COMMENTS on DS 417

COMMENTS BY REVIEWER Reviewer: Page 1 of 1 Country/Organization: **FINLAND** Date: March 26, 2010							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
General Comment		From the point of view of countries having colder winter conditions the phenomena linked to cold weather would be worth of taking more deeply into consideration.		The Safety Guide addresses practices in Member States as available and provide. Additions were added in main text to some cold phenomena (e.g. frazil ice).			
1	3.9	Historical data	Historical and anecdotal data are not linked together. It would be useful to handle historical and anecdotal data separately. Historical data is very useful when e.g. considering rare but strong impact of volcanic eruptions on the climate. A good example of historical data is mentioned in 5.41.	**Y**	It is exact that the two words refer to different concepts, therefore the para 3.9 was modified as "Historical and anecdotal data…"		
2	3.7	Footnote: … , the minimum period of continuous observation should be at least 30 years, … supplemented with historical data if available	The impact of volcanic eruptions may make the climate colder for one or two years. This impact should be taken into account when assessing the extremes of the minimum temperatures.			**X**	The footnote is related to the para 3.7, which discusses the duration of measurements Measurements cannot be replaced by historical data. Information such as volcanic eruptions is incorporated in para 3.9 and should be used to assess measured data.
3	3.23	(2) ... in para 3.9	Misprint: …in para 3.10	**Y**	The text was modified as "*Historical data as mentioned in para 3.9*"		
4	4.27	...regional assessment should be made of snowfall.	Satellite photographs do not give sufficient information in areas where winters are cold and long and there is snow everywhere.	**Y**	"Satellite photographs" were mentioned as a possibility. The text is changed as "*Remote sensing data* may be helpful…."		

5	4.28	… will vary from place to place as a course of local phenomena (e.g. impact of buildings and snow carried by wind from the ice of the adjacent sea or lake)	The wind carries the snow from open areas to certain places			**X**	It seems not useful to add detailed causes of reasons of snow depth variation from place to place.
6	4.28	Snow can stuck the openings of the air intake	It is worth on mentioning that especially wet snow may be blown by a wind against openings			**X**	This comment is more a design consideration which should not be included in this paragraph related to the snow depth variation from place to place.
7	9.7	- frazil ice - pack ice - oil spills	There is a risk of blockage of the intake of cooling water	**Y**	7.9 is devoted to warning systems and frazil and pack ice are included in meteorological warning system which were included in the list. Oil spills is considered in another Safety Guide (NS-G-3.1). Moreover, obstruction of intake is mentioned in 5.126 and 5.127. The subtitle of these para is: *Obstruction due to floating debris and ice conditions.*		
8		Frazil ice and pack ice are so important phenomena that they should have chapters of their own.	The phenomena are lacking in the text (there are only hints in chapters 3.32 and 7.9). There may be good places in chapters 5 and 9.	**Y**	These topics are mentioned: in 2.8, and the corresponding bullet has been modified to: *Freezing precipitation and frost related phenomena* In 2.12 – Frazil ice and 2.14 – Blockage of site drainage and ice floes, 4.71 is modified as follows (new numer:4.70): *Freezing precipitation is a precipitation that falls when*		

					temperature on surfaces and above is below freezing. The drops became supercooled and freeze upon impact with soil or with any surface, resulting in the formation of a layer of ice. Ice due to freezing rain, snow, rime, and in-cloud icing is known to cause increases in dead loads and response of structures. Important effects are related to significant increases in the static and dynamic response to wind action for conductors in transmission lines. Similar but usually less pronounced effects should be frequently expected under winter conditions in steel trusses. In addition the formation of ice in cooling systems may affect their efficiency.		
9		oil and chemical spills into water	Man made hazards are lacking. Oil spill and chemical spills may enter into the plant and cause harmful effects.			**X**	Man induced events, including release of hazardous fluids, are addressed in the Safety Guide NS-G-3.1
10	10.1	Check for completeness	It should stated, whether or not this chapter considerers also the final disposal facilities.	**Y**	The Safety Guide addresses nuclear installations as defined in the Safety Glossary (Ref. 7). The reference to Safety Glossary is clearly made in 10.1 : *In consideration of the use of a graded approach as mentioned in para. 1.14,*		

					this section provides guidance for the meteorological and hydrological hazard evaluation of a broad range of nuclear installations other than nuclear power plants, as defined in Ref [7].		
11	2.5	Check for completeness	The climatic change could be mentioned also here, not only historical data.			**X**	Climate change itself is not a hazard to nuclear installations.
12	2.30	…homogeneous for the entire region…	Clarify the meaning of word "homogeneous" in this context.	**Y**	The para 2.30 was modified as follows. "*When the region to be investigated extends beyond national borders or when the site is located on the coastline, the database should include data from the entire region*."		

TITLE : DS 417 Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations

COMMENTS BY REVIEWER Reviewer: Country/Organization: **FRANCE**				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	1.5	Delete 1.5	Superfluous Already covered by 1.4	**Y**	A new bullet was added to para 1.4 as follows: "*The greater awareness related to the impact of climate change and the adoption of mitigation measures to respond to it and the need to periodically update that guidance in view of the ongoing developments in this area."*		
2.	1.6	Delete 1.6	Superfluous. Redundant with 1.4	**Y**	A new bullet was added to para 1.4 as follows: "*The need to provide guidance on the assessment of low water conditions, e.g. drawdown effects for tsunami hazards and the associated risk of loss of intake water for safety related cooling".*		
3.	1.14/7	Delete "when subjected to seismic loads"	Not related to the scope of the guide	**Y**			
4.	2.3/5	After "communication", add "shift turnover"	Clarification To be consistent with 7.24	**Y**			
5.	Title before 4.57	Delete footnote 14	4.57 and 4.58 do not get into details of hazard assessment methodology	**Y**	The footnote was deleted.		

6.	6.2/4	with~~y~~	Typo	**Y**			
7.	6.4	Delete 6.4	Superfluous. Annex 1 is only one example referring to one Member state	**Y**	The para. is deleted		
8.	6.20/4	Components	Typo	**Y**			
9.	7.5 (a)/5	After "at the site", add a footnote "However, some parts of the installation (e.g. pumping station for a NPP) may be more exposed to flooding and necessitate additional protective feature"	For a NPP, some parts of the site needs to be connected to the river/sea.	**Y**	The footnote is added		
10.	7.24/4	Delete "Special provisions should be made for protection of the families of installation personnel during floods and severe meteorological events in order to help assure the effectiveness of personnel during the emergency"		**Y**	Recent events, e.g flooding in Kalpakkam NPP or earthquake in Haiti, show the importance of protection of personnel. The sentence is modified as follows: *Adequate provisions, by the plant management, when possible, should be made for protection of the families of installation personnel during floods and severe meteorological events in order to help assure the effectiveness of personnel during the emergency.*		
11.	8.2/footnote 32	Delete footnote 32	Too specific.	**Y**	The footnote was deleted from 8.2 and moved to 8.5 (previously 8.6) where it is more appropriate.		

12.	8.3	Replace 8.3 by "Information on climate change may be found on the Intergovernmental Panel on Climate Change (IPCC) web site"	Current references (report AR4) are likely too change so it is preferable to just refer to the website where any new report will be available…			**X**	The IPCC web site address is given in the Annex. Moreover, information given in the Annex is relevant, by illustrating some of the trends.
13.	10.2/1	Replace "For the purpose of meteorological and hydrological hazard evaluation, these installations should be graded" by "For the purpose of meteorological and hydrological hazard evaluation, gradation, if any, should be"	Alternate wording more consistent with 1.14.			**X**	According to 1.14, if no grading is performed, Chapter 10 does not apply. Therefore, it is not necessary to add after gradation, *if any*.
14.	10.7	Delete 10.7	Superfluous. PSA synthesis should be in the SAR and the external hazards assessment should also be in the SAR.			**X**	This paragraph is in coherence with similar one in DS422 and already accepted by CSS.
15.	10.11	Delete 10.11	Duplicates 10.10 (a)	**Y**			
16.	Annex 1	At the beginning, add the name of the Member state	Annex 1 is only <u>one</u> example of <u>one</u> country. Is it appropriate to keep it into the guide? If this annex should remain, to be consistent with annex 2 where US and Japanese methodologies are summarized.	**Y**	The Member State name is added		

17.	Annex 1		Annex 1 is only one example of one country. Is it appropriate to keep it into the guide? If this annex should remain, a warning should appear at the beginning stating that this is only an example and that alternate methods, criteria or combinations could also be appropriate.	**Y**	Modified text at the beginning		
18.	Annex 4	Delete annex 4	See previous comment (just refer to IPCC web site)			**X**	See response to comment 12.

Draft Safety Guide DS417 „ Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations“ (Draft 01.01, 2009-11-18)

COMMENTS BY REVIEWER Reviewer: **Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)** (with comments of GRS+TÜV) Country/Organization: **Germany** Date: March 2nd, 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	general	- / -	A list of abbreviations would be a desirable add-on.	**Y**	It will be done in the final editing according to IAEA rules.		
2	general	- / -	The guide contains some examples concerning “climate change in Europe”. These examples are partially not correct. Therefore, we recommend not to use examples from Central Europe.			**X**	Examples are taken from the IPCC document and it was prepared by a participant of the IPCC/WG1.
3	general	- / -	With the combination of the two guides it would be desirable to expand such paragraphs which are until now only written for aspects belonging to NS-G-3.5. In particular the whole chapter 9 contains predominantly events concerning the main topic of the previous NS-G-3.5. All in all, the meteorological events/hazards in relation to the hydrological hazards are underrepresented respectively the topics “flood” and “tsunami” are too dominant.			**X**	The revised version improved the balance between meteorological and hydrological hazards. Section 9 is 50% dealing with general recommendations valid for both types of phenomena and the rest is divided is ~15% for meteorological and the rest for hydrological events.

4	Title	Meteorological and Hydrological Hazards in Site Evaluation for Nuclear ~~Installations~~ Facilities	According to the Safety Glossary the term "nuclear installations" includes various types of facilities but not conversion facilities, waste storage facilities and waste repositories. However, meteorological and hydrological hazards may also be relevant for these facilities. Using the word "facilities" broadens the scope of application for the guide.			**X**	The scope defined in the DPP is for nuclear **installations**.
5	1.14 (page 4)	1st sentence: „The Safety Guide addresses an extended range of nuclear installations: land based nuclear power plants, research reactors, nuclear fuel fabrication facilities, enrichment facilities, conversion facilities, reprocessing facilities and spent fuel storage facilities."	The current wording of paras 1.14 and 10.1 is incompatible to each other. According to the IAEA Safety Glossary (2007), conversion fa-cilities are not consid-ered as nuclear instal-lations. Para 1.14 (1st sentence) suggests that DS417 does not pro-vide guidance for con-version facilities, while para 10.1 (3rd bullet) refers to them. More-over, para 10.1 (2nd bullet) includes all types of spent fuel storage facilities (col-located with NPPs or independent), while para 1.14 only refers to independent storage facilities, in contradic-tion to the definition of nuclear installations in the IAEA Safety Glos-sary (2007).	**Y**	1.14 and 10.1are rewritten consistently with the Glossary.		
6	1.14	[...] This Safety Guide addresses an extended range of nuclear installations ~~as defined in Ref.[7]~~ including land based stationary nuclear power plants, [...]	There are some other types of nuclear installations that might be addressed by this Safety Guide, e. g. conversion plants, waste storage facilities, near-surface disposal facilities.	**Y**	1.14 and 10.1are rewritten consistently with the Glossary		

7	1.15 (page 4)	Instead of "long term operation" the term "life time extension" should be used.	Clarification			**X**	IAEA NS use the concept of "**long term operation**" instead of "life time extension".
8	1.16 (page 5)	last but one line: replace reference [10] by [7]	cited ref. [10] is wrong	**Y**			
9	1.16	Section 7 provides information for measures to protect the site against hydrological ~~and meteorological~~ hazards.	The current wording is not consistent with the contents of Section 7 which only deals with hydrological hazards. Delete the words "and meteorological" in the 6th sentence ("Section 7 provides ...") or revise Section 7 in a way that it also deals with meteorological hazards.	**Y**			
10	2.7 (page 7)	3rd line: „… are the following (Ref. [1], paras 3.11 to 3.17): …"	cite ref. [1] in this para (compare with citation in para 2.8)	**Y**			
11	2.10 (page 7)	4th line: replace „tornados" by „tornadoes"	misspelling	**Y**			
12	2.11	- / -	Criticality safety is an important issue in nuclear installations managing fissile material. Anywhere in the subsection "Hydrological hazards" (perhaps after Para 2.11) the moderating effect of water for fissile material should be dealt with.	**Y**	The text was added after the paragraph 2.13. *"Also, the effect of water on the criticality of fissile materials in some nuclear installations may be considered."*		

13	2.18 (page 9)	add 3rd sentence: „… significant changes. In this regard, Section 8 provides further guidance.“ alternatively, move this para to Section 8 (which explicitly deals with changes of the hazard with time) and merge its content with para 8.2	avoidance of duplica-tions in content (the same wording is used in para 8.2)	**X**	The content of 2.18 was modified as follows, in order to avoid duplication: *Climatic variability and change may have consequences on the occurrence of meteorological and hydrological extremes. Over the lifetime of the installation, it is possible that the climate at the site will undergo significant changes* In addition para 2.37 provides reference to Section 8.		
14	2.27/8	… all involved uncertainties should be evaluated and assessed (uncertainty and sensitivity analysis),	relevant uncertainties should be modelled due to their sensitivity (effect on the results).			**X**	The proposed comment is redundant with the text of the paragraph 2.34 (new 2.36) . (The paragraph in question was moved to a new para 2.33.)
15	3.20 (page 20)	last line: „… as required in Ref. [1, 3].“	cite also ref. [3] in this para; recommenda-tions how to fulfil the requirements for an on-site meteorological ob-serving programme are presented in NS-G-3.2	**Y**			
16	3.23 (page 20)	subpara (2): replace „para 3.10“ by „para 3.9“	cited para 3.10 is wrong; historical data are mentioned in para 3.9	**Y**	The text was modified as “*Historical data as mentioned in para 3.9*”		

17	4.2/6	… … As the distributions are used in graphical form typical characteristics (parameters, subpopulations) can be obtained. For example: the Fisher-Tippett distribution results in a straight line when plotted on a special template; the curvature at the extreme …	Better to understand.	**Y**	The two sentences were deleted.		
18	4.3/6	… . Due to data uncertainties interval estimation might be superior to point estimation methods.	Uncertainties depending on the sample size e.g.			**X**	The comment is wise, but it goes too much in detail in the comparison with what explained in the paragraph.
19	4.6 (page 28)	3rd line: replace „paragrphs“ by „paragraphs“	misspelling	**Y**			
20	4.7 (page 28)	2nd sentence: replace „2.26 to 2.28“ by „2.24 to 2.26“	cited paras 2.26 - 2.28 are wrong; statistical methods are described in paras 2.24 - 2.26	**Y**			
21	4.13/1 et al.	…(paragraph 3.19 to 3.21)…	reference incorrect	**Y**	Para. numbers changed to: *3.19 to 3.21 …. 3.14 to 3.18*		
22	4.13/7 et al.	…verified by means of the on-site programme (e.g. statistical tests).	What are the means of the on-site programme, statistical tests?	**Y**	The last sentence of the para was redundant and deleted. Statistical test is already mentioned in the beginnning of the para 4.13.		
22	4.16 (page 30)	2nd sentence: replace „2.26 to 2.28“ by „2.24 to 2.26“	cited paras 2.26 - 2.28 are wrong; statistical methods are described in paras 2.24 - 2.26	**Y**			
23	4.20 (page 31)	3rd sentence: replace „2.26 to 2.28“ by „2.24 to 2.26“	cited paras 2.26 - 2.28 are wrong; statistical methods are described in paras 2.24 - 2.26	**Y**			

24	4.41 (page 35)	4th line: the abbreviation PMTC should be specified (PMTC means Probable Maximum Tropical Cyclone)	the abbreviation PMTC is not defined or used elsewhere; analogy to PMP = Probable Maxi-mum Precipitation (see footnote 13, p. 31) and PMT = Probable Maxi-mum Tsunami (see A.2-21, p. 111 and A.2-32, p. 113)	**Y**	Accepted. Text was modified as follows. "*General methods are given for the evaluation of the relevant parameters of the tropical cyclones*".		
25	4.48 (page 37)	last but one line: replace „lattitude" by „latitude"	Misspelling	**Y**			
26	4.61 (page 39)	2nd sentence: „They are usually ~~a~~ less intense phenomena …"	Misspelling	**Y**			
27	5.3 (pages 42-43)	3rd line (p. 43): delete „(see also Ref. [4])" or replace the reference number	cited ref. [4] seems to be wrong (NS-G-3.3 does not refer to severe storms)	**Y**			
28	5.17 (page 46)	last line: replace „footnote 16" by „footnote 17"	cited footnote 16 is wrong; deep-water waves are defined in footnote 17 (p. 44)	**Y**	The new draft text refers to the revised footnote number : 21		
29	5.20 (page 47)	last line: replace „Section XX" by „paras 6.6 to 6.18 and Annex 1, Part 3"	combined event probabilities are considered in Section 6 (paras 6.6 - 6.18) and Annex 1, Part 3	**Y**	The text was modified as follows. *"Considerations in relation to combined event parameters are in Annex I."*		
30	5.65 (page 58)	1st line: replace „ahould" by „should"	Misspelling	**Y**	done		
31	5.78 (pages 60-61)	1st line: „According to the IAEA Safety Requirements NS-R-3 [1], …"	cite ref. [1] appropriately	**Y**			

32	5.107	[…] A second important aspect is that such events appear abrupt without advance warning.	Maybe a sentence like this could be added to the paragraph, because this is an important feature of such hazards.	**Y**	Accepted with modification. The text was modified as follows. "*... the latter may generate a wave of great height moving downstream at high speed which can arrive at the site with short warning time.*"		
33	5.116 (page 68)	last line: replace reference [2] by [4]	cited ref. [2] is wrong; evaluation of seismic hazards is covered by NS-G-3.3	**Y**			
34	6	- / -	By the revision a more balanced treatment of the two main subjects (meteorology, hydrology) of the Safety Guide shall be achieved. A revision of Section 6 should be considered. There are only four paras dedicated to meteorological design basis parameters but 14 paras for the hydrology.			**X**	This Safety Guide is a result of merger of the two previous safety guides. Annex 1 of this safety guide was prepared to balance the two topics with more details about meteorological hazards.
35	6.2 (page 73)	4th line: replace „withy" by „with"	Misspelling	**Y**			
36	6.3 (page 73)	2nd line: replace „poor air quality" by „freezing precipitation and ice storms"	consistency with paras 2.8 and 4.64 regarding the site-specific meteorological phenomena that could affect the safety of the nuclear installation; it is not clear how poor air quality may influence the design basis of a nuclear power plant	**Y**	The para was modified as follows. "Other site specific meteorological conditions that should be considered in a plant design and operating basis (*such as dust storms and sandstorm, hail, freezing precipitation*) should be identified as well."		

37	6.6/4 et al.	…by the product of their individual probability functions. If the processes cannot be assumed to be independent Bayesian theory [MAR82], [HAM08] or Markov models might be applicable methods.	An alternative should be given.			**X**	The proposed modification is too specific.
38	6.20 (page 77)	3rd line: replace „structres“ by „structures“ last line: replace „compenents“ by „components“	Misspelling misspelling	**Y**			
39	7	- / -	At the moment this chapter deals with hydrological hazards only. We strongly recommend adding some paragraphs on meteorological hazards.	**Y**	An explanation is given at the end of para. 7.1: *For practical reasons, most site protective measures deal with flooding hazards rather than low water or meteorological hazards.*		
40	7.6 (page 79)	last line: replace reference [6] by [8]	cited ref. [6] is wrong; text refers to NS-G-1.5(para 10.10)	**Y**			
41	7.8 (page 79)	last line: replace „in a previous section“ by „paras 5.100 to 5.102“	erosion by floods is treated in Section 5 (paras 5.100 - 5.102)	**Y**			
42	7.9 (pages 79-80)	last line (p. 80): replace reference [6] by [8]	cited ref. [6] is wrong; NS-G-1.5 deals with design methods relevant to the phenomena mentioned in this para	**Y**			
43	7.11 (page 80)	4th line: replace „paras 13.5 (a) and (b)“ by „paras 7.5 (a) and (b)“	cited para 13.5 does not exist; text refers to para 7.5	**Y**			

44	7.24 (page 83)	last line: replace „a meteorological events“ by „a meteorological event“	Misspelling	**Y**			
45	8.3	Annex 4 gives information on the content of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4), and the likelihood of global future trends based on projections for the 21st century using green-house gases (GHGs) emission scenarios and different climate models.	It should be highlighted that IPCC focuses on global climate change. For site assessments regional or even local studies are necessary.	**Y**	Accepted. Para 8.3 was modified as follows. “Annex 4 gives information on the content of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4), and the likelihood of future *global* trends based on projections for the 21st century using green-house gases (GHGs) emission scenarios and different climate models. *Regional trends could be different from the global projections. Therefore, regional models are preferred, if available. Results for the distant future are still affected by large uncertainties resulting from both GHG emission scenarios, and climate models. Local observations should be used for statistical analysis to account for observed trends and could be used for extrapolation to evaluate*		

					extreme parameters in the short term (a few decades)."		
46	8.5	The results of ~~the most recent IPCC AR investigations and other pertinent studies, including~~ regional climate odelling should be used to analyse the possible impacts of climate change on nuclear installations, […]	IPCC deals with global climate change. AR4 cannot be applied for local predictions, because the results of regional or local studies may differ **significantly** from the global projections (although in general they are based on the IPCC Working Group 1 reports). Therefore, for site specific assessments other studies **have to be** used.	**Y**	Para 8.5 is included in 8.3. See answer to comment 45, above.		
47	8.6 (page 85)	- / -	General comment: Numerical models do only provide reasonable results and predictions, if the underlying physical processes are sufficiently understood. This is currently not the case with re-gard to our climate.	**Y**	Para 8.5 (previously para 8.6) was modifies as follows. "To account for future climatic change, an additional safety margin should be taken into consideration in the design of nuclear power plants. Periodic re-evaluation of design parameters should be performed as uncertainties affecting estimates of future climate extremes are reduced or observed trends show evidence of more climatic extremes (see Annex 4)."		

48	8.9/3	… basins, including estuaries. The forecast models themselves should be verified and modified as the forecast data are significant different to the real obtained data.	Models for forecasting should be extended with each real dataset. Bayesian theory [MAR82], [HAM08] might be an applicable method.	**Y**	The following sentence is added; *The forecasting models should be updated if necessary.*		
49	9.1 (page 86)	2nd bullet: replace reference [5] by [9]	cited ref. [5] is wrong; periodic safety review of nuclear installations is covered by NS-G-2.10 (or DS426 respectively)	**Y**			
50	9.8 - 9.21 (pages 87-90)	- / -	General comment: Tsunami warning systems are described in detail. Are there dedicated warning systems for hazardous meteorological phenomena (e.g. thunderstorms, tornadoes, hurricanes, typhoons, tropical cy-clones) which could also be presented in this section? With regard to hurricanes, the monitoring and warning system of the U.S. National Hurricane Center (NHC) may be a good example. Link: http://www.nhc.noaa.gov/	**Y**	Para 9.7 was modified and meteorological warning system added.		
51	9.11 (page 88)	4th line: delete „(see reference [11])“ or replace the reference number	cited ref. [11] seems to be wrong (GS-G-3.1 does not fit to the con-tent of this para)	**Y**	Referred to Annex 3		
52	9.17 (page 89)	3rd line: „If a site ~~a~~ is located close to …“ last line: replace „monitoring an dwarning“ by „monitoring and warning“	Misspelling typing error	**Y**			

53	10.10 (page 93)	subpara ©, 1st bullet: replace „hazardassessment“ by „hazard assessment“	missing space charac-ter	**Y**			
54	10.11 (page 93)	Put into Glossary	last line: the term „facility importance factor“ should be appropriately defined or explained. It is not clear how a facility importance factor should be included in the meteorological and hydrological hazard evaluation	**Y**	Para 10.11 is deleted; it duplicates 10.10 (a) where there is no reference to importance factor.		
55	11.3 (page 94)	3rd line: replace references [8] and [9] by [10] and [11]	cited ref. [8] and [9] are wrong	**Y**			
56	11.12 (page 95)	4th line: replace references [8] and [9] by [10] and [11]	cited ref. [8] and [9] are wrong	**Y**			
57	ref. [9] (page 97)	add footnote 35 with following text: „Under revision process with code DS426.“	NS-G-2.10 is being revised under DS426 (compare with footnote 34 attached to ref. [4])	Y			
58	ref. [13] (page 98)	add footnote 36 with following text: „Under revision process with code DS414.“	NS-R-1 is being revised under DS414 (compare with footnote 34 attached to ref. [4])	Y			
59	Annex 1	- / -	This Annex should be revised (supplemented), because many parameters refer to operation basis events not to safety relevant (extreme) events.	Y	Annex 1 in the revised text includes only those parameters which are discussed and treated in this guide, and they are safety relevant meteorological events.		

60	Annex 1 Part 1 Page 101	Maximum wind speed resulting from passage of a tornado having a 0.01% annual frequency of being exceeded (10 000-year mean recurrence interval).	Definition should correspond to criterion	**Y**			
61	A.1-2./1 et al	… established probability of exceedance over XXX years …	XXX: Time period, reference time?	**Y**	Part 3 of the Annex is deleted.		
62	A.1-3 (pages 102-103)	replace the 3rd bullet (p. 103) by a new subpara (d): „(d) Combination D: …“	consistent numbering of the proposed combi-nations A - D of events	**Y**	Part 3 of the Annex is deleted.		
63	A.2-32 (pages 113-115)	subpoint 5. (p. 114): the correct number of the cited Regulatory Guide is probably 1.26 instead of 1.27	typing error (compare with subpoints 4., 6., 7. of this para and ref. [A.2-13] at p. 118)	**Y**	The Reg Guide number is 1.27. Corrected in A.2-32 subpoint 5		
64	ref. [A.2-10] (page 118)	replace „NUREG/CR-6996“ by „NUREG/CR-6966“	typing error (compare with paras A.2-26 and A.2-28); Link to the NRC document: http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr6966/	**Y**			
65	A.3-14 (pages 121-122)	last but one line (p. 122): replace „gage“ by „gauge“	misspelling	**Y**			
66	A.3-11/2	Reference is marked “yellow”		**Y**			

67	Annex 4	- / -	We recommend deleting Annex 4, because IPCC deals with global climate change. AR4 cannot be applied for local predictions, because the results of regional or local studies may differ significantly from the global projections (although in general they are based on the IPCC Working Group 1 reports). Therefore, this annex does not provide information helpful for site specific assessments/measures.			**X**	The question of local predictions is referred in the answer to comment 45, above. The Annex give general trends on climate change which are useful to formulate the problem.

Literature

[HAM08] Hamada, M. S. et al. 2008. Bayesian Reliability. Springer.

[MAR82] Martz, F. M. & Waller, R. A. 1982. Bayesian Reliability Analysis. John Wiley & Sons.

Title: DS417 Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (Draft 01.01) (MS Comments by 26March 2010)

COMMENTS BY REVIEWER Reviewer: Page 1 of Country/Organization: **JAPAN** Date:22 Feb.2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
1 - 2	2.7/7 and 2.12/7	-Waterspouts (see para. 4.59 for definition)	For user friendly.	**Y**	A footnote was added to para 2.12 referencing the para where the definition is given.		
3	5.61/3	'length and width' shall be added between 'position' and 'depth'.	Completeness. Fault length and width are lacking in parameters. They are more important than the other parameters of depth, strike, dip, slip angles.	**Y**	The text was modified as follows. ". . . *the fault position, length, width, depth of upper edge, strike direction*".		
4	ANNEX 2 Part 1 A.2-15	Add the following sentence at the end of the paragraph; Other peripheral phenomena such as sediment sand movement, inundation via adjacent river and ground uplift/subsidence due to the fault movement are required to be evaluated according to site condition.	Add phenomena which are required to be evaluated according to the site condition.	**Y**	New para was added: *"A.2-16. Other associated phenomena such as sand sediment movement, inundation via adjacent river and ground uplift/subsidence due to the fault movement are required to be evaluated according to specific site conditions."*		
5	ANNEX 2 Part 1 1.2.8 Heading	Change the heading as follows; 1.2.8 Evaluation of peripheral phenomena with tsunami	Due to the modification on para. A.2-15, change the heading accordingly.	**Y**	It was changed the heading to: "*1.2.8. Evaluation of other tsunami associated phenomena"*		

Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations DS 417

COMMENTS BY REVIEWER Reviewer: PAEC Country/Organization: **PAKISTAN** Date:March 03, 2010				RESOLUTION			
Comment on	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modif./rejection
1 Objective	1.8 (last sentence)	The objective of this Safety Guide is to provide recommendations and guidance…….this type of hazards. Meteorological hazards are associated with extreme……phenomena. Hydrological hazards are associated with flooding events (both at coastal and river sites), atypical waves, and low water conditions.	This standard covers nuclear installations both at coastal and river sites.	**Y**	This sentence refers to external flooding phenomena **in general terms** and it is not restricted to the coastal or river location of the sites. Old para 1.8 is now para 1.6: "*Meteorological hazards are associated with extreme meteorological conditions and with rarely occurring hazardous meteorological phenomena. Hydrological hazards are associated with external flooding events, including a number of associated phenomena and low water conditions.* .".		
2 Meteorological hazards	2.6	In this Safety Guide the following meteorological variables are considered: −Air temperature −Wind vector −Precipitation (liquid equivalent) −Snow pack −Sea water level −Humidity −Air pressure	'Sea water level humidity' and 'air pressure' are also meteorological hazards. Wind vector may be written instead of wind speed as the wind vector is a combination of wind direction and its speed.			**X**	The para intends to indicate the outline of the remainder of this Safety Guide dealing with **external hazards to the installation**. The parameters given in the comment are included, as necessary, in different paragraphs in Section 3, 4 and 5. Humidity and wind direction were specifically added in 3.11 as

							information to be collected.
3 Hydrological hazards	2.12	Other hydrological phenomena that can cause hazards to the installation and which should be considered include the following: (a) water level rising upstream or falling downstream by, for example, an obstruction of a river channel by, landslides, ice jams caused by logs or debris, or lava or ash or other volcanic materials. (b) (c) (d) (e) (f) (g) (h) direct rainfall on the site: It is the most severe drainage load at the site and effects should be taken into account in the design of site drainage system.	Direct rainfall on the site may also be added as it is also a hydrological phenomenon that could cause hazard to the installation.	**Y**	The intent of the comment is already duly considered in paragraphs 5.79-.81, 7.22 and 7.23, which are dealing with specific hazard assessment and design considerations for the case of **direct rainfall at the site**. The case of "***Extreme precipitation"*** is also included in Paragraph 2.11 and it is considered that it covers also these phenomena in general terms.		
4 Extreme Meteorological Phenomen	4.4	The meteorological variables for which extreme values should be determined are the following as indicated in Section 2: −Air temperature −Wind vector −Precipitation (liquid equivalent) −Snow pack −Sea water level −Humidity −Air pressure All data should include information on the data ("metadata").	Hazard assessment for the Sea water level humidity and air pressure is required like other hazards. Wind vector may be written instead of wind speed as the wind vector is a combination of wind direction and its speed.			**X**	Same reason to the response to the comment on para 2.6 Humidity and wind direction were specifically added in 3.11 as information to be collected.

DS 417 Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations

Reviewer E.G. Bugaevт Pages 4 Country/Organization: **Russian Federation/SEC NRS** Date: 12.03.2010				Resolution			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.7 / l - line 8	To add item 2.7 below the line 7: «- dangerous rime phenomena, including ice-covering and ice-hoarfrost depositions (granular and crystal hoarfrost, complex deposition with a slash).	Dangerous rime phenomena should be considered in evaluation of the territories for nuclear installations located in severe climatic conditions.	**Y**	Included in 2.8 in the following way: *Freezing precipitation and frost related phenomena* And modification of 4.71 "*Ice due to freezing rain, snow, rime, and in-cloud icing is known to cause increases in dead loads and response of structures. Important effects are related to significant increases in the static and dynamic response to wind action for conductors in transmission lines. Similar but usually less pronounced effects should be frequently expected under winter conditions in steel trusses. In addition the formation of ice in cooling systems may affect their efficiency.*"		

2	2.11 / line 9	To add item 2.11 below the line 8: «- dangerous ice phenomena in water reservoirs and watercourses (ice blockages, ice jams, brash ice, ice drifting, frazil ice drift)».	Dangerous rime phenomena should be considered in evaluation of the territories for nuclear installations located near water reservoirs and watercourses of northern and southern hemispheres.	**Y**	2.12 (a) was modified as follows: "*water level rising upstream or falling downstream by, for example, an obstruction of a river channel by landslides or by jams caused by ice, logs, debris, or volcanic materials;*"		
3	2.11 / line 10	To add item 2.11 below the line 9: «- tides».	Tide processes should be considered in evaluation of the territories for nuclear installations located near to the seas and oceans.			**X**	Of course, tide is to be taken into account in the Guide (see 5.2 and 6.7); It is not included in 2.11 it is not considered as an hazard, per se, but in combination to the preponderant hazards listed in 2.11
4	4.65/ line 6	To add item 4.65 below the line 5: «–Dangerous rime phenomena.	Dangerous rime phenomena should be considered in evaluation of the territories for nuclear installations located in severe climatic conditions.	**Y**	The line 5 of 4.65 is modified as follows. *Freezing precipitation and frost related phenomena*		
5	4.75 / below item 4.74	To add Section 4 with item 4.75 «- dangerous rime phenomena include ice-covering and ice-hoarfrost depositions (granular and crystal hoarfrost, complex deposition with a slash)».		**Y**	4.74 was modified as follows: "*If relevant to the site, the results of a hazard assessment for freezing precipitation and frost related phenomena should include a nominal ice thickness and a concurrent wind speed*."		
6	5.139 / below item 5.138	To add Section 5 with item 5.139 ««- dangerous ice phenomena in water reservoirs and watercourses (ice blockages, ice jams, brash ice, ice drifting, frazil ice drift)».	Dangerous rime phenomena should be considered in evaluation of the territories for nuclear installations located near water reservoirs and watercourses of northern and southern hemispheres.	**Y**	This safety guide considers rime and ice conditions in para 5.126 and 5.127. And see also the response to the comment No. 1.		

7	5.140 / below item 5.139	To add Section 5 with item 5.140: «– Tides may be presented as a slow massive and well predicted process. Characteristics of sea tides in NPP location are significant from the point for specification of water fluctuation level which is important for the purpose of design of coast hydraulic facilities and coast guard, transportation and effluent dispersion in water reservoir».	Tide processes should be considered in evaluation of the territories for nuclear installations located near to the seas and oceans.			**X**	Same reason as the response to the comment No. 3.
8		In general, due to the document it is possible to note that in its structure so important and actual characteristic as aerologic conditions and the list of adverse aerologic parameters which are critical during NPP operation are not available.	Aerologic parameters in NPP design practice are applied with meteorological ones. In the period of operation the adverse aerologic conditions may become critical in cases of design basis and beyond design basis accidents.			**X**	The comment needs clarification (no parameter of aeorology with hazards to nuclear installation was given).
9		Due to the document it is possible to note its general structure, actual lack of concrete recommended determination methodologies of calculation parameters of rare recurrence.				**X**	It is not the aim of the Safety Guides to provide specific methodologies. The objectives of the Safety Guide are to inform the reader of hazards to nuclear installations.

Head of the Division of Stability Against External Impacts **E.G. Bugaev**

TITLE: DS – 417, ”Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations”

COMMENTS ON CHAPTERS 1 TO 3 BY REVIEWER Reviewer: José G. Sánchez Cabañero. Country/Organization: **SPAIN/Consejo de Seguridad Nuclear – CSN** Date: 03.24.2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Para. 1.8	To include *groundwater* in the third line as indicated: … meteorological and hydrological (**including groundwater**) phenomena…	Hydrological hazards also are associated with groundwater levels, flow regime or geological media (e.g.: groundwater infiltration into buildings, or foundations ageing from groundwater medium). In general, the hydrogeological point of view is poor referred in this draft.	**Y**	The last sentence of Para 1.8 (revised 1.6) is modified “Hydrological hazards are associated with flooding events, *groundwater,* waves, and low water conditions.”		
2	Para. 1.11	To include *historical records* in the line seven as indicated: … to take in account the changes of the site characteristics, **historical records**, regulatory approaches,…	Historical records grown with events occurrence or new past evidences.	**Y**	The sentence was changed as follows 9new para number: 1.9). “*Site evaluation continues throughout the entire life of the NPP to take into account the changes of the site characteristics, operational records, regulatory approaches, evaluation methodologies and safety standards.”*		
3	Para. 1.13	To include ending the paragraph: **Characterization of hydrogeological medium is**	Necessity of clarification for consistency with § 2.28 content.			**X**	Transport of radioactive material is treated in the reference [3], and not in the scope of this guide.

		into scope of this guide.					
4	Para. 1.15	To include: "These differences could arise by the use of new data with revised methods performed in response to new regulatory requirements or **mandatory following an new event with low probability of occurrence**."	It is obvious.	**Y**	The text was modified in response to the comment. *"These differences could arise by the availability of new data, methods or requirements. This may indicate a need to assess the safety of the existing installations on the re-evaluated site for newly defined external hazards as recommended in this Safety Guide."*		
5	Para. 2.1	To add in last paragraph: …; and extreme groundwater levels **or flow regime changes**.	To see comment No. 1.			**X**	Hazardous effects of flow regime changes are already included in extreme ground water level phenomena.
6	Para. 2.4	To include in the line five as indicated: "Causes include, **water evaporation**, rainfall deficit, channel obstruction…"	Water evaporation by high temperature is a cause that could affect the ability of safety systems like UHS. If supply water is carbonated, large evaporation of Essential Service Water stored in open pounds, raises salt concentration content, increasing possibility of scaling (salt precipitation) en heat exchangers (SO4) and cooler towers (CL^-).	**Y.**			

7	Para. 2.7	To include as hazardous phenomena: **Anticyclone extended in time**.	Anticyclone extended in time is a phenomenon related with vulnerability of UHS cooler capacity. Especially critical in dry countries for high temperatures and reduction of usual on hand water. If it happens in summer, then temperatures are increased, becoming high evaporation rates, low flow in rivers or low levels in groundwater or lakes.	**Y**	The result of the phenomena is considered as droughts in paras 4.8, 4.11 and 4.23. In addition, a footnote is added under para 2.7 "Other meteorological phenomena not addressed in this Safety Guide may require consideration on a site specific basis".		
8	Para. 2.9	To include ending the paragraph: **In any case, exceedance of parameters values related with plant design basis, declaration of emergency levels, or Technical Specifications, should be measured by appropriate instrumentation.**	Instrumentation should be able to monitoring safety related parameters. Also to review in same way the § 3.22	**Y**	The need of continuous monitoring of the site is mentioned in para 9.1.		
9	Para. 2.12f	To add: (f) variation of groundwater level **or flow regime**.	To see comment No. 1.			**X**	See the response to the comment No.5.
10	Para 2.13	To add: … systems and components by the infiltration of **superficial water or groundwater** into internal areas of the plant.	To see comment No. 1.			**X**	The paragraph intends to give general description of infiltration of water, regardless of any specific path of infiltration.

11	Para 2.14	To add ending the paragraph like another example: **Sediments or chemical precipitation cans also blockage groundwater drainage systems, even obstruct heat exchangers.**	To see comment No. 6.	**Y**	Partially accepted, regarding the sediment, the text was modified accordingly. The effect on heat exchanger is not considered since the cause of flooding, not the effect, is emphasized in the Safety Guide.		
12	Para 2.15	To add ending the paragraph: **Groundwater could affect soil or anthropogenic backfill stability, causing surface collapse or building tilting.**	Plants with foundations under groundwater level are vulnerable of infiltration into buildings, or mat ageing from groundwater medium. If vulnerability discovered it is necessary lowering the water level by permanent pumping, resulting slow extraction but continuous of sediments.	**Y**	The following sentence is added to Para 2.13: *Groundwater may also affect soil or backfill stability.*		
13	Para 2.17	Transfer last sentence to § 2.13: "Special attention should be paid to flooding induced by rising of the groundwater level as a consequence of influence of the sea, or a river, **or a rainfall**.	To be consistent with the paragraph context.	**Y**	The sentences of para 2.13, 2.15 and 2.17 were improved. In addition, the idea of the comment is already covered by para 2.12(f) and the discussions in the Section 5.		
14	Para 2.22	To replace "describe" for **characterize**	To describe is an imprecise word.	**Y**			

15	Para 3.5	To replace "the end of the operational stage" for **the site is free of nuclear installations**, or another equivalent sentence.	Spite nuclear installation life, it is important to monitor safety site parameters while the site is really nuclear.	**Y**	Para 3.5 was modified as follows. "*The collection of data and information should be continued during the lifetime of the installation and up to the end of the safety related tasks of the decommissioning phase, in order to allow the performance of periodic safety reviews*."		
16	Para 3.7	To include as new paragraph or add this sentence ending this paragraph: **Parameters important to safety like dry-wet-bulbo air temperatures, or UHS water temperature, should be monitored close to relate safety structures, as cooler towers or cool pipes of Essential Service Water.**	Data obtained from the meteorological tower can be very different if sensors are far of structures related with safety.			**X**	The para 3.7 is related to the duration of the monitoring. Monitoring on safety related parameters is considered in Chapter 9.
17	Para 3.19	To add ending first sentence: "As early as possible… on-site meteorological observing program should be established **taking account the location of safety related structures like UHS cooler towers**".	To see comment No. 16.			**X**	Meteorological observing programme intends to define the site conditions.

18	Para 3.22	To add ending the paragraph: **In any case, instrumentation should be capable to measure threshold values established in Emergency Plans or Technical Specifications.**	To see comment No. 8.			**X**	3.22 doesn't refer to the monitoring instrumentation. Para 9.1 addresses this point (see answer to comment No 8)
19	Para 3.27	To correct the sentence: In addition, information should be obtained on geological ~~framework~~ **medium and anthropogenic backfill** within which groundwater occurs.	It is very important to include backfill locations and his characterization.	**Y**	The text is modified as follows. "*In addition, information should be obtained on the geological conditions related to groundwater*."		
20	Para 3.31	To add: Hydrogeological ~~information~~ **parameters from geological media and anthropogenic backfill, such as permeability and porosity, or flux trend,** in the vicinity of the site. To add ending the paragraph: **In general, all required information or data on groundwater should be managed in a rationale way by means of a hydrogeological model**.	Level of ground water is not the only parameter important to monitor. Also it is very important to analyze all data by developing a hydrogeological model of the site, including geological media and anthropogenic backfill characterization.	**Y**	Para 3.31 was modified as follows. "*Hydrogeological data from geological media and backfills, such as permeability and porosity, should be collected in the vicinity of the site. Groundwater measurements should be obtained as follows :*" Hydrogeological model is discussed in a separate chapter (para 5.136).		

21	Para 3.33	To include: **anthropogenic backfill**	Anthropogenic backfill is other type of medium, and his characteristics and location can be high influence on groundwater behaviour.	**Y**	The second bullet under para 3.11 was modified as follows. "*Information should be obtained on anthropogenic influences, such as location and magnitude of groundwater extraction, artificial recharge and backfill.*"		

TITLE: DS – 417, ”Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations”

COMMENTS BY REVIEWER Reviewer: P. Carboneras (ENRESA). Country/Organization: **SPAIN/ENRESA** Date: February 2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Para. 1.14	Please double check the following wording *“…in accordance with the potential radiological consequences of their failure when subjected to seismic loads.”*	Likely the intention of this phrase is not to refer to the failure when subjected to seismic loads but to the failure when subjected to meteorological and hydrological events.	**Y**	The text “*when subjected to seismic load*” was deleted.		
2	Para. 2.19	The sentence saying that deterministic and probabilistic methods “*are seen as complementary, with each filling a specific role*”, might be interpreted as if both, meteorological and hydrological hazards assessments, are required for the site evaluation of a nuclear installation Later, it reads: “*Whatever method is used…*” that suggests that the site evaluation can use any of the methods. In conclusion, it is not clear the position with respect to the scope of the assessment.	It would convenient to clarify the intention of these sentences within the Safety Guide to this respect.	**Y**	The para is included in the Section on “GENERAL CONSIDERATIONS” in which is not intended to provide recommendations using the “should” statements, but just to inform on the status of the practice. Therefore, the para was modified to avoid confusion as requested by the comment, as follows: *“Hazard assessment methods are often broken into two broad approaches, deterministic methods and probabilistic methods. In the meteorological and hydrological fields, these two approaches are implemented as explained in the following paragraphs.”* Moreover, the last sentence was moved to para 2.32.		
3	Para. 2.20	Footnote 2 has no meaning in the context of this Safety Guide	Hopefully it is not the intention to refer to seismic hazards	**Y**	The footnote was deleted.		

DS 417 Meteorological and Hydrological Hazards for Site Evaluation for Nuclear Installations (Draft 01.01, 18/11/2009)
FOR OFFICIAL MEMBER STATES COMMENTS

COMMENTS BY REVIEWER Reviewer: Country/Organization: **UK** Member States comments DS 417 Date: 24 March 2010				RESOLUTION			
CommentNo.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General		This is a well-written document, however our technical review is limited because of the specialist nature of the document.	**Y**			
2	General		The document might usefully include some commentary on whether and how the assessment might address the impact of the meteorological and hydrological events on the nuclear emergency response plans for the site, for example: ▪ Are such plans still viable under the adverse conditions assessed? ▪ Would the occurrence of the adverse weather event increase the likelihood that a nuclear accident might occur?			**X**	The interaction of meteorological and hydrological events with emergency plan is already mentioned in 2.3. The objective of this SG is to avoid significant increase in likelihood of accident
3	General		The interchangeability of the terms "nuclear facilities" and "nuclear power plants" should be considered in the document. We recommend that each reference to "power plant" be checked to see if it applies to other nuclear buildings or facilities.	**Y**	The term "installation" is no more appearing in Section 3 to 8.		

4	General		It has been known for sand to be carried to remote locations, such as sand from the Sahara being deposited in the UK. Does this require a mention in the document?	**Y**	It corresponds to dust storm phenomena described in paras 4.65 and 4.66. A footnote was added.		
5	Para 3.20	Delete "be" to read: "….programme should be used as part of an on-site.."	Superfluous text	**Y**			
6	Para 4.26	Consider including at this point in the document an allowance for the change of snow to ice.	Ice build-up under the snow due to thawing/freezing should be accounted for, especially in far north/south/high altitude locations, due to the greater density (weight) of ice.			**X**	Ice is considered in water-equivalent depth.
7	Para 4.26		Consider whether there should be a requirement to estimate the loading on the roof due to changes in temperature turning snow to ice. It should also be noted that snow has insulation qualities lacking in ice.			**X**	Same reason as the response to the comment No. 6.
8	Para 4.74		Should the effects of sub-zero temperatures on structures also consider the brittleness of the components? This could affect the loading due to ice, wind, etc.			**X**	The point is more design oriented. Minimum temperature is one of the design basis parameter
9	Para 5.38, 5th sentence	Modify to read: "Several large waves could be observed, the first one may not **be** the largest."	Improve English	**Y**			
10	Para 5.65, 1st sentence	Replace "ahould" with "should"	Typo	**Y**			
11	Para 5.137, 2nd sentence	Modify to read: "The analysis should then identify the predominant cause(s) and …"	Typo	**Y**			

12	Section 6 Determination of design basis parameters		This section covers nuclear power plants. Consider using the term "nuclear power plant" instead of "nuclear installation" in this section (eg paragraphs 6.2 and 6.19), as installation could be interpreted as any nuclear site.	**Y**	The word "installation" has been replaced by plant or power plant in this Section		
13	Para 6.2, 2nd sentence	Replace "withy" by "with"	Typo	**Y**			
14	Para 6.9, 1st sentence	Consider modifying to read: "The design basis flood for a given site may result not from the occurrence of one extreme event but from the simultaneous occurrences of more than one severe event, each of which is in itself less than the **resultant combined** extreme event."	Improve clarity. The additional text suggested improves the meaning of this sentence, which we assume refers to an event that is the cumulative effect of several severe events.	**Y**			
15	Para 6.9 and throughout	Replace "flood causing" with "flood-causing"	Addition of the hyphen improves the readability of this phrase.	**Y**			
16	Para 6.20	Modify to read: "The conditions resulting from the worst site-related low water level at the nuclear **installation** (eg low water resulting from tsunami, seiche, storm surge, drought, sedimentation) constitute the design basis low water conditions **to which** safety-related **structures**, systems, and **components** should be designed to maintain their safety functions."	Typos and improve readability	**Y**	6..15, new number of 6.20, modified as follows: *6.15 The minimum water elevation that the water surface reaches during one single hydrological event or a combination of hydrological events, such as tsunami, seiche and the associated duration of the draw-down, constitute the design basis low water parameters.*		

17	Para 7.5(b)	Consider adding the following text: "Levees, sea walls and bulkheads should be checked to ensure that water can leave the site, and that these external barriers do not act as a dam, prevent water release to rivers, etc."	The barriers may act in both directions, preventing water from either entering or leaving the site, in effect creating a "swimming pool" round the facility.	**Y**	The sentence is added to para 7.5(b).		
18	Para 7.6, 1st sentence	Modify to read: "…to ensure the capability to shut down the reactor **or other critical plant** and maintain it in a safe shutdown condition."	For completeness. This guidance could also apply to reprocessing facilities, etc.	**Y**	Modified as: "*…to ensure the capability to shut down the reactor **or other critical facility** and maintain it in a safe shutdown condition."*		
19	Para 7.13	Consider adding the following text: "Any changes which may affect the drainage of rivers, such as the construction of barrages or bridges, should be considered in the flow patterns of water from both the river and the sea."	Omission. A tidal barrage could affect the carriage of silt to sea, water levels, bores, etc.	**Y**			
20	Para 7.13-7.17	Consider adding the following text within the section "Stability of the shoreline": "Observed changes in the main stream course in deltas of rivers should form part of a review"	Omission. Rivers in sandy deltas can change course, which could affect movements of silt, etc.	**Y**	The first sentence of 7.13 is modified as follows: *Stability of the shoreline is an important factor in determining the acceptability of a site, in particular for sites on the shores of large bodies of water, or in deltas of rivers where changes in main course may occur.*		

21	Para 9.17, 3rd sentence	Modify to read: "…about the status of the monitoring and warning systems."	Typo	**Y**			
22	Para 11.8	Consider adding the following text: "The data produced by the use of such software is to be retrievable, based on the retention period required for that data."	This is to "future-proof" the retrieval of such data.	**Y**	Added the following at the end of the 11.8: *with associated input and output files*		

USA Comments on IAEA Draft Safety Guide
"Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations" DS417 (Rev 01.01)

COMMENTS BY REVIEWER Reviewer: United States of America Country/Organization: **USA - United States of America** Date: March 2010				RESOLUTION			
Comment No. / Reviewer	Para. / Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General	The draft guide is suitably detailed in scope and topics, with no major omissions. It does a good job of explaining why each hazard should be considered and in outlining an approach for collecting information on each hazard. The only aspect that could perhaps be given more explanation is described at right.	The report gives some specific guidance for selecting areas over which data should be collected or collated for certain hazards (e.g., 3.29 and 3.36), but perhaps a more general approach should be described in section 3. This would help users to determine how large an area surrounding a potential site should be considered for data collection.	**Y**	See text in paras 2.29, 3.4, 3.14, 3.22, and 3.27.		
2	General	Reference list should include broader technical input. Most references are existing IAEA safety guides. However, paragraph 1.4 contends significant new knowledge and experience has been gained in meteorological and hydrological topics.				**X**	References in SG should contain only IAEA documents. Other references are added to Annex or Appendices, if necessary.
3	Sections 3, 4, and 5	Make clear what is essential in the General Recommendations and General Procedures sections by adding appropriate words, such as, "shall" or "should".	Incorporating general considerations and recommendations into the body of standard is an interesting concept. In this format it can be distracting to those who need a sharp distinction between what is good to do and what is essential. Legal or contractual obligations and interpretations	**Y**	The text was checked. *Shall* is used only when Safety Requirements are quoted or mentioned. *Should* is generally used, except in General Considerations.		

			usually hinge on the essential elements of a standard.				
4	2.26 / 1	Define “nonstationarities”.	Clarification.	**Y**	The sentence was modified as follows. “*lack of stationarity due, for example, to climate change,…”*		
5	2.35	Delete this section or refer to it later in the standard.	This is the "recommendations section" and this paragraph does not offer much guidance and even seems to go off-topic.			**X**	This paragraph (new number 2.37) is consistent with the rest of related paragraphs in the Section in connection to treatment of the uncertainties and it is necessary.
6	Page 15 / footnote 5	Define “up-crossings”.	Clarity.	**Y**	The latter half of the footnote (new footnote number: 7) is modified as follows. *“However, simplified approaches may assist in establishing adequate load combination criteria.”*		
7	3.8 / 2	“…sufficient. Consequently other approaches, such as ~~paleological~~ paleoflood hydrological or geological analysis of the site, should be considered.”	Paleology is the study of (prehistoric) antiquities, while paleoflood hydrology is the study of flood-deposited sediments and botanical evidence preserved in rivers and their floodplains and geology is the study of the solid and liquid matter that constitutes the Earth. Both paleoflood hydrological and geological analyses of the site area could result in data regarding past tsunamis, while paleology would not.	**Y**	The text was modified as follows. “*other approaches, such as paleoflood analysis…*”.		

8	3.10	"~~The most~~ An important required action in response to the observed effects of climatic change is long term monitoring of environmental data and the correlation of the associated data with regional trends." Additionally, consider expanding the paragraph to provide examples of the types of environmental data that should be included in a monitoring program aimed at providing early warning about climate change impacts: regional trends in temperature, precipitation frequency and intensity, sea level rise (for coastal sites). Guidance on a time-scale for reviewing monitoring data would also be useful. Trends over one or two-years are generally not meaningful. Trends over decadal time-scales are more appropriate.	Improves the intent and provision of the standard.	**Y**	The text was modified accordingly. Text was not expanded in relation to monitoring, because monitoring is already addressed in the Chapter 9 and the interpretation of the effects of climate change is addressed in the Chapter 8.		
9	3.27	Add: " - Where possible, locations of field samples and measured data should be referenced to a standardized coordinate system to establish site baseline conditions that can be compared to subsequent studies performed during future plant operations, and long term monitoring."	Strengthens the usefulness of collected data.	**Y**	Because the idea is related to the project organization, the following sentence was added in para 11.3. *"Locations of field samples should be referenced to a standardized coordinate system."*		

10	3.33 / 3, 5, 8, 11	**Line 3:** "…phenomena <u>if appropriate to the site</u>:" **Line 5:** Define "sediment type". **Line 8:** "Landslide affects ~~to~~ <u>along</u> rivers ~~course~~". **Line 11:** "~~large~~ seismogenic structures <u>capable of generating fault displacements consistent with tsunami generation;</u>"	**Line 3:** Provides clarification and a limit to the necessary investigation. **Line 5:** Does sediment type imply a geological investigation – this will be undertaken for a site in any case, so perhaps reference guide or report that states that? **Line 8:** The effects of landslides on rivers are not solely restricted to changes in a rivers course. **Line 11:** Rapid fault displacements are the important factor to the generation of tsunamis by seismogenic structures.	**Y**	The text is modified in accordance to the comment. However the comment on line 11 is rejected because it is the list of tsunamigenic sources.		
11	3.36 / last bullet	"- ~~Eventual~~ topography modification due to recent crustal deformation."	This is unclear: Eventual due to recent? Do we mean "due to potential"? Suggest deleting the word "eventual".	**Y**			
12	3.37 / 7-8	"…until a water depth of approximately 100 m, with a spatial measurement interval of ~~at least~~ <u>no more than</u> ten of meters."	Resolution larger than 10m would be too coarse.	**Y**			
13	3.37 / 17	"~~Eventual topography modification due to recent crustal deformation~~".	As written, it is too vague to provide any useful guidance. It's probably not relevant to the vast majority of sites.	**Y**	Accepted, and related text under para 3.36 and 3.37 was also modified as follows: *Recent bathymetry modification, due, for instance, to a large earthquake*		

14	4.20	The precipitation record from gauges may in some cases be augmented by radar data.	National weather services are increasingly providing radar precipitation estimates that can compliment gauge data. This may be especially useful in areas where the density of gauges is insufficient.	**Y**	Accepted with modifications. The following sentence was inserted. "These data may be complemented by weather radar data."		
15	4.45 / 1-3	"The following data on the storm parameters for tropical cyclones should be collected: — air temperature at the top of the hurricane; — minimum central pressure;"	For a fixed sea-surface temperature, the hurricane intensity will increase as the temperature at the top of the hurricane decreases,			**X**	The point given by the comment is included in the fifth item of the parameters "vertical temperature and humidity profiles within the eye".
16	Page 49 / footnote 23	"The wave set-up is the temporary build-up of water level at a beach due to the ~~action of waves~~ breaking waves, which is to be added to the surge height."	Attributing setup to "wave action" is too vague.	**Y**	The text was modified accordingly.		
17	5.67	"…of ~~such kind of~~ a landslide-induced tsunami is limited around the source and generally not observed at more than…"	Clarifies the type of tsunami.	**Y**	Accepted.		
18	5.89 / 2	"…be assumed to be less because of increased ground ~~wetness~~ soil saturation leading to decreased infiltration. In many cases, losses are ignored…"	This is a more accurate description of the physical phenomena	**Y**	The text was modified as follows. "… *because of increased soil saturation leading to decreased infiltration.*"		
19	5.124 / 1-2	"The volume of water stored by the structure at the time of failure should be considered as the maximum possible ~~(e.g.; top of the flood storage pool)~~ coincident with the peak of flood."	Previous parenthetic statement is confusing and potentially unconservative.	**Y**	Accepted with modification (new number 5.123). "*The volume of water stored by the structure at the time of failure should be considered as the*		

					maximum possible. However, for seismically induced failure a normal water level may be considered since earthquakes and floods are not related events."		
20	5.134 / Section Heading	"~~FLOODING DUE TO~~ HIGH GROUNDWATER LEVELS"	To clarify that high groundwater levels may be of concern even if they do not result in surface flooding.	**Y**	Accepted with modifications. The headings of the Chapter 5 were modified accordingly.		
21	5.134	"High groundwater levels are of concern if they risk flooding inside the plant, or interfere with movement of personnel and equipment outside the plant. The groundwater level that would cause such problems should be ascertained before beginning the analysis of high groundwater levels. This level may be based on the design of the plant structures or on surface topography, and may be different in different parts of the plant. Analysis of high groundwater levels should be coordinated with the analysis of surface flooding, because surface flooding can cause some of the same undesirable effects as high groundwater levels. An increase in the ~~surficial groundwater level~~ groundwater level in the uppermost formation is generally a consequence of another phenomenon. For sites located near a river or coastal area, a rise in the groundwater level is generally related to an increase in the water level of the surface water bodies that are	To explain the purpose of examining possible high groundwater levels. To clarify that the concern is with near-surface groundwater that could cause flooding of the plant or problems with trafficability of land near the plant, and not, for example, with groundwater levels in deep confined aquifers. To clarify that the geological media are not the only factors affecting groundwater levels.	**Y**	Partially accepted. The first sentence was modified as follows (new number 5.133): *An increase in the groundwater level in the uppermost formation is generally a consequence of another phenomenon*." The last sentence was modified as follows. "*The range of yearly variations of ground water levels may vary from entimeters to tens of metres due, in particular, to the broad diversity of geological media*"		

		hydraulically connected to the aquifer. Additional phenomena, such as a large rainfall event or failure of a water control structure can also cause groundwater levels to increase. Groundwater level variations depend on soil and rocks properties, primarily soil permeability and porosity. Due to the broad diversity of geological media and of the hydrological phenomena that affect groundwater levels, the range of yearly variations of ground water levels may vary from entimeters to tens of metres."					
22	5.135	"The ~~groundwater level rising~~ probability of significantly high groundwater levels, and in particular the highest probable groundwater level, should be defined on the basis of a hydrogeologic study of the site to define the regime and the extent of groundwater bodies. The hazard should be assessed using either a deterministic or statistical hazard analysis. When using statistical approach, special attention should be paid to the reliability and the sufficiency of the piezometric data (see 3.31). Where onsite groundwater level measurements are limited in number or in the period they cover, consideration should be given to extending their record statistically by correlating observed groundwater levels with, for example, records of wells observed for longer periods and meteorological records."	To clarify that the concern is with significantly high groundwater levels, and not just with ordinary increases in groundwater level. To suggest additional approaches to quantifying onsite groundwater levels.	**Y**	Partially accepted. The first sentence was modified as follows. (new number 5.134): *The probability of significantly high groundwater levels* should be defined on the basis of a hydrogeologic study of the site to define the regime and the extent of groundwater bodies." The latter part of the comment was put in the text.		

23	5.136	"~~The use of hydrogeological modelling is recommended. However, in certain cases, the hydrogeologic conditions can make it possible to determine in a simple and conservative way the height delimiters of increase of groundwater level, without it being necessary to resort to modelling (e.g. physical limit).~~ Where possible, maximum probable groundwater level should be estimated using conservative assumptions about basic factors that control groundwater levels, for example surface topography, presence of highly permeable formations, and elevations of groundwater drains. Complex hydrogeological computer models should be used only when no better alternatives exist. The results of such models generally depend on many parameters whose values are poorly constrained, and modeled groundwater levels are likely to be sensitive to the values of some of these parameters. Consequently, modeled groundwater levels should be used with great caution when they are close to levels of concern. Models are generally fixed (calibrated) using observed water levels, which may not be representative of the levels likely to be reached at the time of an extreme event and are hence prone to be used in an operation range located beyond its field of verification. Thus it is necessary to justify the conservatism of the assumptions relating to the representation of the formations usually located above the watertable."	Uncritical use of models can easily lead to erroneous results.			**X**	The safety guide does not recommend the Maximum probable approach, the paragraph was modified for clarity as follows. (new number:5.135). *The use of hydrogeological modelling is recommended. In certain cases, the hydrogeologic conditions make it possible to determine in a simple and conservative way the physical limits of the groundwater level, without resorting to complex models. Models are generally calibrated using observed water levels, which may not be representative of levels that may be reached during an extreme event. Thus it is necessary to justify the conservatism of the assumptions of the model relating to the formations above the watertable."*

24	5.138	"~~Extreme rising are characterised by water level, associated pressure on structures and, if this level reaches the surface of the ground or any drainage device, water discharge rate and water volume.~~ High groundwater levels are characterized by the highest probable groundwater level, and, where feasible, by a statistical distribution of high groundwater levels. The potential harmful effects of high groundwater levels should be characterized. If groundwater levels are expected to reach the ground surface or the levels of groundwater drains, the expected discharge rate should be characterized, together with way in which the water will be discharged. The potential need for active dewatering, for example by wells, should be identified where appropriate."	To clarify the results expected from the assessment of high groundwater levels.	**Y**	The para. is modified as follows (new number 5.137): *The extreme groundwater levels at the site, and the associated pressures on structures, should be characterized. If groundwater levels are expected to reach the ground surface or the levels of groundwater drains, the expected discharge rate should be characterized, together with way in which the water will be discharged. The potential need for dewatering should be identified where appropriate*		
25	Section 6 and Annex 1	Include design basis parameters for ground water elevation, ground water velocity, adsorption and absorption coefficients, and liquid water pathways to public use water resources	Liquid and gaseous waste treatment facility design can have a significant bearing on the need to establish site characteristics for ground water; also, the extent to which the design uses embedded structures can influence factor of safety against buoyancy, provisions of equipment operability or	**Y**	Partially accepted. Design parameter for groundwater elevation was added. (new para 6.16): *The conditions resulting from the worst groundwater level at the site constitute the design*		

			redundancy when subjected to flooding, or provisions for safety-related dewatering systems can all be important.		*basis groundwater parameters* In addition, the combination part was deleted in the Annex 1. The remaining parameters addressed in this comment are mainly related to dispersion in air and water. They are treated in the Safety Guide reference [3].		
26	6.9 / 4-5	"…potential flood causing phenomena should be examined according to the site specificity. <u>In addition, appropriate sensitivity analysis should be conducted to ensure that the design basis flood height incorporates uncertainty in natural events and margin</u>. In many combinations of flood causing events the distinction between dependent and…"	It is important to consider site specific conditions in relation to evaluate combination of events	**Y**	Accepted. The following text was inserted in the para 6.4 (previously in para 6.9). "*In addition, appropriate sensitivity analysis should be conducted to ensure that the design basis flood height incorporates uncertainty in the natural events.*"		
27	6.14, list of causes	There are 120 possible interactions of these causes, and only a few of the interactions are discussed. There should be an appendix (annex?) that itemizes all of the interactions and assesses their likelihoods.	The topic of interactive flood causes is not covered well anywhere. The IAEA could do the flood community a service by going through all of the interactions.			**X**	Listing all possible interactions is outside of the scope of the Safety Guide.

28	7.10 / 1	"Many data have recently been recorded on in-leakage (unwanted entry of water into the reactor facility), essentially through poor…"	Clarifies a term not commonly used globally.	**Y**	Accepted. Para 7.10 was modified as follows. "Many *occurrences* have recently been recorded on *unwanted entry of water into safety-related structures (*in-leakage*)*, essentially through poor sealing in structural joints or cable conduits and inspection openings."		
29	7.18 / 6 & 16-17	**Line 6:** "…events of great magnitude, events of both types should be considered. In some case, a few large storms can have impacts that are more severe than the cumulative impact of many small storms. The analysis should…" **Line 16-17:** "− Establishment of the trends in shoreline migration over the short term and the long term and of the protection offered by vegetation. Vegetation can reduce the impacts of smaller storms, but not have much effect on large storms."	Because a few large storms can have impacts that are more severe than the cumulative impact of many small storms. For example, a large storm can cut new channels right through a barrier island (e.g. Outer Banks on North Carolina in the USA). Many small storms won't do this. Vegetation may reduce impacts of smaller storms, but not large storms.			**X**	The comment is properly reflected in the text of this Section.
30	8.4	Changes in river discharges may also be important (e.g. inland sites).	Changes in weather patterns will likely impact river discharges.	**Y**	The third bullet under para 8.5 was modified as follows. "Changes in the frequency of occurrence and in the intensity of some meteorological and hydrological phenomena considered in this Guide (e.g.		

					intense tropical cyclones, storm surges, *river discharges*)"		
31	9.8 / 4-6	The extent of the monitoring system and the frequency of observations should be consistent with local hydrologic conditions.	The description of the dedicated monitoring system is overly prescriptive	**Y**	Para 9.8 was modified as follows.: *If the region in which the installation is located is covered by a national warning system for floods, administrative arrangements should be made to receive the warnings reliably and on time. Otherwise it should be considered whether to set up a dedicated monitoring and warning system. The extent of the monitoring system and the frequency of observations should be consistent with local hydrologic conditions.*		
32	A.1.2 / 1-3	"The design basis flood associated with a mean annual frequency of exceedance (e.g. 1× 10–4 or 10E-6 depending on the member state criteria) for the following combination of events should be determined (including several…"	Frequency of exceedance has a more direct connection with statistical data.	**Y**	Part 3 of the Annex 1 was deleted.		
33	A.1-3	Need clarification with regard to HWL and DWL in description of cases A,B,C, and D.	The text appears to be inconsistent in the description of the cases.	**Y**	Part 3 of the Annex 1 was deleted.		

34	A-1.3 (a)	"Combination A: - The design water level (DWL) (given spring tide, the storm surge corresponding to the mean annual frequency of 1×10^{-4} ~~probability~~ value at the coast and the average value of the river discharge) plus, ~~given the DWL,~~ - Wave runup (~~with the most probable~~ using the wave height and wave period, and the geometry of the construction). (e.g. the wave parameters can be derived with a wave model using the DWL and the same wind as used for the calculation of the DWL with a hydraulic model)."	Conveys the meaning better and mean frequency is almost universally used in probabilistic safety analysis.	**Y**	Part 3 of the Annex 1 was deleted		
35	A-1.3 (b)	"Combination B: - The high water level (HWL) (given spring tide, the storm surge corresponding to the ~~1 × 10–2 probability value~~ 1 × 10–3 mean annual frequency value at the coast and to the ~~1 × 10–1 probability~~ 1 × 10–2 mean annual frequency value of the river discharge) plus ~~given the DWL~~, - Wave runup (with the most probable wave height and wave period, and the geometry of the construction) (~~the probability of the coincidence of the storm surge with the river flood has been taken as the value corresponding to 1 × 10–1 probability~~ since hurricanes or cyclones can linger near a coastal area, the likelihood of coincidence of the storm surge with the river discharge has been taken as the value corresponding to a mean annual frequency of 1 × 10–2, a conservative value).	To read better and to ensure that the proposed combination incorporates higher river discharge coincident with hurricane front that can remain stationary over a large drainage area.	**Y**	Part 3 of the Annex 1 was deleted		
36	A-1.3 (c)	Delete Combination C	Unnecessary, Combination B should govern.	**Y**	See comment 35		

37	A-1.3 / Combination D	" - High water level (HWL) ~~(~~given spring tide, no storm surge value at the coast and ~~the~~ a mean annual frequency value of 1 × 10~~–~~4 ~~probability value~~ of the river discharge~~),~~ plus ~~0.5 m freeboard~~ wave runup (using the wave height and wave period, and the geometry of the construction).	To make the combination more objective.	**Y**	Part 3 of the Annex 1 was deleted		
38	A.4-5	Need to be precise about ability to downscale to "local" conditions. What is local?	Other parts of this Annex talk about downscaling to obtain regional information, which is more appropriate.	**Y**	In the para 4.5 of the Annex, *local* was changed to specific conditions prevailing at smaller scales.		
39	A.4-1 / 1-4	"Nearly all countries have produced an assessment of past climate change in their ~~country~~ respective territories, generally covering the 20th century, or part of it. ~~However, it is only from~~ The third (2001) and fourth (2007) assessment reports ~~(TAR)~~ of the Intergovernmental Panel on Climate Change (IPCC) ~~that analyses of extreme climate parameters were~~ have developed worldwide analyses of extreme climate parameters"	Clarity. Includes the two most recent IPCC reports.	**Y**			
40	A.4-4 / 1	"Synthesis reports reflecting the state of the art are published ~~every five years or so~~ occasionally by …"	There is no regularity to the timing of these reports. The next planned report is due out in 2014.	**Y**	*"Synthesis reports reflecting the state of the knowledge are published by IPCC as Assessment Reports (Ref. A.4-1 and A.4-2)"*		

We offer the following editorial comments (EC) for the consideration of the Secretariat.
These comments do not need to be explicitly addressed in the comment resolution table.

COMMENTS BY REVIEWER

Reviewer: United States of America
Country/Organization: **United States of America** Date: March 2010

Comment No.	Para./Line No.	Proposed new text	Reason
EC-1	General & 1.11 / 7	Substitute "installation" for NPP, as in rest of this section.	General comment: if this guide is applicable to all nuclear installations (see 1.9 & 1.14) then substitute "installation" for NPP, unless mention is specific to NPPs.
EC-2	General & 1.14 / 11	"…are applicable to other types of nuclear installations. In such cases, ~~Chapter~~ Section 10 does not…" Also see 2.29.	Sections in this guide are sometimes referred to as chapters.
EC-3	1.6 / 1	Rewrite; not obvious to what "drawdown effects" refers? Also, this paragraph concerns a detailed point that seems out of place in the general introduction.	Missing something – does not read correctly.
EC-4	1.15 / 12	"…could arise by the use of new data or old data with revised methods performed in response to new…"	Differences could arise from changes in data or changes in methods.
EC-5	Pg. 5 subhead	"STRUCTURE OF THIS GUIDE"	Clarification.
EC-6	2.2 / 2	"common cause effects and damages" - re-write; delete "and"; define SSC here, not on pg. 17.	Meaning unclear.
EC-7	2.2 / 5-6	"…possible impacts on a site, ~~the potential of common cause effects and damages across the site should be considered~~ NPP operators should consider the potential of common cause effects and damages across the site; and new, upgraded or appropriately located safety related systems…"	Active voice. Identifies who is analyzing impacts on the site.
EC-8	2.4 / 3	Define: "…particular the ultimate heat sink…" (see also 3.11 iii)	Meaning unclear – should be defined here, not in 4.9.
EC-9	2.7 / 1-2	"The hazardous, rarely occurring meteorological phenomena considered ~~as rarely occurring meteorological phenomena~~ for the purposes of this Safety Guide according to the definition…"	More succinct.

We offer the following editorial comments (EC) for the consideration of the Secretariat.
These comments do not need to be explicitly addressed in the comment resolution table.

COMMENTS BY REVIEWER

Reviewer: United States of America
Country/Organization: **United States of America** Date: March 2010

Comment No.	Para./Line No.	Proposed new text	Reason
EC-10	2.15 / 3-4	"…cases there could also be major erosion at the site boundary or scouring around structures, the possibility of which should be studied and taken into consideration."	It's the possibility that deserves attention.
EC-11	2.17	Add reference to the Volcanic Hazards safety guide here (DS405), which would then become ref. (11).	Reference DS 405 earlier.
EC-12	2.20 / 2	A reference should be provided how one estimates probable maximum seiche.	Need reference.
EC-13	2.20 / footnote / page 9	Generalize concept of Frequency of Exceedance.	Frequency of Exceedance is not a concept limited to seismic hazards, as this implies (see, for example 4.51).
EC-14	2.25	Be more specific about the two statistical methods given.	The two statistical methods given (and/or names used) may be specific to a particular field, such as meteorology. They are not used, or named as such, in all fields.
EC-15	2.28	Delete this paragraph.	It is redundant to quote at length obvious and general requirements from other safety guides.
EC-16	2.33 / 1 & 7	Line 1: "In deterministic and statistical approaches, ~~this should be done~~ uncertainties should be determined by conducting a…"; Line 7: "…deterministic process should be such that all uncertainties are duly accounted for. In the statistical…"	1: "this" is unspecified.
EC-17	2.34 / 2-3	"…included in the procedure. The overall uncertainty will involve both aleatory ~~uncertainties (inherent variability in natural processes)~~ as well as epistemic ~~(modelling)~~ uncertainties that…"	The terms aleatory and epistemic uncertainty were previously defined in 2.21.

We offer the following editorial comments (EC) for the consideration of the Secretariat.
These comments do not need to be explicitly addressed in the comment resolution table.

COMMENTS BY REVIEWER

Reviewer: United States of America
Country/Organization: **United States of America** Date: March 2010

Comment No.	Para./Line No.	Proposed new text	Reason
EC-18	2.37	"The assessment of the meteorological and hydrological hazards should be ~~done~~ implemented through ~~the implementation of~~ a specific project for which clear and detailed objectives are..."	Better than "done".
EC-19	Section 3 / page 14 / subhead of section	"~~GENERAL RECOMMENDATIONS FOR DATA COLLECTION~~ INVESTIGATIONS AND INFORMATION NEEDED/REQUIRED FOR DATABASE COMPILATION"	Present subhead is awkward.
EC-20	3.19 / 8	"(Refer to ~~Dispersion SG~~ Ref [3])"	Accurate and consistent referencing.
EC-21	3.23 / 1-2	"Two types of data, which are generally available from National Metrorological Services, should be collected for rare meteorological phenomena~~ which are generally available from National Meteorological Services~~:"	Clarity.
EC-22	3.28 / 1	"For coastal or estuarine locations, the tidal water level range should be obtained. This range can differ greatly from…"	Clarity.
EC-23	3.30 / 1	"Discharge measurements and related information should be obtained ~~as follows~~ from the following sources:"	Clarity
EC-24	3.32 / 1	"Other measurements and information should be collected ~~as follows~~ from the following sources:"	Clarity
EC-25	3.34 / 6 & 13	Line 6: "- for earthquake induced tsunami, ~~the required data are as follows~~: date and origin…" Line 13: Add reference to SG 405.	Line 6: Redundant, stated above.
EC-26	3.36 / 12-13	Define: "etc."	Etc. not very helpful.

EC-27	3.40 / 1	"For the ~~concerned~~ relevant hydraulic structures, the following should be provided:" Define "hydraulic structures" more thoroughly, preferably using examples.	Structures can not have concerns and improves clarity.
EC-28	4.1	Define QA/QC.	Clarity.
EC-29	4.5 / 3-4	"…changes, among other phenomena. ~~Trends in meteorological variables were not considered before the advent of global warming concerns.~~ Criteria for design purposes should describe…"	To better convey the meaning.
EC-30	Page 30 / footnote 12	"Depending on sources and on national ~~customs~~ practice or convention, EPSs may also be designated as extra-tropical storms, extra…"	
EC-31	4.18 & 4.26	Seems strange to deal with liquid precipitation when roof-loading is discussed in this section (4.20); then why not head 4.26 Snow, as both snow-fall and snow-pack are discussed separately.	Improved clarity.
EC-32	4.41 / 4	Define PMTC.	First use of acronym.
EC-33	5.3 / 5	Why is a sufficiently low probability mentioned – surely the probability can be determined for surges of a given intensity?	Unclear reasoning.
EC-34	Page 46 / heading	"FLOODING BY WIND-GENERATED WAVES"	Clarity and uses term appearing in 5.17 & 18.
EC-35	5.41-42	Cross-reference to DS405 can again be made somewhere here.	Proper references.
EC-36	5.41/15	Specify what is disappearing in "hundreds of meters [metres?, of what?] disappears [sic] suddenly."	Whatever is disappearing needs to be specified.
EC-37	5.57	Delete this paragraph	It says nothing that is specific to evaluating tsunami hazards. It is a repetition of general considerations discussed previously that apply to all hazard evaluations.
EC-38	5.64 / 2-8	Delete this discussion.	It says nothing that is specific to evaluating tsunami hazards. It is a repetition of general considerations discussed previously that apply to all hazard evaluations.
EC-39	6.10 / 9-10	Re-word "Reasonable values of the probabilities that a certain level of severity of an effect is exceeded in the combination should be estimated from the values for these quantities."	It makes no sense as is. It is circular logic.

EC-40	7.1 through 7.12	These sections should be deleted.	They are generic design considerations and do not add value to the discussion of hazards or hazard evaluation.
EC-41	7.17(b) / 1	"Beach erosion caused by interference by structures built on the ~~swash zone~~ zones of wave activity of sandy…"	Replaces a term not commonly used globally.
EC-42	7.19 / 2	"…the tidal currents and ~~the climatologically data for waves~~ wave climate as they occur in the given segment …"	"wave climate" is common terminology.
EC-43	8.5 / 1	"The results of the most recent ~~IPCC AR~~ investigations summarized in IPCC AR and other pertinent studies …"	Specifies which IPCC report is being cited.
EC-44	10.5 / 8th bullet	"− The characteristics of the process or of the engineering features that might show a ~~cliff edge~~ catastrophic effect in the event of an accident;"	Eliminates slang.

DS417: Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations

COMMENTS BY REVIEWER Contact: Irina Borysova (borysova@world-nuclear.org) Country/Organization: **WNA/CORDEL** Date: 22.03.2010				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.1/4	Hazards considered in this guide include wind, water, snow, ice or hail, wind driven materials, extreme water level around or at the site (high and/or low); dynamic effects of water (e.g. waves, tsunami, flash flooding); extreme air temperature and humidity; extreme water temperature; and extreme groundwater levels.	Add a comma after "hail".	**Y**			
2	Page 9, footnote 2		Footnote breaks across two pages and needs to be formatted to appear on one page.	**Y**	The footnote was deleted.		
3	2.26/1	~~Nonstationarities~~ Long term variations (e.g. climate change) might be dealt with by allowing parameters of...	Replace nonstationarities, which is not a word.	**Y**	The sentence was modified as follows: "L*ack of stationarity due to long term variation of the variables (e.g. climate change), might be dealt with by ...* "		
4	2.8.	Other possible phenomena that have the potential to give rise to adverse effects on the safety of nuclear installations and that are related to meteorological phenomena are the following (reference 1, paragraph 3.52): - Dust storms and sandstorms - Hail - Freezing precipitation (ice storms) - Salt spray - Cooling tower drift	Salt spray like e.g. seawater acidified wind flows should be considered regarding adverse effects by corrosion. The drift of small water droplets e.g. from natural draft cooling tower installations can contain the minerals of the makeup water and water treatment chemicals such that contact with plants, building	**Y**	The most relevant phenomena are discussed in this safety guide. Other possible phenomena may exist as established in a new footnote under para 2.7. "*Other associated meteorological phenomena not addressed in this Safety Guide may require consideration on a site specific basis (e.g. salt spray from seawater wind flows)*".		

			surfaces and human activity can be hazardous.				
5	3.21/1	Even if there may be indirect evidence that long-term measurements made at nearby meteorological stations be considered representative of the site, the on-site data obtained during the short period record of the site evaluation should be used for analysing and assessing the possible influence of specific conditions of the site relative to the extreme values of meteorological parameters assessed from the data of nearby stations. Use of data from multiple nearby meteorological stations surrounding the site is recommended to ensure that the indirect evidence is truly representative of site conditions.	Translation of long-term measurements made at nearby meteorological stations is not an exact science. Use of multiple stations from the surrounding area is recommended to ensure the data is representative.	**Y**	Modified: The concept of the comment is already addressed in 3.14 for off-site sources: "3.14. *For evaluating extreme meteorological variables, ... Because locally recorded data are not normally available for most sites, an assessment should be made of the data available from meteorological stations installed and operative in the region surrounding the site. Long-term data sets from the station where the site conditions are most representative for the parameters concerned or alternatively the records of various neighbouring meteorological stations shown to belong to the same climatic zone should be processed, so as to furnish more robust estimates of the necessary statistical parameters. The first approach may be accomplished by making comparisons with similar data obtained in an on-site programme for the collection of meteorological data.*		.
6	3.29/13	Coastal and offshore wave measurements should be obtained using ~~tide~~ tidal gages, ~~tsunameters,~~ tsunami warning systems, ~~waves buoys~~ deep water buoys and/or satellite derived data.	Not sure tsunameter is a real word.			**X**	The used terminology is right. Tsunameters are real instrumentation and defined in Annex 3 (see A.3-15). Deep water buoys are a type of tsunameters.

7	4.52	Tornadoes are generally described as violently rotating columns of air, usually associated with a thunderstorm. If tornadoes strike buildings or structures of a plant, damage may be caused by the following: (a) The battering effect of very high winds, (b) The sudden pressure drop which accompanies the passage of the centre of a tornado, (c) The impact of tornado generated missiles on plant structures and equipment~~.~~, (d) the sudden pressure change by straight line winds like convective wind gusts, outflow and downbursts which comes out of a thunderstorm.	Straight line winds as produced by thunderstorms should be added for completeness regarding mechanical impacts.	**Y**	The idea of the comments is basically considered but in para 4.12. The phenomena of strong winds from thunderstorms (mainly "longitudinal" winds) are already considered under para 4.12. The para 4.52 corresponds mainly to rotational winds from tornado phenomena.		
8	4.73/1	...thickness from ~~hsitorical~~ historical weather data...	Typo: "historical" vs. "historical"	**Y**			
9	5.20/3	Considerations in relation to combined event probabilities are in Section XX.	Unfinished reference: Section XX should be Section ??	**Y**	The text was modified as follows. *"Considerations in relation to combined event parameters are in Section 6."*		
10	5.36/2	(e.g. several minutes to tens of minutes, ~~exceptionaly~~ exceptionally hours),	Typo: "exceptionaly" should be "exceptionally"	**Y**			
11	5.37/1	Tsunami waves propagate outward from the generating area in all directions	Typo: "propagate outward the" should be "propagate outward from the"	**Y**			
12	5.37/2	"controled" should be "controlled"	Typo	**Y**			
13	5.40/	"refered" should be "referred"	Typo	**Y**			
14	5.103/item 4	"steambed" should be "streambed"	Typo	**Y**			