Form for Comments

DS 498, Design of Nuclear Installations against External Events Excluding Earthquakes – STEP 11

COMMENTS BY REVIEWER Reviewer: C. Maestre y Dutra Page .... of.... Country/Organization: Brazil / CNEN Date: 25/04/2019				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.4 / 06	Move the definition of "cliff edge effect" to page 2	Item 1.4: The term "cliff edge effect" is mentioned by first time on page 2, but it was defined only on page 5.	Footnote is moved to proper place.			
2	2.4 / 06	Definition of the term "Design Organization"	The definition of a design organization shall be presented in the document, as it is not part of the IAEA Glossary and to avoid wide interpretations of the meaning of design organizations.		Design organization was deleted. Passive phrasing is used.		
3	2.4 / 05	Specification of the responsible for this communication	It is said that that the design organization should be communicated, but it is not clear who is responsible for this communication.		Design organization was deleted. Passive phrasing is used.		
4	2.6 / 03	Definition of "Hazard Assessment Organization"	The definition of a hazard assessment organization shall be presented in the document, as it is not part of the IAEA Glossary and to avoid wide interpretations of the meaning hazard assessment organizations.		Hazard assessment organization was deleted. Passive phrasing is used.		
5	7 / 01	"7. APPLICATION OF MANAGEMENT SYSTEM"	Misspelling of the word "SYSTEM". It's written SYSYTEM instead of SYSTEM.			x	This must be a comment to an earlier version of the document. In the present version, the word is correctly spelled.

COMMENTS BY REVIEWER Reviewer: M-L Järvinen Page.... of.... Country/Organization: Finland/STUK Date: 3rd November 2019				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	2.3	IAEA Safety Standards Series No. SSR-1, Site Evaluation for Nuclear Installations [13], requires proposed sites for a nuclear installation8 to be evaluated for external natural and human induced events, with emphasis on the frequency of exceedance and severity of the events. For this purpose, external event hazards should be assessed. Hazard assessments should be performed using deterministic and~~, as far as practicable,~~ probabilistic methods taking into account the current state of practice, science and technology. Potential combination of events should be considered.	Please clarity. Please delete: as far as practicable. It is not needed.			x	To perform probabilistic methods for hazard assessments reasonable level of data is needed for evaluation of uncertainties, and this may not be available. For this reason, it is written as far as practicable.
2.	4.44	For some other external hazards, the approach above may lead to non-credible scenarios. In those cases, a hazard-agnostic23 approach should be taken and the BDBEE may be selected by taking an adequate margin with respect to the DBEE.	The footnote (23) does not give guidance on how to determine a criterion for adequate, if the size and frequency of the hazard are unknown. Some other word than “adequate” would be more appropriate.			x	The footnote is correctly placed to explain what is meant by ‘hazard agnostic’. The word ‘adequate’ appropriately describes the intent of the paragraph.
3.	5.1	Guidance for a site-specific review of the potential risk of flooding of a site due to diverse initiating causes and scenarios (and relevant potential combinations) is provided in IAEA …	If IAEA dos not want to use the word meteotsunami, the phenomenon should be mentioned with explicit definition. The phenomenon is different from wind generated waves and			x	Meteotsunami will be included in the next revision of the SSG-18.

			seiches, and it can cause a sudden water level rise of up to several meters. Please add meteotsumani to the list.				
4.	5.41	For some sites, in addition to design wind speeds corresponding to 'extreme' meteorological phenomena, 'rare' meteorological phenomena, such as tornadoes and hurricanes [6] should also be considered. In design, the former is usually considered as an extreme condition and the latter, as a rare condition.	It is true that the terms 'extreme phenomena' and 'rare phenomena' are mentioned in the reference [6], but it would be helpful to define them, e.g., in a footnote. A clear definition is not easily found in the reference either.		A sentence is added refencing to relevant para of the Safety Standard No SSG-18.		
5.	5.112	Explosions during the processing, handling, transport or storage of potentially explosive substances outside the safety related buildings should be considered in the site hazard assessment, in accordance with Ref. [8]. The explosion hazard can come from stationary or mobile sources. The result of the explosion hazard assessment should include a list of potential explosion sources with associated amount and nature of the explosive substance, the distance to the site, and the direction from source to site. Occasionally, the annual frequency of explosion for each source is also given.	Is it really possible that there is no reference to security aspects of explosions in any IAEA documents? In that case, a general note with no reference should be made.			x	Considerations of actions related to security aspects are outside the scope of this Safety Guide. Engineering safety aspects of the protection of nuclear power plants against sabotage are discussed in Ref. [15] of the document.

COMMENTS BY REVIEWER Country/Organization: FRANCE / ASN/DRI Date: pages				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	1.4	…the term "Beyond Design Basis External Event" is used to indicate a level of external hazard exceeding those considered for design, derived from the hazard evaluation for the site and that has the purpose ~~of evaluating the margins that exist in the design as well as the identification of potential cliff edge effects~~. to take into account sufficient safety margins to avoid cliff edge effects .	France insists on the fact the the use of the expression "BDBEE" is not very ambitious and that it would be better to use something like "design extension hazards" or "hazards within DEC". Nevertheless, France can live with this expression if it is not possible to change it. Nevertheless, it should be clear that the consideration of "BDBEE" is part of the design. Thus, consistently with SSR-2/1 (e.g 5.21, 5.21a), the guide should be clear regarding margins (which is vague and should be "qualified") and cliff edge: for the design of a new facility, it seems essential to provide as early as possible sufficient margins to deal with extreme hazards. It must not limit to knowing cliff effects but we must try to avoid them. The current text is ambiguous and suggests that the margins will always be sufficient. The proposal is to be consistent with article 2.5.			x	The request from France in the 'Reason' part of the comment has been discussed numerous times and the current version has been retained as the most accepted terminology. The main reason to retain it is actually to clearly distinguish the term from DEC which is not associated with external hazards. Use of a similar term for both causes confusion. Regarding the proposed text, safety margins always exist in the design and their evaluation is not only related to the avoidance of cliff edge effects.

2.	1.8	Consider deletion or, **at a very minimum**: The bases for ~~the design basis~~ requirements for EEs are the protection of people and the environment against radiation risks and the safety of facilities and activities that give rise to radiation risks.	Design basis requirement is neither defined nor understandable (for example: are they requirements for DBEE? It does not make sense). DS 498 is a safety guide that refers to requirements such as those mentioned in 1.7. Referring to high level goal after 1.7 could downgrade safety expectation	This para. is deleted.			
3.	1.9	2 possibilities : This Safety Guide provides methods and procedures for defining an appropriate design ~~envelope5~~ for a nuclear installation based on the site hazard evaluations carried out in the site characterization phase and on the specific layout of the installation. ~~5: The initiating events, internal and external hazards and other conditions considered in the design of the nuclear installations.~~ or This Safety Guide provides methods and procedures for defining an appropriate design envelope5 for a nuclear installation based on the site hazard evaluations carried out in the site characterization phase and on the specific layout of the installation. 5: this includes the initiating events, internal and external hazards and other conditions considered in the design of the nuclear installations.	Design envelope is a general term that does not need to be defined.the footnote refers to a pseudo-definition which is in TECDOC 1791 (thus not approved by all MS) and France does not support at all this TECDOC.	First possibility is accepted.			
4.	1.11	Natural event Floods due to events such as tides, tsunamis, seiches, storm surge, wind generated waves,… **+ please verify consistency of the list with other guides such as SSG-18**	Strom surge have been replaced by wind generated waves which is not the same. This bullet has been deeply modified and does not seem anymore consistent with other guides	Storm surges will be included in the list.			

5.	2.4	~~The end products of hazard assessments should be hazard descriptors, expressed by information on the annual frequency of exceedance versus information on the severity levels of the hazards, descriptions of ail hazard assessment methodological elements and parameters of importance (including screening methods and results), assumptions made in the hazard assessment process and characteristics of the hazard descriptors. This information should be communicated to the responsible design organization~~	Consider deletion: the objective is to achieve safety, not to obtain information. Moreover, this article is not understandable. (what is a descriptor, why to communicate to the designer as the current guide is yet for the design…)		The para. is rephrased. This is a paragraph that recommends the appropriate interfacing between the hazard analyst and the designer. There have been instances that when this interfacing is not made properly what the designer receives from the hazard analyst may not be sufficient for his purposes.	x	
6.	2.5	… The second level should be selected to be more severe than considered in design, derived from the hazard evaluation for the site, and used in the evaluation of the nuclear installation, in order to take into account sufficient safety margins to avoid cliff edge effects.	The original sentence means that consideration of BDBEE is not a design approach. The proposed text comes from SSR and is less ambiguous on this aspect.			x	It is not always possible to derive the BDBEE from hazard analyses. Sometimes it is taken as a factor (e.g. in seismic design for EUR this is 1.4 which is not associated with the hazard).
7.	2.5	…FN10 FN10- A common target value of frequency, not higher than 10–4 mean per annum, is used for DBEEs in many Countries regarding natural hazards.	This FN is only true for natural hazards. For human made hazards, when an exceedance frequency is used, it is generally 10-6 or 10-7.	x			

8.	2.8	The margin is understood to be the result of conservative design approaches, taking duly into account the variability and uncertainty of the different methods, data, assumptions and rules that provides the SSCs the capability to safely perform even in situations more severe than those postulated in the design basis without the incurrence of cliff edge effects. ~~The analysis should consider all applicable epistemic and aleatory uncertainties.~~ A~~nother~~ source of margin is design of the SSCs for a wide range of internal and external extreme loads, for example, pressure and other environmental loads due to accident conditions, aircraft crash, tornado, pipe break, seismic loads, etc. and the governing loads for some SSCs could be different.	Uncertainties shall be considered anyway. Their consideration provides confidence that SSCs will be able to perform their safety functions. Margins come after and are something more.	x			
9.		Paragraphs 2.13 to 2.17 : consider deletion	These articles are close to proposals of methodology and are not relevant in a chapter dedicated to general concept. Moreover these methodologies could be highly questionable since there is a mix between the margins to be taken into account on the DBEE and the BDBEE margins: margins remain a vague term and there should not be misunderstanding between margin assessment to reinforce confidence in DBEE assessment and margins that should be implemented regarding event more severe than those considered in the design basis according to SSR-2/1, SSR-3 and SSR-4. <u>As a consequence, it is not possible to endorse these articles</u>			x	Many MS find these articles very useful. This is a safety guide and not a requirements document and providing some concrete guidance is generally appreciated

10.	2.14	The margin assessment can be performed by ~~probabilistic or~~ deterministic and, as far as practicable by probabilistic approaches	To be consistent with 2.3, with requirements from SSR and, more generally, with all well-established safety approaches		The para. is rephrased.		
11.	2.19	…The items of EE category 1 should be designed to withstand against the respective DBEE. Those SSCs necessary to avoid cliff edge effects, notably to prevent large or early releases should also be checked against conditions exceeding the DBEE, i.e. BDBEE in order to demonstrate an adequate margin and avoidance of cliff edge effects at the levels close to DBEE.	The objective of BDBEE is related to avoidance of cliff edge effects. This shall not be limited to avoidance of large or early releases.		The para. is rephrased.		
12.	2.22	… • For beyond design basis evaluations, ~~probabilistic or~~ deterministic and, as far as practicable by probabilistic methods should be used to assess safety margins for the EEs	To be consistent with 2.3, with requirements from SSR and, more generally, with all well-established safety approaches	X			
13.	2.24	~~If the combination of two independent events is~~ Unless credible, a DBEE or a BDBEE should not be considered in combination with other rare events that may occur independently, such as other external human induced events, natural phenomena, equipment failures and operator errors. Deterministic and probabilistic evaluations should be used for the determination and evaluation of suitable design combinations ~~between EEs and internal incidents14~~ ~~FN14: Internal incidents: this does not include the postulated initiating events considered in the design – see para. 2.19 for the EE categories.~~	2.24 is not understandable. If proposed modification is not accepted, consider deletion of 2.24 The concept of "internal incident" not included in PIE is new and not relevant (a credible incident shall be postulated according to requirements SSR). This part is - at a minimum - not understandable	X			
14.	2.39	The following aspects should also be considered in a design to meet safety requirements for BDBEEs: … - The systems not protected against DBEEs (items not important to safety) should be designed in a manner not to jeopardize safety related SSCs while failing due to DBEE. …	Highlighted text is related to DBEE and should be moved somewhere else		The para. is rephrased.		

15.	3.26	The definition of BDBEE conditions is innately coupled to the performance and acceptance criteria for SSCs and/or the nuclear installation. Similar to those for DEC, methodologies to evaluate BDBEEs may be best estimate, i.e. relaxed from design methods or material properties ~~and acceptance criteria~~.	Use best estimate values of material properties, or advance calculations for BDBEE may be possible. But acceptance criteria should not be changed if the requirement is still the same, e.g: • If water-tightness is required under BDBEE, what is a relaxed acceptance criterion? • Allowing some inelastic behavior for the BDBEE is relaxed design methods or properties not at all relaxation of the acceptance criteria. Generally, it would be better for the redaction to use the notion of safety requirement instead of acceptance criteria.		The acceptance criteria actually refers to material properties. Text should read: …i.e. relaxed from design methods and acceptance criteria related to material properties.		
16.	4.17	~~Some of the EEs can be considered as extreme events, which are more frequent than rare events. This is the case, for instance, of wind load when it does not include tornado or hurricane conditions. In these cases, external event loads should be combined with normal operational loads and with loads from other extreme events, with combination factors dependent on the Member State practice. A combination of probable maximum storm surge with 10 year wind wave effects is an example of such cases.~~	The way "concepts" of rare and extreme are used in this article needs to be better explained.			x	Reference is given to SSG-18. Concept is explained in SSG-18 in detail.

17.	From 4.24 to 4.28	Load combinations and acceptance criteria Preliminary note: the following articles are partially dealing with the topic as only referring to civil works and EE that may impact them. For other SSCs, they may be useful.	Paragraphs referring to civil works are not relevant for all hazards and all SSC. It shall be specified at the beginning of the section because when we read the title, we wait for recommendations on how to combine hazards in general and here the paragraph is limited to civil engineering France had still made this very important comment during MS consult and cannot understand why it has not been taken into account with the reason that "Most mechanical and electrical equipment are not directly exposed to EEs considered in this Safety Guide" which is an "a priori" statement not relevant when dealing with safety.			x	Almost all hazards considered in this guide affect first the civil structures. The SG should not be an incomplete document. It would have been preferred that comments were made to fill the gap (if any) rather than point out a gap which in our opinion does not exist.
18.	4.42	The rules for ~~design~~ (DBEE) and the rules for ~~assessment~~ (BDBEE) are different. The purpose of the BDBEE consideration should be to show that, ~~reasonably~~, the BDBEE will not compromise the intended safety functions. For this purpose, the assessment for BDBEE should take credit for all safety margins intentionally ~~or unintentionally~~ introduced by the design process. Nonetheless, it should be emphasized that the criteria should remain consistent with the safety requirements and consider adequate margins.	BDBEE is part of the design and its assessment should lead to design provisions if necessary: it is not only assessment without actual actions The term "unintentionally" seems inappropriate in the nuclear safety guide. A designer must identify and understand the margins origins. The added sentence intends to be more accurate than the previous general ones	x			

19.	5.x	SAFETY DESIGN PROVISION AGAINST EXTERNAL EVENTS *No specific chapter about EE "snow", "high temperatures" and "very cold temperatures" : it would have been better if they could have been developed*	France has noticed that after its comments during MS consult, some article have been developed but enhance that they are not fully sufficient. France would like to make again the comment that it is important that this guide proposes recommendations regarding "high temperatures", notably in the context of global warning. This is all the more necessary as the "high temperatures" can potentially affect the entire nuclear island. Combinations are possible such as losses of external power supplies or problems of low water. Moreover, experience feedback has shown that the EE "high temperatures" and "very cold temperatures" could lead to significant risks for the safety of nuclear installations. Besides, almost nothing is said in the document about snow, whereas some more hypothetical loadings are fully developed. **Generally, each EE mentioned in the paragraph 5.68 should be dealt with separately**, like the other EEs of this guide. **Nevertheless, France can live with the situation considering that no other MS requires equivalent complementary articles**.			x	Guidance for these hazards are already given under sub-section "Other extreme meteorological conditions".

20.	5.32	The temperature of the river may greatly vary during the different seasons and directly connected to extreme weather temperature if it occurs for a longer period of time (days/weeks). Design considerations for river site plants should take into account that the effects of extremely high weather temperature are usually correlated with high river water temperature which follows the weather temperature with a relatively short delay and may affect the transient behaviour of the plant. It should be taken into consideration in the design that high river temperature may induce initiating events on its own due to administrative restrictions or technological reactor protection measures that initiate a transient (shut down, power reduction, etc.).	This article should be moved to another chapter considering that it is not related to flooding	x			
21.	5.66, 5.135 5.155	Consider deletion	For some loadings, what is expected for BDBEE is specified. For others nothing is said. Moreover, the proposed text is quite fuzzy and opens the possibility to have inconsistency between criteria and safety requirements. These articles seem to be here not for technical reason but just for editorial consistency which is not a good approach to provide a good understanding of specific technical item.			x	There is not enough MS experience that we could have used for these external events. However, it is not justified to discriminate them just on this basis. There is guidance in Section 4 in this regard which can be used by MS.

	COMMENTS BY REVIEWER Reviewer: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) (with comments of GRS) Pages: 4 Country/Organization: Germany Date: 02.10.2019				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.	5.86	As mentioned in para. 5.82, massive flows, such as, lava flows, pyroclastic flows, lahars and debris avalanches, are	The para. is in contradiction with SSG-21 and in itself contradictory.	x			

			considered exclusionary and should normally be screened out in the site selection process. There is no credible precedent for design or site protection measures against these phenomena ~~in nuclear installation related applications. Protective barriers may be considered if the nuclear installation is sufficiently distant from the volcano, so the flow is substantially decreased and if design bases have been established for these effects in terms of parameters such as volume, velocity, temperature and viscosity. In such cases all uncertainties should be considered, and large safety factors should be used in the design of these protective structures.~~	There is up to now no credible precedent for design or site protection measures against these phenomena, whether from nuclear installations nor from any other field, thus no protection measure can claim credibility. So at least cancel the words crossed out with a single line. The possibility of protective barriers rests on the (baseless) assumption that parameters such as volume, velocity, temperature and viscosity might be quantifiable, and uncertainties can be derived. Even if these parameters may be determinable with any kind of precision, the function of the protective barrier may not be given as lava flows or pyroclastic flows do not behave like normal fluids. As safety should have the highest priority better do not imply that protective barriers are possible. This implication also contradicts the sentence immediately above, that protective measures are without credible precedent.				
1	2.	5.136	Toxic, flammable, corrosive and asphyxiant chemicals might on release	The 2. & 3. sentence should be deleted, because	x			

			into air affect the nuclear installation both externally and internally, damaging or impairing safety related systems and operator action. ~~The release of corrosive gases or liquids may potentially enter and damage the plant cooling system. Additionally, fluids from oil spills or corroded pipes may adversely affect the function of heat exchangers, pumps and valves, potentially affecting safety related items.~~ Corrosive fluids may also affect outside areas, such as switchyards, and consideration should also be given to outside electrical and electronic equipment.	they deal with hazards for UHS components and do not fit into Sect. 5.7 on releases into air. Obviously, the text was taken over from NS-G-1.5, para 8.2, that was originally intended for liquids. Old text: *"Corrosive liquid effluents may have the potential to enter and do damage to the plant cooling system.* *Additionally, particles from oil spills or corroded pipes may adversely affect the function of heat exchangers, pumps and valves, potentially affecting safety related item."* The hazards of corrosive liquids and oil spills are already treated in Section 5.12 on COLLISIONS OF FLOATING BODIES WITH WATER INTAKES AND UHS COMPONENTS, in para 5.218, 5.224, 5.233, & 5.234.				
1	3.	5.172 Line 7	[…] - Consequences of an impact, e.g. fuel ~~fires~~ effects or debris and secondary missile	"Fire Effects" are treated under 5.197	x			
1	4.	Title Sec. 5.12	5.12. <u>HAZARDS BY</u> ~~COLLISIONS OF~~ FLOATING BODIES <u>AND HAZARDOUS LIQUIDS ON</u> ~~WITH~~	The headline should be adapted to the contents of the chapter. Para 5.218, 5.224, 5.233, & 5.234 deal		x		

			WATER INTAKES AND UHS COMPONENTS	with hazardous liquids (oil spills & corrosive liquids). These are treated mainly as a secondary hazard from wrecked ships but can also occur e.g. from pipelines.				
1	5.	5.218 Line 4	… Hazardous fluids or particles can be released by ship collision or leakages of pipelines or offshore installations.	Important aspect of releases by offshore installations others than ships was added.	x			
1	6.	5.224	The design of water intakes against ship collision and oil spills or releases of corrosive fluids or particles should be capable of providing an adequate level of performance under various environmental conditions~~. and for all the related potential consequences, such as oil spills or releases of corrosive fluids.~~	Oil spills & releases of corrosive fluids etc. should not only be considered as secondary effects by ships collisions.	x			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Pages: 2 Country/Organization: Japan / Nuclear Regulation Authority (NRA) Date: 4 October, 2019				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	2.24.	If the combination of two independent events is credible, a DBEE or a BDBEE should ~~not~~ be considered in combination with other ~~rare~~ events that may occur independently, such as other external human induced events, natural phenomena, equipment failures and operator errors. Deterministic and probabilistic evaluations should be used for the determination and evaluation of suitable design combinations between	It is strange to state that the combination should not be considered if the combination of events is credible.	x			

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Pages: 2 Country/Organization: Japan / Nuclear Regulation Authority (NRA) Date: 4 October, 2019				RESOLUTION			
		EEs and internal incidents14 (Ref. [9, 10, 16, 17]).					
2.	2.34. Last sentence	Administrative measures as a replacement for passive or active protection should be ~~avoided as far as reasonably practicable~~ developed in accordance with the recommendation described in para 2.43.	To keep a consistency with para 2.43. Para 2.43 does not say that administrative measures should be avoided.			x	The main issue is that administrative measures should not replace other protection measures.
3.	3.16./L5	The walkdown team should consist of experts in EEs, design of nuclear structures and component design, together with systems analysts, and plant operators and maintenance personnel.	The last sentence of this para says the team should address "housekeeping" aspects, which need involvement of maintenance personnel.		The last part of the sentence is revised: '…plant operators including maintenance personnel.'		

COMMENTS BY REVIEWER Reviewer: Page 1 of 1 Country/Organization: Republic of Korea / Korea Institute of Nuclear Safety (KINS) Date: October 8, 2019				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	5.64	Sensitive equipment important to safety ~~equipment~~ located outside the buildings should be protected against windborne missiles.	To clarify the text		It is modified as "..items important to safety…"		

COMMENTS BY REVIEWER Reviewer: SSTC NRS Page 1 of 1 Country/Organization: Ukraine Date: 03/10/2019				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection

1.	2.19, 2.20, 3.14	We recommend to introduce category EE-3 in DS498 for External Events	To align EE categorization with seismic categorization in DS490 that contains 3 categories.	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: ENISS Country/Organization: ENISS			Page 1 of 10 Date: 04/10/19	ENISS			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	2.12	~~In consideration of the BDBEE and following a best estimate approach, values of external event parameters causing cliff edge effects should be established.~~ Adequate margins to avoid cliff-edge effect should be demonstrated by means of a best-estimate approach. ~~For this purpose, the demonstration should include the determination of the severity of the event causing a cliff edge effect and the estimates of the probability of occurrence at which the cliff edge effect can occur.~~	The way the paragraph is formulated it gives the impression that BDBEE analysis should determine the maximum severity of the event causing a cliff-edge. This is not in line with SSR-2/1. According to para. 5.73 of the SSR-2/1 safety analysis shall provide assurance that adequate that adequate margins are available to avoid cliff edge effects. The important message in this paragraph is to point out that best estimate approaches are appropriate for demonstrating sufficient margins to avoid cliff edge effects. This was also pointed out by the IAEA in the comments resolution table belonging to review step (step 7). It is sufficient to keep only a minor part of the paragraph. This proposal was rejected after step 8. The reason was :"The margins can only be known if the severity of the hazard that causes the cliff edge effect is known."			x	The paragraph is very clear. It requires to establish cliff-edge effect by best estimate approach and demonstrate adequate margin by determining the severity of EE.

			Indeed, the margins need not necessarily be known, only adequate margins should be demonstrated: if "intermediate" severity, far from cliff edge effect, can cause sufficient margins, there is no use determining more severe event. What can be considered "adequate safety margin" depends on the attributes of the external hazard. See for example, IAEA TECDOC 1791, Chapter 9.2 and WENRA Guidance document on Issue T (SRL T6.3).				
2.	2.15 a)	-Insufficient experience in specific EEs – maturity of subject matter/~~nuclear~~ industrial installation experience	The experience can be drawn from all industrial installations, not only nuclear			x	Factors that potentially make the effects of the external event on a nuclear installation (especially on a NPP) more severe and more uncertain are listed.
3.	2.18	In the design and evaluation process for each individual EE to be considered, all SSCs important to safety that are affected by or exposed to the EE under consideration should be identified, including those SSCs whose failure could jeopardize SSCs important to safety. …	In a nuclear facility, about any SSC could be affected by an EE; for the purpose of a nuclear safety guide on should focus on SSCs important to safety (directly and indirectly)	x			
4.	2.19	…~~Those~~ SSCs important to safety ~~necessary to prevent large or early releases~~ should also be checked against conditions exceeding the DBEE, i.e. BDBEE in order to demonstrate an adequate margin and avoidance of cliff edge effects at the levels close to DBEE. … c) Items that ensure the control room functions and, if the main control room can be made unavailable	In order to stay consistent with 2.7. In general all SSCs important to safety should have a sufficient margin w.r.t. cliff edge effects (at a certain BDBEE level). If control room is protected with adequate margins against external events, there is no use asking for the same requirement for the supplementary control room, which is		2.19 is moved to 3.26 and it is modified as "c) Items that ensure the control room and, if the main control room is not available following the BDBEE, items that ensure supplementary		

		following the DBEE or the BDBEE, items that ensure supplementary control room functions.	needed overall when the control room is confronted to internal hazard.		control room functions"		
5.	2.33	It is also relevant for passive components, 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 and that its function would remain unaffected by the DBEE.	Completed to avoid any ambiguity	x			
6.	2.35	… An adequate redundancy of ~~safety related~~ items important to safety. The level of redundancy should be an outcome of the application of the single failure approach to the design. …	According to IAEA definitions, safety related items constitute only a part of items important to safety. In general, all items important to safety are targeted. The same remark is valid for 4.8, 4.14, 5.19, 5.85, 5.88, 5.136, 5.156, 5.166, 5.192, 5.199 and 5.207. Even if this concerns text which was not modified in step 8, it seems important to adapt anyway for maximum coherence with IAEA safety glossary.	x			
7.	2.37	… to specifically address changes in the ~~perception~~ evaluation of the site specific hazard…	"perception" is not appropriate. Here it is about hazard evaluation or assessment		Accepted to change as '…assessment'		
8.	3.13	All plant ~~operating~~ states of normal operation should be considered at the time of occurrence of any DBEE or BDBEE, …	Conform to the definition of IAEA glossary.	x			
9.	4.32	~~Analyses should be carried out on mesh-independent models~~ To minimize the uncertainties of the numerical approximations ~~and the user effects~~ when using meshed models, analyses should be carried with checking convergence of results, which can need optimization of mesh size.	The term "mesh-independent models" is ambiguous. A model is always dependent on the mesh used! For instance, one will not use the same law material for a 3D or 2D mesh. It is the results of the calculation which must be independent of the mesh size chosen for a given model.	x			

10	5.32	~~The temperature of the river may greatly vary during the different seasons and directly connected to extreme weather temperature if it occurs for a longer period of time (days/weeks). Design considerations for river site plants should take into account that the effects of extremely high weather temperature are usually correlated with high river water temperature which follows the weather temperature with a relatively short delay and may affect the transient behaviour of the plant. It should be taken into consideration in the design that high river temperature may induce initiating events on its own due to administrative restrictions or technological reactor protection measures that initiate a transient (shut down, power reduction, etc.).~~	The purpose of this paragraph is not very clear. Firstly, why is it located in the Chapter 5.1 "External floods" ? Secondly, the fact that the weather temperature and the water temperature are generally correlated seems sufficiently obvious so that it is not necessary to specify it. High temperatures are predictable phenomena so the shut down due to potential administrative restrictions can be anticipated without special protection measures. We understand that the purpose of this paragraph is to recommend the analysis of the risk of offsite power. If it is correct, it should be indicated more clearly.		Accepted that the paragraph is in the wrong location. It is moved to subsection on other extreme meteorological conditions.		
11	5.33	Special considerations should be given to the occasionally rather short warning times concerning flooding potentially resulting from ice dam formation and failure.	Clarification	x			
12	5.37	For new nuclear installations, SSCs necessary to avoid cliff edge effects should…	In order to stay consistent with 2.7. In general all SSCs important to safety should have a sufficient margin w.r.t. cliff edge effects (at a certain BDBEE level).			x	The paragraph as written is supporting the requirements of SSR 2/1.
13	5.65	Assessment for beyond design basis wind (BDBEE) should be performed for SSCs necessary to avoid cliff edge effects ~~that are used for the containment of radioactive material or otherwise mitigation of the consequences of an accident caused~~	In order to stay consistent with 2.7. In general all SSCs im-portant to safety should have a sufficient margin w.r.t. cliff edge effects (at a certain BDBEE level).			x	The paragraph as written is supporting the requirements of SSR 2/1.

		~~by extreme winds or associated hazards.~~					
14	5.66 and 5.135, 5.155, 5.236	Methods in the assessment for beyond design basis external events (BDBEE) should normally be the same as in the design for design basis wind (DBEE). The differences should be reflected in engineering approaches that apply realistic assumptions, acceptance criteria, and the material properties used in the assessment.	As the complete proposal made by ENISS at step 8 was rejected, it is proposed to ask only for more realistic assumptions. In the comments resolution table in step 8 it was highlighted that the paragraph refers to methods concerning "engineering approaches, computer software." The paragraphs 5.66, 5.135, 5.15, and 5.236 give the wrong impression that the methods for assessment of BDBEE should be the same as assessment of DBEE. There are a number of clear and basic differences regarding the treatment of DBEE and BDBEE and this ought to be reflected in the guide. This applies to all types of EE (winds, fire, flood, etc). In case of beyond design, methods for assessment should normally apply - Realistic approach, i.e., best-estimate assumptions and no additional postulates such as single failure. - Less restrictive technical acceptance criteria	x			
15	5.69	Delete paragraph	As written, it looks like a systematic rejection of existing protection and amplification of the consequences of lightning.			x	The ambiguity which the comment refers to is not the intention. There is no recommendation in the paragraph regarding

			Lightning events are not be treated any different from any other external events. Protection should be designed with proper account of dimensioning values and adequate margins.				lightning. The following two paragraphs (5.74 and 5.75) explain the intent more clearly. There is no need for deleting the paragraph.
16	5.72	The effect of the snow on ventilation intakes and discharges, roof design, ventilation and diesel generator combustion air intakes, access by the operator to external safety related facilities and mobility of emergency vehicles should be considered in design and safety analysis of the installation. ~~Heating the roof to prevent the building of excessive amount of snow and ice may be considered.~~	Mentioning a technical solution in this guide is not appropriate	x			
17	5.74	Lightning could cause various failure modes depending on lightning properties that cannot be characterized by a single parameter but with several physical properties (e.g. peak current, rising time, time of half value, impulse charge, specific energy). Different types of lightning impulses (first positive, first negative, subsequent, long) are defined in lightning standards. ~~down time Primary and secondary Thermal, mechanical ,electrical and electromagnetic hazardous effects of different impulse types should be taken into consideration in the design.~~ It is noted that ~~high current lightning strikes hit the primary lightning protection system with a high probability that conducts the current in a coordinated way to the ground.~~	Rewriting to complete and simplify, consistently with the IEC 62305 standard.	x			

		~~However, lightning strikes in the middle range (with few times of 10 kA current) may miss the lightning rods with a higher probability~~ the higher the peak current is, the easier it is caught. Therefore a minimum peak current has to be defined too to design the lightning protection ~~and also have the capability to induce the failure of sensitive equipment by the secondary effects. Therefore, care should be taken not only to lightning strikes with high peak currents, but also to the ones with a moderate level of peak current too in the design~~. Thermal, mechanical, electrical and electromagnetic hazardous effects of different impulse types should be taken into consideration in the design. Special care should be taken to ~~secondary~~ electrical and electromagnetic effects of lightning ~~(e.g. electromagnetic pulse),~~ since it may pose even more severe threat to the nuclear safety than ~~primary~~ other effects.					
18	Section 5.8	Make modifications to focus only on radioactive hazards from outside the site. Or at least write a caveat to explain why sources from within the site are presented here.	This section also addresses the radioactive hazard from within the licensed site, which is not consistent with the definition of what is an external hazard. The risk of radioactive releases from other facilities on the licensed site is part of the internal hazards.			x	Please see footnote 2 on definition of EE. It includes both.
19	Section 5.10	Make modifications to focus only on EMI/RFI hazards from outside the site. Or at least write a caveat to explain why sources from within the site are	This section also addresses the radioactive hazard from within the licensed site, which is not consistent with the definition of what is an external hazard. The EMI/RFI hazards			x	Please see footnote 2 on definition of EE. It includes both.

		presented here.	from installations on the licensed site is part of the internal hazards.				
20	5.198	If, for any reason, beyond design basis aircraft crash is considered involving fully fuelled commercial airplanes, acceptance criteria should be chosen such that as a minimum the ~~safety related items~~ SSCs of the nuclear installation that are ~~involved in defence in depth level 4~~ necessary to prevent large or early releases remain functional.	given the important level of BDBEE that is considered here, It is understood that it is considered in evaluation of margins w.r.t. large or early releases only; more-over, when referring to DiD level 4 it needs to be clear if it means all DEC or severe accidents only	x			
21	5.221	Beyond design basis events (BDBEE) should be established by increasing the size of the floating body and/or the impact velocity with respect to the design values (DBEE). ~~The approach should be based on the potential maximum size or weight of floating bodies during the installation life, the bathymetry around the plant and the physical limits to navigation conditions around the site.~~ The approach should account for the potential changes, during the installation lifetime, in the physical limits that could impact the characteristics of the floating bodies (e.g. effects of changes in bathymetry due for example to sediment transport, or climate change effects like sea level).	Necessary to include a slightly more detailed rationale. Consideration of “potential maximum sizes during installation lifetime” was removed for other man-made hazards in step 7 (external explosions and toxic chemicals) but was kept for “floating bodies”.	x			