigation of the consequences of accident conditions is widely used
2	3.54.	The more likely combinations of PIEs and common cause failure (CCF) between the redundancies of the safety systems should be analysed. If consequences exceed the limits given for DBAs, reliability (or capacity) of the safety systems should be improved (e.g. vulnerabilities for CCF should be removed) or additional design features should be implemented to prevent such events from escalating to accident with core melting. The additional features for residual heat removal and heat transfer to the ultimate heat sink should be designed and installed if it is reasonably achievable and if ~~such that~~ they should be unlikely to fail for the same cause.	The system may not have only low reliability, it may also have insufficient capacity (for example, in the case of a postulated CCF which disables 3 of 4 systems with a project capacity of 4X50%) Reasonable achievability is unexceptionable part of safety enhancement.			X	In the context of failure and loss of all the redundancies of a system due to a common cause failure, "reliability" is appropriate

3	6.43.	Systems designed for cooling the core in accident conditions (DBAs or DECs without significant fuel degradation) should be independent to the extent possible to those designed for operational conditions and from those dedicated to the core cooling in the event of core melt. Systems designed for a higher level of defense in depth (NO, AOO, DBA) can only be used in lower level of defense in depth if they are qualified and their malfunction or damage is not postulated	The use of the remaining functional equipment in case of DEC is such an essential part of the event management that it should be mentioned for completeness. Independence of system is important, but it is not the only criterion for deciding on the usability of the system.			X	This recommendation is for design and layout not for the usability of the system.
4							
5							