AUSTRIA COMMENTS

DS417, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (20/08/2009)

COMMENTS BY REVIEWER Reviewer: Steven Sholly (IRF), Volker Holubetz (Lebensministerium) Page 1 of 26 Country/Organization: Austria Date: 21/09/2009				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Entire document	General Comment: Frankly spoken, this is a very poorly written and haphazardly constructed draft. It reads like it was cut and pasted together in very short order from the two existing standards that it is meant to replace, and then shoved out the door to meet a time constraint rather than being at a stage of completion sufficient to merit IAEA safety committee review. The typographical and grammatical errors in the document are too numerous to mention, and no comprehensive attempt to do so is presented in these comments. The document contains errors of logic that should not have been missed by a proper internal technical review. It is recommended that the current draft be sent back to the Secretariat and significantly reworked before the safety committees see it again. If this is the type of product that we can expect to see with the new compressed schedule that we were told about in our last NUSSC meeting, that schedule will never be kept. In order to maintain a compressed schedule, NUSSC needs to see high quality documents in the first instance. It is NUSSC's job to review and comment on standards – not to rewrite them when they were poorly prepared in the first instance.				X	A deep review of the new version consider most of these comments.

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2	Entire Document	General Comment: This is a very large document – something we thought (based on discussions in the past several NUSSC meetings) that IAEA was trying to avoid. Indeed, the existing draft (which is still missing some "up front" pages) is 130 pages long – only three pages less than the two standards it is attempting to supercede (these standards included a total of 16 pages of "up front" material as well as an additional 5 pages added to the ends of the two documents). Even if DS417 were only to include 8 pages of such material, it would be 138 pages long, and thus longer by five pages than the two standards it is trying to replace! What is the point of combining these two standards – it is just so IAEA can say to its Member States, "See, we have fewer standards now than we used to have."? The document requires considerable futher technical and editing work before we could recommend it being put out for Member State comment.				**X**	The objective of grouping 2 SG was not, a priori, to decrease the number of pages, but to group 2 interacting subjects. Moreover, the counting of pages should be corrected.

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3	Entire Document	General Comment: The document does not appear deal with flooding hazards on lake and reservoir sites. Based on a spot check and based on existing nuclear power plant sites, at least 12% of existing sites (representing about 18% of existing nuclear power plants) are on lakes and reservoirs (many of these are in the United States, Canada, and the Russian Federation).	Flooding on lakes and reservoirs is qualitatively different from river and coastal flooding, and needs to be addressed in DS417. No new text is proposed – it is not NUSSC's task to write standards. The lack of treatment of flooding for nuclear installations sited on lakes and reservoirs is a major omission that must be corrected before the document is appropriate for sending out for Member State comments.			**X**	The document is not organized by "site location" but more by type of hazards, which are also applicable to lakes as corresponds.. The word "lake" or the expression "enclosed body of water" , used as synonym for lakes and reservoirs is present in many locations through the document

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4	Pages 2, 5-7, 11-12, 15, 21-24, 46, 50-59, 71, 73-74, 85-89, 101-110, 115 & 119	The term "tsunami" needs to be defined. The definition from NS-G-3.5 should either be included in the IAEA Safety Glossary in the next revision or the definition should be inserted into the text or a footnote of DS417 for clarity: "*A tsunami is a wave train generated by impulsive disturbances of a water surface due not to meteorological but due to geophysical phenomena such as submarine earthquakes, volcanic eruptions, submarine slopes, landslide*	IAEA needs to define what it means by "tsunami". The word is not included in the IAEA Safety Glossary, and while it is well known and widely used in technical literature on the subject, IAEA needs to have a definition in the context of its standards so that Member States are clear on what the term means. The	**Yes**	Definition is already in paragraph 5.36, which is in accordance with Glossary "Tsunami" of IOC/UNESCO		

		or ice blocks falling into a body of water. … Ocean impacts may also be the cause of a tsunami. The impact of an asteroid or comet on an ocean may be a significant cause of major tsunamis that affect populations quite different from the populations affected by tsunamis caused by geological events."	lack of a definition for IAEA Safety Standards could lead to unintended omissions in site evaluation for nuclear installations. See proposed definition here. It might also be considered to adopt (perhaps with modification if needed), one or more of the definitions included in the International Tsunami Information Center (see, "Tsunami Glossary", International Tsunami Information Center, Intergovernmental Oceanographic Commission, UNESCO, http://www.drgeorgepc.com/TsunamiGlossary.pdf).				

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5	1.4	Add the Blayais estuarine/river flooding event from 27 December 1999 to the list.	This was an important actual event that should be called to the attention of users of the standard. The following references could be useful in this regard: 1. A. Gorbatchev et al. (IRSN), "Report on flooding of Le Blayais power plant on 27 december 1999", Eurosafe Forum 2000, http://www.eurosafe-forum.org/files/pe_297_24_1_sem1_1.pdf.			**X**	Examples are not be provided in the introduction of the Safety Guide. All examples were removed. References in the Guide should correspond only to SG or equivalent. Indicated references may be included in the Annexes.

			2. IAEA, Extreme external events in the design and assessment of nuclear power plants, IAEA-TECDOC-1341, March 2003, Section 3.3.5, "Blayais NPP – Flood, 1999", http://www-pub.iaea.org/MTCD/publications/PDF/te_1341_web.pdf. 3. Republic of France, Convention on Nuclear Safety, Second Review Meeting, Vienna – 15-26 April 2002, France's answers to questions and comments received from other Contracting Parties on its 2nd report for the CNS, 16 April 2002, pages 42-43.				
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6	1.5	There should be an explicit reference to the portions of the standard that discuss the recent findings from IPCC and the large body of new research that is included in the standard.	In §1.5, it is stated that recent findings from IPCC and a large body of new research are included in the present Safety Guide. Simply saying that this is so leaves the reader to do the research when the authors of the Safety Guide should know quite well where this information has been placed. Why make the user of the standard guess where this material is?	**Yes**	Added at the ens of Para 1.5: … in Chapter 8 and Annex 4.		

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7	1.6	Delete this paragraph.	In §1.6, it is stated that "recent safety re-evaluation programmes" have revealed a risk of loss of intake water. There is nothing at all new about this. Loss of intake water due to tsunami effects was one of the reasons for doing tsunami hazard evaluations in the first place. This is plainly obvious since intake structures are generally located on or near the edge of the body of water on which or near which the nuclear power plant is located. To say that this was only recently recognized – perhaps implying that this recognition occurred after the December 2004 Indian Ocean tsunami – is simply not correct. Indeed, two years before the Indian Ocean tsunami occasioned by an undersea earthquake in December 2004, the Japan Society of Civil Engineers explicitly called attention to this problem (see, Tsunami Evaluation Subcommittee, Nuclear Civil Engineering Committee, Japan Society of Civil Engineers, Tsunami Assessment Method for Nuclear Power Plants in Japan, February 2002, page 5, http://www.jsce.or.jp/committee/ceofnp/Tsunami/eng/JSCE_Tsunami_060519.pdf), as does the September 2004 California Natural Hazard Mitigation Plan guidance (see, Tsunami Hazards in Southern California, 18 September 2004, http://www.cityofinglewood.org/pdfs/hazardmitigation/SectionV-TsunamiFinal.pdf). The Lungmen NPP Preliminary Safety Analysis Report (apparently from 1999) also addressed this issue in Section 2.4.1.1.		**Yes.** In view of the comment, the paragraph has been reformulated: *"Although NPPs previously designed for tsunami hazards, e.g. drawdown effects, safety re-evaluation programmes have identified a risk of loss of intake water for safety related cooling. Therefore, there is a need for updating the assessment of this risk and proceeding with the required upgrade, if necessary. The earlier Safety Guide does not provide guidance on the assessment of low water conditions and this will be covered in this Safety Guide."*		

8	1.8	Change the text to read, " Hydrological hazards are associated with flooding events, atypical waves, and low water conditions."	Such atypical waves can come from tsunamis, storm surges (an offshore rise of water associated with a low pressure weather system such as a tropical cyclone, also called a typhone or hurricane in different regions, which causes the water level at the coast to exceed the predicted astronomical tide level), and credible combinations of events such as flooding and high winds owing to the same source (a powerful storm) coincident with high tide (such as the Blayais estuarine flood event in December 1999).	**YES**			

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9	1.12	Change the text to read " external to the nuclear installation", and delete the last sentence of the existing text.	The statement in §1.12 that the concept of "external to the installation" is intended to include more than the external zone is more confusing than it is illuminating. Indeed, tsunamis and upstream dam failures far removed from the external zone can nonetheless result on impacts on plant safety. "External to the installation" means just what it says, and it would be even more explicit if the statement were modified to say "external to the nuclear installation" since the term nuclear installation is clearly and explicitly defined in the IAEA Safety Glossary. The last sentence in §1.12 could then be deleted as unnecessary and potentially confusing as it is currently worded.			**X**	There is no ambiguity that “installations” refers to nuclear installations

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10	1.14	Change reference [4] to reference [7].	The reference in §1.14 is incorrect. The term "nuclear installation" is defined in the IAEA Safety Glossary, which in the current document is reference [7], not reference [4]. One cannot have a Safety Guide applicable to "nuclear installations" say in the 14th paragraph that in fact it is not applicable to all nuclear installations. This is either a "nuclear installation" Safety Guide, or it is not. If it is not, then the title should refer to those types of facilities to which it is applicable.	**Yes**			
11	1.15, line 13	Correct "asses" to "assess".	Typographical error (an example!).	**Yes**			
12	2.1	Change the text to read, "Meteorological and hydrological phenomena cause several hazards that singly or in some combinations may affect the …".	Meteorological and hydrological phenomena can occur in combinations (such as high tide, storm surge, and extreme precipitation due to a tropical cyclone that makes land fall at high tide).	**Yes**			
13	2.1	Add hail to the list of examples of extreme loading.	Hail is capable of causing increased structural loads, particularly since it can jam up rainwater distribution systems.	**Yes**			

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14	2.1	The list of possible meteorological hazards contained in §2.1 needs to include duststorms and sandstorms, and wind-driven missiles (tornado missiles, for example).	These are obvious omissions; there may be others.		**Yes:** text was modified for clarification *"Meteorological and hydrological phenomena cause several hazards that singly or in some combinations may affect the safety of nuclear installations (Ref. [1]) and therefore for their protection adequate measures should be taken in order to comply with the concept of defence in depth. 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*		

15	2.2	The following should be added to the end of the last sentence in §2.2: "… are more important when a multi-unit or multi-installation site is being considered, particularly so if structures, systems, or components are shared or capable of being shared between or among nuclear installations (such as water sources, electrical power supplies, cross-connects, etc.)."	Shared structures, systems, or components (SSCs) can further exacerbate the issue being discussed here. There are existing nuclear power plants which share SSCs (for example, Turkey Point 3 & 4 share a common auxiliary building).		**Yes.** Modified text: …. *Particularly if some safety related SSCs are shared between units.*		
16	2.3	Include the following statement at the end of the existing paragraph: "Upstream or downstream failure of water control structures should also be considered in this regard."	It is obvious that failures of upstream or downstream water control structures could have an impact on nuclear power plants unless their effects are adequately reflected in the design. For example, suction to the ultimate heat sink could be lost if a downstream dam fails and lowers the water level for a river site. Another example could involve failure of an upstream dam during flooding, which would quickly exacerbate the existing flood situation at the downstream nuclear power plant site.		**Yes,** partly only, because é." Is related to low water conditions and not high water conditions. Modified text: *… downstream failure of water control structures.*		

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17	2.7	The list of other phenomena in §2.7 should add rainfall onto structures whose surface temperature is below freezing.	Rainfall in cold weather onto structures whose surface temperature is below freezing could add considerable additional structural load compared with rainfall under other weather conditions.			**X**	This phenomenon is identified in 2.7 as "freezing precipitation"
18	2.10	The last item in the list in §2.10 should include the following statement at the end of the existing text: "Sudden releases of water from natural or artificial storage, including those due to upstream or downstream failure of water control structures (such as dams)."	This is an obvious omission; see Comment 16, above.			**X**	A bullet in 2.11 covers that case.
19	2.11	Item (a) in the list of §2.11 should be modified to read "… water level rising upstream or falling downstream by, for example, …"	The standard should not cause the reader to simply use the list provided as a checklist, but rather should cause the reader to consider those matters explicitly called out, and also cause the reader to think about whether there are any site-specific matters to be considered. The standard should not discourage creative thinking by site suitability analysts.	**Yes**	Included in 2.12, corresponding to mentioned 2.11)		

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20	2.8 2.16	In line 4 of §2.8 the word "probability" should be replaced by the word "frequency". The same replacement should be made in line 3 of §2.16.	"Rarely occurring phenomena" seems to imply frequency – that is, likelihood over time rather than an absolute probability irrespective of time. The same goes for line 3 of §2.16 – it seems clear that frequency (likelihood over time) is what is being referred to here rather than a probability (which is dimensionless).	**Yes**	This is modified all along the text		
21	2.15	The last line of §2.15 should read "…could hinder implementation of emergency plans." The following additional sentence should be added as well: "Duststorms, sandstorms, ashfall (from fire or volcanic sources), lightning, and precipitation can also impede implementation of emergency plans by slowing evacuation or relocation, and/or by interfering with communications."	Although the fire or volcanic sources of ash are not meteorological in origin, the effects of fire and volcanic ash are clearly governed in part by meteorological phenomena (wind speed and direction, and precipitation) and should therefore be included here.	**Yes**	The proposed addition was included. All the paragraph was moved to 2.3, in a part which now deals with both hydrological and meteorological hazards.		

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22	2.20	The word "probability" in line 4 of §2.20 should be replaced by "frequency".	Otherwise, the sentence makes no sense. If this is meant to be a conditional probability, the question arises, "Conditional on what?" The sentence makes more sense if one is talking about frequency of exceedance. If the issue is what is the conditional probability that the probable maximum is exceeded once attained, it is still necessary to have a probabilistic approach because one then needs the fraction of the time that the probable maximum is exceeded compared with the fraction of the time it is not exceeded. A fully probabilistic estimate is needed in any event.	**Yes**			

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23	2.21	The following sentence should be added to the end of §2.21: "For high potential hazard nuclear installations such as nuclear power plants, consideration should be given to employing formal expert elicitation techniques."	Such techniques exist for seismic hazard studies (see, for example, the probabilistic seismic hazard methods developed by Lawrence Livermore National Laboratory, the U.S. Nuclear Regulatory Commission, and the Electric Power Research Institute), for volcanic hazard studies (see the methods applied to the analysis of the proposed Yucca Mountain repository in the United States), and also in general for probabilistic studies of all types (see, for example, M.A. Meyer & J.M. Booker, Eliciting and Analyzing Expert Judgment: A Practical Guide, NUREG/CR-5424, LA-11667-MS, January 1990, http://library.lanl.gov/cgi-bin/getfile?00143877.pdf).	**Yes**	A footnote is added: *Some Member States conduct formal elicitations to evaluate the significance of model and data uncertainties*		

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24	2.23	In line 4 of §2.23, "probability" should be changed to "frequency".	The text is clearly referring to likelihood over time (which is frequency) rather than a dimensionless, conditional probability.	**Yes**			
25	2.25	The phrase "annual probabilities" should be replaced by frequency.	Probabilities are dimensionless numbers having nothing to do with time (like the number of times in 10,000 rolls of the dice that the number 7 appears). What is meant by "annual probabilities" is actually frequency. There is no such thing as an "annual" probability – an "annual" probability, if it existed, would be a frequency, that is to say, the likelihood per year.	**Yes**			

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26	2.33	Replace the reference in line 8 to "70th percentile with "90th, 95th, 98th, or 99th percentiles (depending on the application)."	Line 8 of §2.33 cites 70th percentile confidence level as an example of "upper bound confidence levels". What is upper bound about the 70th percentile? More typical upper bounds are 90th, 95th, 98th, or 99th percentile, depending on the specific circumstances and the engineering judgment of the author or organization using the data. Typical lower and upper bounds are the 5th and 95th percentile. In more than 25 years experience in risk and reliability studies, I (Sholly) have <u>never</u> seen the 70th percentile of any uncertainty distribution described as the "upper bound" of anything. See, for example, the OREDA data base, which uses 95th percentile. There are numerous other examples ranging from 90th to 99th percentile as "upper bound". The reference to 70th percentile as "upper bound" should be deleted as not representing industry practice throughout the nuclear and petrochemical industries. If IAEA wants to use 70th percentile as "upper bound", then specifically justify it with appropriate references to industry practice.		**Yes.** The given value (70th percentile) was only an example which is used in some meteorological applications. All the parenthetical values have been deleted.		

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27	2.34	Define what is meant by "sufficient margin".	The last sentence of §2.34 states, "The selection of the probability level for the design basis parameter should guarantee a sufficient margin of safety to protect the plant against serious radiological consequences." This is a very curious sentence for several reasons. First, the IAEA Fundamental Safety Principles (SF-1) states that the fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation – not the plant. If the plant owner has an investment protection goal, fine – but the fundamental safety objective of IAEA safety standards is to protect people and the environment. Second, safety margins cannot guarantee anything – there is always a limit to how far one can go (in the extreme, nobody designs nuclear power plants to survive asteroid impacts). Safety margins are margins to failure, not guarantees of anything. Finally, it is all well and good to say "sufficient margin" – but what do the authors of DS417 mean here? What is "sufficient" – a 50% safety factor? A factor of 2? A factor of 5? A factor of 10? The authors should be more explicit, and (hopefully) more quantitative about what they mean by a "sufficient" margin. One would think that at least part of the idea here is to get enough of a safety factor beyond the design basis so that cliff-edge effects are avoided.			**X**	The sentence was removed. It is not related to the remaining part of the paragraph.

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28	Footnote 4, page 15	Delete the reference to 30 years of data and replace it with something that is statistically justified to ensure events with a recurrence frequency of 10^{-2} per year are expected to be observed in the data collection period.	Concerning Footnote 4 on page 15 (which refers back to §3.7), what is the basis for 30 years of data providing an acceptable minimum to identify events with a recurrence frequency of 10^{-2} per year (see, for example, §3.22 in DS417)? With only 30 years of data, one is more likely to <u>not</u> observe an event with a frequency of 10^{-2} per year than to observe it.	**Yes**	The point was clarified in the footnote . *For instance, for annual frequency of occurrence of 10^{-2}, typically adopted to determine the design parameters in meteorology, the minimum period of continuous observation should be at least 30 years*		

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29	3.8	Delete the reference to "several hundred years" and replace it with a time interval more appropriate to the hazard being evaluated.	Concerning §3.8, what is the basis for a period of "at least several hundred years" of data being the minimum for evaluation of tsunami hazard? More likely it is the case that upwards of one or more thousands of years of data are required, most likely in the form of paleological analysis of the site area. It has been suggested that with an ocean site with a 180 degree exposure that the probability of the site being inundated by 2 meters waves in 1000 years is 1 chance in 14. For a 5 meter wave height, the probability is 1 in 35 per thousand years. For a 25 meter wave height, the probability is 1 in 345 per thousand years. These results are for a generic site; see, S.N. Ward & E. Asphaug, *Asteroid Impact Tsunami: A Probabilistic Hazard Assessment*, Icarus **145**, 64-78 (2000). Note that these figures are not for extinction-level impactors like the K/T impact (Chicxulub) 65 million years ago – rather, these figures are for more moderate impactors 30-500 meters in radius. Meteors of this size are estimated to impact the earth's oceans every 1,000 to 100,000 years. The paper cited limited its scope to impactors with diameters of 50 meters or less. For seacoast sites with 180 degree exposure, however, the results above place a floor on tsunami wave expectations. Hazards for other types of sites depend on the area of ocean exposed, **(continued on next page)**	**Yes**	Para 3.8 was modified: *For the tsunami hazard assessment, available observation periods are generally not sufficient. Consequently other approaches, such as paleological analysis of the site area, should be considered*		

			although the relationship is not linear. Depending on the hazard of tsunamis from other sources (earthquakes, volcanic eruptions, subsea landslides and mass movements from the land surface into water), the local tsunami hazard can be larger than these "floor" estimates. Probabilistic tsunami hazard analysis (PTHA) is a growing field (see, for example, F.L. Wong, E.K. Geist & A.J. Venturato, U.S. Geological Survey Menlo Park & Joint Institute for the Study of the Atmosphere and Ocean, University of Washington, *Probabilistic Tsunami Hazard Maps and GIS*, presented at the 2005 ESRI International User Conference, San Diego, CA, July 2005, http://proceedings.esri.com/library/userconf/proc05/papers/pap2000.pdf).				

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30	4.32	Delete the reference to "lightning strikes" as an example of a rarely occurring hazardous meteorological phenomenon.	Regarding §4.32, lightning strikes are <u>not</u> an example of "rarely occurring hazardous meteorological phenomena". Rather, they are normally occurring phenomena – they are "anticipated operational occurrences" with likelihoods well above 10^{-2} per year. The discussion of lightning needs to be moved to a more appropriate section of the standard, not contained in a discussion of rarely occurring hazardous meteorological phenomena.			**X**	Lightning is listed as a rare phenomenon in the Safety Requirement NS-R-3. In addition the "lightning phenomenon" copes with the definition in the Safety Requirement, in the sense that we cannot determine extreme values from observations.

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
31	5.36	Define "rare" and "large" in the context of the paragraph.	In §5.36, DS417 states, "… rare large meteorite may also impact the ocean and generate a tsunami". What do the authors of DS417 mean by "rare" and "large"? For example, the Canadian Nuclear Safety Commission (CNSC) specifies events with a frequency of occurrence between 10^{-2} and 10^{-5} per year are "design basis accidents" (see, Canadian Nuclear Safety Commission, Safety Analysis for Nuclear Power Plants, RD-310, February 2008, §5.2.3, page 4, http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/RD-310_e_PDF.pdf). It is estimated that meteorite impactors with diameters up to 50 meters hit the world's oceans with a frequency between about 10^{-3} and 10^{-5} per year, and that such impactors typically produce tsunami waves from 2-25 meters in height (see, S.N. Ward & E. Asphaug, *Asteroid Impact Tsunami: A Probabilistic Hazard Assessment*, Icarus **145**, 64-78, 2000). Is this rare and large? Nearly all nuclear power plants are designed for a large pipe break, which has an estimated frequency of occurrence of 10^{-5} per year – if this is not rare, why should tsunami waves resulting from oceanic meteorite impactors with diameters up to 50 meters be considered to be rare when it has the same order of likelihood of occurrence?		**Yes** This "rare" attribute was deleted in the definition since the other tsunami generating causes (earthquakes, landslides, volcanoes° do not have a "frequency" attribute. Consistency is thus maintained. See also footnote 26.		

DS417, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (20/08/2009)

COMMENTS BY REVIEWER Reviewer: Steven Sholly (IRF), Volker Holubetz (Lebensministerium) Page 24 of 26 Country/Organization: Austria Date: 21/09/2009				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
32	5.40	See "reason" discussion opposite.	In §5.40, DS417 states that the most frequent source of tsunamis are earthquakes. This is not true in all locations (of course, it is true for seismically active regions). In some location, the most frequent source of tsunamis is non-earthquake-related seabed disturbances. The statement in DS417 needs to be appropriately qualified and referenced, as it is demonstrably inaccurate in some areas of the world.			**x**	80% of the tsunamis are generated by earthquakes. All other sources are treated. In the draft according to the state of the practice.

COMMENTS BY REVIEWER Reviewer: Steven Sholly (IRF), Volker Holubetz (Lebensministerium) Page 25 of 26 Country/Organization: Austria Date: 21/09/2009				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
33	5.44	Qualify the text "the sea level" as to what is specifically meant (e.g., mean sea level, highest tidal sea level, or what).	Does the reference to "the sea level" in §5.44 refer to mean sea level or to the highest tidal sea level? The statement should be appropriately qualified, and it should be borne in mind in so doing that tsunamis are random phenomena which can easily impact the coastline when the tide is already high. Further, this paragraph unmistakably excludes lake-, reservoir-, or impoundment-sited nuclear power plants which are more than 50 meters above sea level. This is an error in the case of lakes that could be affected by mass movements (landslides, avalanche, glacial calving, etc.). Such lake-, reservoir-, or impoundment-sited nuclear plants still need to be assessed for waves generated by such phenomena. This error needs to be corrected; as noted in the general comments above, there are numerous existing nuclear power plants sited on such bodies of water, and proposed projects show evidence that this trend may be continued in the future as existing sites are frequently being used as planned sites for new facilities. The Vaiont Reservoir landslide and tsunami (cited by the NRC in NUREG/CR-6966) should be recalled in this regard.	**Yes**	The paragraph refers to a simplified screening criteria for sites located at sea/ocean/lake shoreline. Second bullet is corrected to reflect this fact. New text: *at more than 50 m elevation from the mean water level*		

DS417, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (20/08/2009)

COMMENTS BY REVIEWER Reviewer: Steven Sholly (IRF), Volker Holubetz (Lebensministerium) Page 26 of 26 Country/Organization: Austria Date: 21/09/2009				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
34	5.67	Define specifically what is meant by "research status", and justify this discussion in the light of existing knowledge about caldera collapse.	§5.67 states that tsunami modeling due to caldera collapse "has to be considered as research status", whatever this means. The locations of existing calderas are well known. Their location with respect to proposed nuclear power plant site should be identified, and the potential for caldera collapse should be assessed in terms of its likelihood, its magnitude, and the resulting wave heights, wave runup distances, and inundation potential at the proposed site. There is no *a priori* reason why probabilistic methods could not be used to perform such an assessment, provided that due care is taken in considering uncertainties (especially alternative assumptions). Indeed, numerical modelling of tsunamis resulting from caldera collapse is documented in the literature (see, for example, F. Maeno, F. Imamura, & H. Taniguchi, *Numerical simulation of tsunamis generated by caldera collapse during the 7.3 ka Kikai eruption, Kyushu, Japan*, Earth Planets Space **58** 1013-1024, 2006; and K. Minoura. et al., *Discovery of Minoan tsunami deposits*, Geology **28:1** 59-62, 2000).	**Yes**	New text of Para 5.68, corresponding to the previous 5.67: *Tsunami modeling due to volcanic phenomena is not the current practice applied by Member States for assessing associated tsunami hazards. Methods for tsunami modelling due to volcanic phenomena have been proposed although standard evaluation procedures have not yet been developed*		

CANADA COMMENTS

COMMENTS BY REVIEWER **Reviewer: Shizhong Lei** **Page 1 of 2** **Country/Organization: CANADA -Canadian Nuclear safety Commission, Date: 2009-09-14**				RESOLUTION			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
1	Throughout the document	Add explanation about "Safety Guide" and "Safety Standard"	Both "Safety Guide" and "Safety Standard" are used, including the cover page, to refer to the same document. They should be defined.			**X**	In the body of text, "Safety Guide" is used. Safety Standard is used, when needed, and in the cover page as usual.
2	Page 3, last sentence	Add section "Glossary".	The document refers to the 2006 IAEA Safety Glossary. There are two reasons the document should have a Glossary section of its own: (1) it's not convenient for a reader to go to another document to find the definition of a technical term; and (2) the 2006 IAEA Safety Glossary does not contain many of the technical terms used in the current document, such as aleatory, epistemic, surge, waterspout, Tsunami, PMP, etc.	**YES** partially	In the final editing, it will be decided if a glossary is needed. It will be considered all used definitions, which are now included in the text or in footnotes.		
3	Page 3, line 3	…the site area itself may contain objects that pose a hazard to the installation, such as a water reservoir and onsite precipitation.	To emphasize the importance of onsite precipitation and flooding.			**X**	Precipitation on site is obviously considered in the document. In the sentence are included facilities/features which may pose hazard to the installation.

COMMENTS BY REVIEWER **Reviewer: Shizhong Lei** **Page 2 of 2** **Country/Organization: Canadian Nuclear safety Commission, Date: 2009-09-14**				RESOLUTION			
Comment	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but	Rejected	Reason for

No.					modified as follows		modification/rejection
4	Page 5, 2nd sentence	Section 5 details the Implementation of hydrological hazard assessment.	Missing word “of”	**YES**			
5	Page 60, Sec 5.78, 2nd sentence	To complete the sentence	The sentence is incomplete: “The site drainage system should be designed for such amounts of precipitation so that rainfall (combined with snow or hail, if necessary).”	**YES**	See new text: *“. .The site drainage system should be designed to account for extreme rainfall combined with snow or hail, if appropriate.*		
Annex 5	Page 117	Add a section on “Design Basis Parameters”	The document lists some examples of “Meteorological and Hydrological Design Basis Parameters” in Annex 5. In my opinion, the document should have a special section to discuss the guiding principles on the selection of the criteria of design basis parameters. It would be very useful to the licensees.		**YES** It is the objective of Chapter 6 and current Annex 1, which merged former Annexes 1 and 5.		

FRANCE COMMENTS

COMMENTS BY REVIEWER Reviewer: F. Féron Page Country/Organization: France - ASN Date: 4 sept 2009				RESOLUTION			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
1.		In bullet list, end bullet by ";" except for the last one with "."	Typo	**Yes**	This will be done during final editing		
2.	1.6/2	"have_also"	Typo	**Yes**			
3.	2.29/last line	Para 2.35 ?	To be checked/updated	**Yes**			
4.	3.7/6	Replace "would be important" by "is valuable"	Alternative wording. All infos are important, not only recent ones	**Yes**			
5.	3.29/1st bullet/3rd line	Acquire ;	Typo	**Yes**			
6.	4.66/4	Sandstorm	Typo	**Yes**			
7.	5.4/footnote 1	(see Chapter 6).	Typo	**Yes**			
8.	5.20/3	Section XX	To be updated	**Yes**	Section 6		
9.	5.49/2	Demonstrate	Typo	**Yes**			

COMMENTS BY REVIEWER Reviewer: F. Féron Page Country/Organization: France - ASN Date: 4 sept 2009				RESOLUTION			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
10.	5.63 5.64		If PTHA is not the current practice, is it to be mentioned in the guide?	**Yes**	See new text for 5.63: *"Probabilistic Tsunami Hazard Analysis (PTHA) is analogous to the Probabilistic Seismic Hazard Analysis (PSHA), but it is not the current practice applied by Member States for assessing tsunami hazards. Methods for tsunami hazard assessment using probabilistic approaches have been proposed although standard evaluation procedures have not yet been developed."*		
11.	5.67		If tsunami modeling due to caldera collapse is not the current practice, is it to be mentioned in the guide ?	**Yes**	See new text for 5.68: *"Tsunami modeling due to volcanic phenomena is not the current practice applied by Member States for assessing associated tsunami hazards. Methods for tsunami modelling due to volcanic phenomena have been proposed although standard evaluation procedures have not yet been developed"*		

COMMENTS BY REVIEWER Reviewer: F. Féron Page Country/Organization: France - ASN Date: 4 sept 2009				RESOLUTION			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
12.	5.108	Delete 5.108	The issue with downstream dam is covered by 5.109. If 5.109 is not the sole issue, then 5.108 should be made clearer… Maybe 5.108 deals with upstream dams ?		**Yes.** The paragraph was modified for clarification; new text (new number: 5.109): *"Dams located on tributaries, even if the tributaries are downstream of the site, should be considered in the investigation if the dam failure could increase the flood hazard at the site. "*		
13.	5.117		If those water control structures are not under the responsibility of the NPP operating organization, such recommendation is difficult to implement…	**Yes**	This paragraph is under the general header: *Analysis of the stability and the survival of the water control* If proper inspection is not available, the failure of dam should be postulated.		
14.	6.10/6	Replace "*considerable*" by "*Unless detailed regulatory guidance exists, "*	Clarification			**X**	The sentence emphasizes the need of engineering judgment when defining combination of events. If a regulatory guide exists, then, of course, it should be used. This issue is considered now in para. 6.5

COMMENTS BY REVIEWER Reviewer: F. Féron Page Country/Organization: France - ASN Date: 4 sept 2009				RESOLUTION			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
15.	6.16 6.17	Installation Structures Components	Typo	**Yes**			
16.	7.5/13	After "for the barriers", add a footnote "Additional attention should be paid if such external barrier is not under the responsibility of the NPP operating organization"	Clarification. See also comment en 5.117		**Yes.** Modified text: *" . .In this case, care should be taken that appropriate design bases (e.g. for seismic qualification where relevant) are selected for the barriers and that periodic inspections, monitoring and maintenance of the barriers are conducted, even if such external barriers are not under the responsibility of the installation operating organization. The barriers should be considered important to safety. . . "*		

COMMENTS BY REVIEWER Reviewer: F. Féron Page Country/Organization: France - ASN Date: 4 sept 2009				RESOLUTION			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
17.	7.9/1	Before "floods", add "hydrological issues, including"	Clarification. For example, sedimentation is not only related to flood.		**Yes.** Modified text: *" ..Other factors related to hydrological issues should be considered in site evaluation, mainly for their potential effects on water intakes and thereby on safety related items:* *Sedimentation of the material transported by the flow* *Erosion* *Blockage of intakes by ice and debris . .*		
18.	7.9/1st bullet	After "sand", add a footnote "Such sedimentation may also happen, at a slower rate, without flood. Sediment level in or near the intake channel of a NPP should be regularly monitored"	To take into account an event at Chinon NPP in France.	**Yes partial**	The first part of the comment concerning sedimentation was included (see Comment 17). Monitoring is discussed in Section 9.		
19.	7.18/7	A bullet list should be created after "follows this outline:"	Typo	**Yes**			
20.	8.2/4	Replace "is" by "may be"	It may be longer for waste repositories…			**X**	The Safety Guide is not intended for repositories. (see Para. 1.14)
21.	8.4/bullet list	©	Typo	**Yes**			

COMMENTS BY REVIEWER Reviewer: F. Féron Page Country/Organization: France - ASN Date: 4 sept 2009				RESOLUTION			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
22.	9.3/4	After “basis flood”, add “, for example when performing a periodic safety review”	Clarification	**Yes**			
23.	9.15	Combine 9.15 with 9.14	9.14 and 9.15 deals with tsunami warning centres.	**Yes**			
24.	9.16	Delete 9.16	Superfluous. Does not provide guidance (explanatory only)	**Yes**	All paragraphs from 9.12 to 9.20 were moved to Annex 3		
25.	9.17	Delete 9.17	Superfluous. Does not provide guidance (explanatory only)	**Yes**	All paragraphs from 9.12 to 9.20 were moved to Annex 3		
26.	9.18	Delete 9.18	Superfluous.	**Yes**	All paragraphs from 9.12 to 9.20 were moved to Annex 3		
27.	9.29/5	Delete “if practicable”	Coordination is necessary	**Yes**	… when practicable		
28.	10.1/last bullet	Should be a “-“ bullet, not a “•”	Not dealing with spent fuel facilities	**Yes**			
29.	10.2/2	Replace “should” by “may”	To be consistent with last sentence of 1.14.	**Yes partial**			Concerning comments 29, 31, 33, Para 1.14 was modified together with the first sentence Para 10.1. This is in line with the DS422.
30.	10.3/9	Delete “commercial/”	Industrial facilities should be privileged as reference			**X**	For consistency with SG NS-G-2.13.
31.	10.7/1	Before “The grading”, add “If grading is implemented,”	To be consistent with last sentence of 1.14. and comment on 10.2	**Yes partial**			See 29
32.	10.7 (b)		Is the PSA including external hazard events?	**YES**	Any PSA performed for the installation may be used		

COMMENTS BY REVIEWER Reviewer: F. Féron Page Country/Organization: France - ASN Date: 4 sept 2009				RESOLUTION			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
33.	10.10/1	Before "The meteorological", add "If grading is implemented,"	To be consistent with last sentence of 1.14. and comment on 10.2	**Yes partial**			
34.	10.10/2	After "guidance", add a footnote "Specific attention should be paid if several nuclear installations belonging to different categories are located at the same site."	To take care of sites accommodating several nuclear facilities where it may not be easily explainable to the public to consider different external hazard level (flood level for example)….	**Yes**	The footnote slightly modified was added to Para 1.14: *"For sites at which nuclear installations of different types are collocated, particular consideration should be given to using a graded approach"*		
35.	11.2 11.4	Replace "regulatory authority" by "regulatory body"	Consistency with IAEA glossary	**Yes**			

GERMANY COMMENTS

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: **Federal Ministry for the Environment, Nature Conservation and Nuclear Safety** (BMU) Page..1. of..13. Country/Organization: **GERMANY** Date: Sept. 2009							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	general	- / -	The new guide is a good approach, but some paragraphs are not completely consistent in all details. There are a couple of misspellings and also some other issues lead to the impression that the draft is not yet fully developed. A thorough revision of the scientific and technical content by experts on the concerned disciplines is strongly advised.	**YES**	See new version. Many flaws have been resolved and completed, with the contribution from NUSSC comments.		
2	general	- / -	A list of abbreviations would be a desirable add-on.	**YES**	In the final editing will be done, according to the rules of the IAEA.		
3	general	- / -	Up to now Europe seems to be represented only by France. In spite of this, the guide contains some examples concerning “climate change in Europe”. Maybe due to the lack of local experts, these examples are partially not correct.			**X**	The information given on that subject are extracted only from UN/IPCC documents
4	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		**Yes.** Chapter 9 has been modified to consider both hazards.		

			relation to the hydrological hazards are underrepresented respectively the topics “flood” and “tsunami” are too dominant.				
5	general	- / -	Tsunami warning systems are described in detail. Are there other warning systems for meteorological hazards which also could be presented? For example a thunderstorm warning system?		**Yes.** Part of the Chapter 9 was moved to Annex 3. Other warning systems are mentioned in Para 9.8 to 9.10		
6	2.28	- / -	The subtitle “GENERAL RECOMMENDATIONS” is the same as the heading of the whole chapter. This should be changed.	**Yes**	The complete Section is titled as “GENERAL CONSIDERATIONS AND RECOMMENDATIONS”.		
7	2.27	[...] Probabilistic methods should also be checked by a simplified deterministic analysis. When applying probabilistic methods, any use of engineering judgement should be explicitly and clearly identified and the related uncertainties should be evaluated.	Experience with Probabilistic Seismic Hazard Assessments has shown that a crosscheck by simple deterministic considerations is necessary to avoid unrealistic results	**Yes**	New text: *“Probabilistic methods results should be checked for consistency with the results from a simplified deterministic analysis. “*		
8	2.27	[...] Probabilistic methods should also be checked by a simplified deterministic analysis. When applying probabilistic methods, any use of engineering judgement should be explicitly and clearly identified and the related uncertainties should be evaluated.	We recommend not focusing on the logic tree approach, because also other possibilities are conceivable to account for the variation in expert opinions.	**Yes**	New text: *When applying probabilistic methods, any use of engineering judgment should be explicitly and clearly identified and all involved uncertainties should be evaluated as applicable for the specific hazard”.*		
9	4.33	[...] Lightning is a visible electrical discharge **mostly** produced by a thunderstorm. [...]	Lightning mostly occurs in combination with thunderstorms, but there is also the possibility for their appearance e. g. in smoke- and ash-clouds of volcanoes. Furthermore, there is sometimes lightning in connection with sandstorms or	**Yes**	New text: *… discharge **most commonly** produced by thunderstorms …*		

			snowstorms. Even in fair weather lightning can be observed under certain circumstances.				
10	4.53 - 4.64	- / -	The distinction between tornadoes and waterspouts seems not appropriate. a) As stated in paragraph 4.62 waterspouts are not necessarily tornadoes. b) Dust-devils, the correspondent to fair weather waterspouts are not mentioned at all. Therefore, we propose not to make a distinction between tornadoes and waterspouts but a distinction between tornadoes (over land and over water) and whirlwinds (dust-devils and waterspouts). In general, we would recommend the involvement of specific experts on the various hazards discussed in draft. For the issue of tornadoes Mr. Nilesh Chokshi (U.S. NRC) could be a good choice.			**X**	In the document, the distinction between tornadoes and waterspouts is the following: 1) Tornadoes deal with design basis wind pressure. Dust-devils are smaller, weaker phenomenon that is bounded by tornado characteristics. 2) Waterspouts deal with depositing large quantities of water on the site.
11	4.66	Dust storms […]	Headline: 'Dust storms [...]' instead oft 'dust and storms [...]'.	**Yes**			
12	4.66	[...]	A short description of the potential impacts should be provided (just as done for the other hazards).	**Yes**			
13	5.106	[…] 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.	**Yes**			
14	6.1	- / -	a) The formulation of this paragraph leads to the impression that meteorological parameters have not to be seen in combination. But for example, in a thunderstorm lightning and heavy precipitation occur at the same time. Similar combinations can be found in other weather events.		**YES** .Partially. See new text *For the different meteorological hazards considered in Chapter 4, extreme values are defined using the assessment methods described in Chapter 2. In general, each*		

			b) Maybe a sub-section “simultaneous events” could be added. (This approach has proven suitable in the hydrological design basis parameters section). c) The whole chapter 6 is somewhat unbalanced w. r. t. the depth of the descriptions (meteorological vs. hydrological phenomena, i. e. one paragraph for meteorological and 17 for hydrological parameters/ effects).		*of the meteorological hazards is determined individually, even if they occur simultaneously, unless they interfere and increase a given hazard (e.g., freezing precipitation and winds, 4.17)*		
15	7	- / -	Delete this chapter! In spite of some aspects that might relate to site characteristics, the whole chapter 7 is more about safety measures. As “protection” belongs to the engineering part and not to the natural science part, we propose to shift this chapter to the appropriate guide, which deals with the plant design.			**X**	Site protection measures is mentioned in the Safety Requirements for Site evaluation, NS-R-3 in Para 2.6. This chapter is mentioned in the DPP.
16	7	- / -	If this chapter should not be deleted from the site evaluation guide (in spite of comment 14a), we recommend to enhance it by adding some paragraphs on meteorological hazards, because at the moment this chapter only deals with hydrological hazards.	**Yes**	The Title of the Chapter has been changed and the following sentence was added: *For practical reasons, most site protective measures deal with flooding hazards rather than low water or meteorological hazards*		
17	8.1	Hydrological and meteorological hazards may change over time as a result of various causes, namely: - regional climate change impact - [...]	Global climate change is not relevant for a specific site and its assessment. Regional climate change impacts are the right issue to worry about.	**Yes**	First bullet was modified as follows: *Regional climate change associated with global climate change*		

18	8.2	The planned life time of a plant is assumed to be in the order of about **40 - 60** years.	The planned life time of most NPPs is about 40 - 60 years. Life times of 100 years are not considered (to our knowledge).			**X**	The duration covers the licensing process from site selection up to the end of operational phase (see para 1.10)
19	8.3	- / -	Climate predictions are still highly uncertain. It seems inappropriate to use information that is not yet settled knowledge in a regulatory document. Therefore we recommend deleting this paragraph. It is dispensable anyway, because paragraph 8.6 covers the issue of climate change already in a reasonable way.	**Yes**	The paragraph was modified in order to refer to the IPCC conclusions: New paragraph: *Annex 4 gives information on the content of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4), and the likelihood of future trends based on projections for the 21st century using green-house gases (GHGs) emission scenarios and different climate models.*		
20	8.3	- /-	If the paragraph should be kept (in spite of comment 12a), the reference to the IPCC report should be deleted, because IPCC deals (almost) only with global climate change. For regional climate impacts other studies have to be used (see comment 18).			**X**	See reply to 17a and 18
21	8.5	- / -	This paragraph should be deleted! IPCC deals (almost) only with global climate change. For regional climate impacts other studies have to be used. The potential impact of (the regional) climate change on the weather in Germany has for example been assessed by DMG (*Deutsche Meteorologische Gesellschaft (DMG) Stellungnahme der Deutschen*			**X**	The paragraph is not deleted. The information given is meaningful. 8.5 has been rewritten to emphasize the use of local climate studies.

			Meteorologischen Gesellschaft zur Klimaproblematik, 09.10.2007, Oktober 2007), Jonas et al. (*Jonas, M., T. Staeger, C.-D. Schönwiese Berechnung der Wahrscheinlichkeiten für das Eintreten von Extremereignissen durch Klimaänderungen – Schwerpunkt Deutschland, Forschungsbericht 201 41 254, UBA-FB 000845, August 2005*), and Spekat et al. (*Spekat, A., W. Enke, F. Kreienkamp Neuentwicklung von regional hoch aufgelösten Wetterlagen für Deutschland und Bereitstellung regionaler Klimaszenarios auf der Basis von globalen Klimasimulationen mit dem Regionalisierungsmodell WETTREG auf der Basis von globalen Klimasimulationen mit ECHAM5/MPI-OM T63L31 2010 bis 2100 für die SRES-Szenarios B1, A1B und A2, Endbericht zu einem Forschungsprojekt im Auftrag des Umweltbundesamtes, Januar 2007*) (to cite only three of the many studies). The results of these studies (regional climate projections) differ significantly from the global assessment of IPCC (although in general they are based on the IPCC Working Group 1 reports). Again, we recommend to involve specific experts in the development of the guide to avoid meaningless requirements.				
22	8.7	- / -	This paragraph should be deleted! Numerical models do only provide reasonable results, if the underlying (physical) processes are sufficiently			**X**	The paragraph was not deleted. It was shortened and included in paragraph 8.6:

			understood. This is not the case with our climate (*Tetzlaff, G., Klimawandel – Prognosen und zu . . . . en für den Katastrophenschutz, Beitrag zum 3. Europäischen Katastrophenschutzkongress, 30. - 31. Oktober 2007, Bonn Bad Godesberg, Deutschland, Oktober 2007*; *Thommes, W. Mit Wissensmanagement und Wetterinformationsdiensten die Katastrophenprävention stärken, Beitrag zum 3. Europäischen Katastrophenschutzkongress, 30. - 31. Oktober 2007, Bonn Bad Godesberg, Deutschland, Oktober 2007*; *Wood, R., Predicting the future of the MOC, Beitrag zur Rapid Climate Change International Science Conference, 24. - 27. Oktober 2006, Birmingham, United Kingdom, Oktober 2006*; *Fichefet, T., et al., Modeling the interactions between the Greenland ice, Beitrag zur Rapid Climate Change International Science Conference, 24. - 27. Oktober 2006, Birmingham, United Kingdom, Oktober 2006*)				*"…To account for future climatic change, an additional safety margin should be taken into consideration in the design of nuclear power plants. Numerical modelling should be resorted to in order to estimate the impact of climatic changes on the design basis parameters, e.g. the consequences of increase in size and energy of waves because of increase of water depth due to change of sea level. 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).*
23	9	- / -	The headline "GENERAL" does not fit here. Only hydrological phenomena are described. Meteorological phenomena are ignored. Therefore, it cannot be 'general'.	**Yes**	The first part of the Chapter 9 has been modified and includes now both meteorological and hydrological hazards.		
24	9.11	- / -	The reference should be checked. The content of the referenced paragraph doesn't fit.	**Yes**	Reference is Para 5.44		
25	9.12 - 9.21	- / -	These paragraphs do not fit into a regulatory stile document. For they do	**Yes**	These paragraphs were moved to Annex 3		

			also not provide essential information for the user of the guide, we recommend to delete them.				
26	Annex 2	- / -	Although at the beginning of annex 2 it is mentioned that a method will be described which current praxis in **some** member states is, only the Japanese praxis is described. We think that a short reference to the Japanese documents would be more adequate than this detailed description in this annex.	**Yes**	US practice was also added		
27	Annex 4	- /-	We strongly recommend deleting Annex 4. The information given there partially contradicts the results of IPCC Working Group 1 (*Intergovernmental Panel on Climate Change (IPCC) Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)], Cambridge University Press, Cambridge, United Kingdom and New York, USA, 2007*) and the regional studies performed for Central Europe (examples for references see comment 18).			**X**	A participant of IPCC/WG1 prepared this Annex.

JAPAN COMMENTS

COMMENTS BY REVIEWER **Reviewer: Uchiyama, Prof. Satake, Prof. Imamura Page 1 of** **Country/Organization: JAPAN/ JNES, Tohoku Univ., Tokyo Univ. Date: 16/09/2009**				RESOLUTION			
Comment No.	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modif./rejection**
1	2.29 (Page 12) the last line	"Chapter 3 (para 3.35?)" may be "Chapter 5 (para 5.48)"	Editorial	**Yes**	Chapter 3 (Para 3.34 ans Chapter ((Para. 5.48)		
2	3.34 (page 23) 11th line:	"volumn" should be" volume"	Editorial	**Yes**			
3	3.36 (page 24) 14th line	Add following sentence to the last of this paragraph. - Sea level and tidal data such as low and high tide or tidal components	These data are necessary.			**X**	Para. 3.36 refers to topographic and bathymetric data. Tidal data are already mentioned in Para 3.28
4	5.42 (page 51) 2nd line	"or, " should be "or " (remove comma)	Editorial	**Yes**			
5	5.43 (page 52) 2nd line from bottom	"para 5.38" should be "para 5.41"	Editorial	**Yes**			
6	5.44 (page 52) 2nd line	"chapter 3" may be "para 3.35"	Editorial	**Yes**			
7	5.47 (page 52) 3rd line	"chapter 3" may be "paras 3.33, 34 and 35"	Editorial	**Yes**			
8	5.65 (page 57)	Because the frequency of landslide is not well known, probabilistic methods	Responding to IAEA comments, we would	**Yes**	See new text (now 5.66): *". . .Due to the insufficiency of*		

		for landslide-tsunami are still at a research stage and standard procedure has not been established.	like to propose to add the sentence shown left to the last of this paragraph.		*data for probabilistic analysis in most regions[1], deterministic methods are usually used for landslide-induced tsunamis. The source parameters of the analysis are the dimensions and geometry of the landslide, and the speed and rheology of the falling material. The numerical model should couple the landslide with the resulting water motion…"*		
9	5.67 (page 57)	Tsunami modeling due to volcanic phenomena including caldera collapse, either deterministic or probabilistic, is still at a research stage and standard evaluation procedure has not been established.	Responding to IAEA comments, we would like to propose to add the sentence shown left to the last of this paragraph.	**Yes**	See new text (now 5.68): *". . . Tsunami modeling due to volcanic phenomena is not the current practice applied by Member States for assessing associated tsunami hazards. Methods for tsunami modelling due to volcanic phenomena have been proposed although standard evaluation procedures have not yet been developed…"*		
10	9.11 (page 86)1st line	"para 5.43" may be "para 5.44"	Editorial	**Yes**			
11	9.12 (page 86) 3rd line	Annex should be Annex 3	Editorial	**Yes**			
12	A2-3 (page 101) 4th line	"Each results of the parametric study are termed as scenario tsunamis." , should be: "Each result of the parametric study is termed as scenario tsunami."	Editorial	**Yes**			
13	A2-6 (page 102) 2nd line	"composed, of the" should be "composed of the"	Editorial	**Yes**			
14	A2-6 (page 102) 4th line	'parameter study' should be 'parametric study'	Editorial	**Yes**			

[1] However, in some Member States probabilistic methods are being used for assessing this type of hazard.

15	A2-7 (page 102) 1st line	"Dominant historical tsunamis for the target site by literature survey should be done at first " should read "Literature surveys for dominant historical tsunamis affecting the target site should be done at first"	Clarification	**Yes**	New text: *The first step should be to conduct literature surveys for dominant historical tsunamis affecting the target site and then validity of recorded tsunami heights should be examined…*		
16	A2-8 (page 102) 2nd line	"but they cannot be" should be "but the latter cannot be"	Editorial	**Yes**			
17	A2-8 (page 102) 5th line	"submarine active fault" should be "submarine active faults"	Editorial	**Yes**			
18	A2-9 (page 102) 1st line	"Continuing to select tsunami source area, then the standard fault models for scenario earthquakes are determined" should be "The standard fault models for scenario earthquakes are then determined"	Editorial	**Yes**	New text " . .*The standard fault models for scenario earthquakes are then determined. These standard fault models will be…"*		
19	A2-10 (page 103)2nd line	Remove "in base"	Editorial	**Yes**	New text: *"In setting for scenario earthquakes, the standard fault model is set in order to reproduce recorded historical tsunami heights in each region. In this process, occurrence mechanism of historical…."*		
20	1.2.4 (page 103)	1.2.4 "Parameter study" should be "Parametric study"	Editorial	**Yes**			
21	A2-19 and A2.20 (page 107) at three locations	"offing" should be "offshore"	Editorial		**Yes**: "… *Offshore zone*"		
22	References for Annex 2 (page 107)	[A2-2, 3, 4, 5, 6, 7,8 and 9] may be deleted. For [A.2-1], the website where this document is stored may be	Only [A.2-1] and [A.2-10] are directly related to this Annex.	**Yes**			

		added. http://www.jsce.or.jp/committee/ceofnp/Tsunami/eng/JSCE_Tsunami_060519.pdf					
23	References for Annex 2 (page 107)	The following paper is recommended to be added to the reference list, and add "[A.2-3]" to the last of para.A.2-19. "F. Imamura, I. Abe, "History and challenge of tsunami warning system in Japan", Journal of Disaster Research Vol.4 No.4,2009"	Clarification	**Yes**			
24	Annex 3 (page 109)	"Unesco/Ioc" should be "UNESCO/IOC"	Editorial	**Yes**			

PAKISTAN COMMENTS

COMMENTS BY REVIEWER **Reviewer: PNRA** **Page.... of....** **Country/Organization: PAKISTAN** **Date:**				RESOLUTION			
Comment No.	**Para/Line/ page No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
1	4.13/2nd/29	**Comment:** From the conducted on site measurements program the specific data should be collected **for monthly or seasonally and annual joint frequency** and a comparison with data from existing offsite meteorological stations in the region should be preformed.	Time span like monthly. Quarterly or annually should be specified for the collection of data.		**YES:** new text; *"From the conducted on-site measurement programme (paragraph 3.21 to 3.23), the specific site data should be collected and a comparison with data (e.g., monthly or seasonal and annual joint frequency distribution of wind speed and wind direction) from existing offsite meteorological stations (paragraphs 3.16 to 3.20) in the region should be performed…"*		
2	Section 9/84	**Comment:** To ensure safety against meteorological and hydrological mishaps like tsunami and dam break etc, a full-fledged exercise /drill should be conducted at specific interval of time among all concern departments.	Practice/ exercises for these emergencies build more confidence in emergency handling.	**YES**	See new sentence in paragraph 9.6, new version.		

3	Section 6.8/5th/72	6.8. For independent events, the probability that they will occur in such conditions that their effects will be cumulated is related to the duration of the severity level of each event. The probability that the events occur in combination is more than the product of the probability of each event and therefore effect of contemporaneous events should be considered (see example B in the annex **- I).**	Typo error	**YES**	See para 6.11, in new version.		

U.K. COMMENTS

COMMENTS BY REVIEWER Reviewer: Country/Organisation: **UK** (NUSSC)/HSE (ND) Date: 18 September 2009				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General		The production of this guide is logical in superseding and merging the two earlier guides NS-G-3.4 and NS-G-3.5, in that some of the hazards considered are related.	**Yes**			
2	General		The graded approach outlined in Section 10 for facilities other than NPP is welcome, since the totality of data and analysis identified in the guide would otherwise be excessive for facilities less hazardous than a NPP.	**Yes**			
3	Para 2.11	Add a new bullet point: (g) Frazil		**Yes**	New bullet (g) *subsurface freezing of subcooled water (frazil ice).*		
4	Para 2.27, last sentence	Delete the last sentence: "When using probabilistic methods, any……detailed logic tree and uncertainty should be incorporated."	The need in Para 2.27 for a detailed logic tree and incorporation of uncertainty, whilst generally accepted as being necessary in the probabilistic assessment for certain hazards, such as seismic, is excessive in the assessment of all hazards.	**Yes**	The paragraph was modified taking also into account comments from other members; new text: *When applying probabilistic methods, any use of engineering judgement should be explicitly and clearly identified and all involved uncertainties*		

					should be evaluated as applicable for the specific hazard..		
5	Para 3.31	Replace “surficial aquifer” with “appropriate strata” to read: “Piezometers should be installed at the site to monitor the ground water levels in the **appropriate strata**.”	"Surficial aquifer" may not be understood and the suggested replacement is more general.		**Yes;** modified as follows: *…Piezometers should be installed at the site to monitor the groundwater levels and pressures in the appropriate aquifers…*		
6	Para 8.6, 1st sentence	Consider modifying to read: “To account for future climatic change over the life cycle of a nuclear facility, account should be taken of differing emissions scenarios and model parameters.”	Para 8.6 advises "to account for future climatic change, an additional safety margin should be taken into consideration in the design of nuclear power plants". While recognizing that there may be differing views amongst Member States regarding future climate change, this guidance is too arbitrary and vague. Consider replacing with the suggested wording.			**X**	The IPCC scenarios and models are mentioned in Para 8.5. This paragraph is dealing with the consequences on design, providing a general recommendation of adding some conservatism to the hazard estimate, once the design basis are derived.

U.S.A. COMMENTS

COMMENTS BY REVIEWER Reviewer: NUSSC, WASSC Date: September 21, 2009 Country/Organization: **United States of America** / NUSSC, WASSC				RESOLUTION			
Comment No. / Reviewer	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
1	Table of Contents and Section Headings	Insert "Chapter" in the actual chapter headings since text often refers to chapter numbers.	Clarify document navigation.	Yes	Will be considered during editing to be in accordance with IAEA rules		
2	2.18 / 4	"~~Over such long period~~ For many installation lifetimes, it is possible…"	"long period" is equivocal – need is for consideration of change during installation lifetime.	Yes	Modified text: *Over the lifetime of the installation…*		
3	2.31 / 8-10	"T~~here may, t~~herefore, ~~be a part of the~~ remaining uncertainty ~~which is irreducible with respect to~~ for site specific investigations~~. This~~ should be ~~recognized and taken into consideration~~ evaluated stochastically where possible."	Vague definitions imply no useful guidance.	Yes	Modified as follows: *therefore remaining uncertainty for site specific investigations should be evaluated*		
4	2.34 / 7-9	"…assessment and consider ~~all~~ important uncertainties explicitly to the extent possible. ~~.The selection of the probability level for the design basis parameter should guarantee a sufficient margin of safety to protect the plant against serious radiological consequences.~~"	all" too encompassing – need to focus on important uncertainties. Vague definitions imply no useful guidance.	Yes. The last sentence was deleted			
5	3.1 / 4-5	"…compiled in specific site catalogues or databases for each of the hazards under consideration. To permit the	Standardized database structures and templates permit consistent and	Yes			

COMMENTS BY REVIEWER Reviewer: NUSSC, WASSC Date: September 21, 2009 Country/Organization: **United States of America** / NUSSC, WASSC				RESOLUTION			
Comment No. / Reviewer	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
		development of scalable databases over the facility life cycle, the database structure should whenever possible, be standardized to permit reproducible analyses by a third party. Consider that climate change may require revised analyses in future years that may need to be compared to an initial baseline analyses. The results of the site evaluation should be used for the design of a plant as described in the…"	comparable analysis over the data collection period.				
6	3.6 / 1	"Data should be presented legibly ~~clearly~~ and using maps of appropriate scale, graphs, and…"	Often maps received are illegible in the applicant's reports and application documents.			X	Clearly is sufficient.
7	3.6 / 5	"…including a Digital Elevation Model (DEM) extended to the ~~complete~~ appropriate region surrounding the…"	"complete" may be misinterpreted to mean an entire ocean basin, for example.	Yes			
8	3.18 / 4	"…available and ~~validated~~ adequately supported, they should be used as part of the meteorological site evaluation…"	A validated (as in NPP engineering codes), local-scale model is unobtainable. Need to have appropriate level of model support.	Yes	Modified as follows: *If such models are available, validated, and adequately supported, they should be…*		
9	3.27 /2-3	"-The ~~locations and~~ hydrological characteristics of ~~all relevant bodies of water and~~ groundwater and all relevant bodies of water, and locations of surface water bodies. In	For completeness and clarity.	Yes			

COMMENTS BY REVIEWER Reviewer: NUSSC, WASSC Date: September 21, 2009 Country/Organization: **United States of America** / NUSSC, WASSC				RESOLUTION			
Comment No. / Reviewer	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
		addition, information should be obtained on the geological framework within which groundwater occurs."					
10	3.31 / 1-2	"Hydrogeological information in the vicinity of the site. Piezometers should be installed at the site to monitor the ground water levels and vertical gradients in the ~~surficial~~ aquifer system."	The term "surficial aquifer" is vague. Vertical gradients are important to capture for radiological transport.	Yes	Modified as follows: *Piezometers should be installed at the site to monitor the groundwater levels and pressures in the appropriate aquifers.*		
11	3.31 / 7	"…regard, see Ref. [3] for further guidance. "- Information should be obtained on anthropogenic influences, such as location and magnitude of groundwater extraction and artificial recharge. Anticipated future trends based on population changes and development should be considered. "- Long-term records of groundwater levels should be obtained from wells in the same region and in comparable hydrogeological situations to allow estimation of the effects of extreme meteorological conditions on groundwater levels, and to examine long-term trends such as caused by large-scale groundwater extraction."	To obtain information over a longer term than is typically obtained from piezometers at the site.	Yes			
12	3.33 / 7	"Hydrogeological characteristics such	Landslides causing	Yes			

COMMENTS BY REVIEWER Reviewer: NUSSC, WASSC Date: September 21, 2009 Country/Organization: **United States of America** / NUSSC, WASSC				RESOLUTION			
Comment No. / Reviewer	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
		as permeability and porosity. "- Landslide effects to rivers course."	diversion of the channel and possible flooding should also be considered in areas that are not necessarily affected by tsunami				
13	3.35 / 3	…"Catalogue specific to the site, which should consider evidence of tsunamis from available stratigraphic records."	Take relatively recent evidence for tsunamis from paleo-stratigraphy.	Yes	New text of Para 3.35: *All data relevant for assessing the potential for tsunami hazards and for determining the tsunami hazard parameters should be compiled in a Tsunami Catalogue specific to the site. This catalogue should consider all historical information and paleological evidence of tsunamis from stratigraphy and other geological studies*		
14	3.36 / 2	"The reference vertical and horizontal datum. Special attention should be paid to the possibility that surveys made at different times may have been made using different survey grids or datums. The grid or datum used in each data set should be explicitly stated."	This is very easy to overlook, but can cause much difficulty if, for example, elevations measured from different datums are combined.	Yes			

COMMENTS BY REVIEWER Reviewer: NUSSC, WASSC Date: September 21, 2009 Country/Organization: **United States of America** / NUSSC, WASSC				RESOLUTION			
Comment No. / Reviewer	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
15	4.40 / 1-7	"The ~~proness~~ proneness of occurrence of this type of meteorological phenomena at the site should be assessed. If the site is subjected to the affects of tropical cyclones, ~~two approaches have been used to develop the design-basis wind speeds from tropical cycles: a statistical approach and a deterministic approach~~ a combination of statistical and deterministic approaches are used to develop the design-basis wind speeds from tropical cycles. In the statistical-deterministic approach, the consideration of high winds resulting from tropical cyclones has been included in the development of extreme wind hazards. ~~Thousands of storm track simulations combined with wind field and gust factor models were used to define wind speed probability distribution for a particular location.~~ The statistical properties of climatic tropical cyclones are combined with deterministic numerical models to generate Thousands of storm track simulations to define wind speed probability distribution for a particular location."	This is the state-of-the-art method –replaces Probable Maximum Hurricane/Tropical Cyclone methods of the 1970s.	Yes			

COMMENTS BY REVIEWER Reviewer: NUSSC, WASSC Date: September 21, 2009 Country/Organization: **United States of America** / NUSSC, WASSC				RESOLUTION			
Comment No. / Reviewer	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
16	4.41 / 1-5	"~~The deterministic approach relies on the determination of a probable maximum tropical cyclone (PMTC)12. For the purposes of the application of the methods discussed in this Safety Guide, a PMTC is a hypothetical steady state tropical cyclone having a combination of values for meteorological parameters chosen to give the highest sustained wind speed that can reasonably occur at a specified coastal or near coastal location.~~"	Probable Maximum Hurricane/Tropical Cyclone methods of the 1970s method replaced by statistical-deterministic methods using larger/updated databases, numerical models and latest peer-reviewed research.	Yes			
17	4.42 / 1-2	"The methods for evaluating ~~the PMTC should~~ tropical cyclone parameters depend on the results of theoretical studies on the tropical cyclone structure and combine data from synoptic networks, satellites, and aircraft as well as data obtained from modelling."	Removes references to PMTC.	Yes			
18	4.49 / 1	"Most of the ~~tropical cyclone~~ data used for the ~~development of the PMTC~~ evaluating tropical cyclone parameters are…"	Removes reference to PMTC.	Yes			
19	4.50 / 2	"…period of a few hours are still little known~~, so the PMTC is assumed to be in a steady state~~."	Removes reference to PMTC.	Yes			
20	5.8 / 4-5	"…surge model which maximizes the flooding potential. All parameters should be ~~conservatively~~ realistically	The approach developed in paragraph 2.34 is "unbiased and realistic."			X	Para 2.34 refers to Probabilistic approach. Para 5.8 is

COMMENTS BY REVIEWER Reviewer: NUSSC, WASSC Date: September 21, 2009 Country/Organization: **United States of America** / NUSSC, WASSC				RESOLUTION			
Comment No. / Reviewer	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
		evaluated and justified."	Realism, not conservatism, should thus be required.				in related to Deterministic approach Deterministic evaluation should be performed "conservatively".
21	5.36 / 4	"…generate a tsunami; rare large meteorite strikes may also impact the ocean and generate a tsunami."	Typographical error.			X	*…large meteorites*[2] *may also impact…* is clear enough.
22	5.64 / 8	"…analyst should take into consideration at each step of the process. Some Member States conduct formal expert elicitations to evaluate the significance of model and data uncertainty on calculated hazard."	Concept of elicitation is introduced, but not used as practical solution to problem outlined in paragraph.	Yes	Included in footnote3: *Some Member States conduct formal elicitations to evaluate the significance of model and data uncertainties*		
23	5.67	Develop new paragraph(s) on guidance regarding volcanic phenomena.	Although numerous volcanic phenomena are discussed in 5.41, no practical guidance is given here for conducting a hazard assessment. Clear guidance is needed for these phenomena.			X	See new text that explain why only one paragraph is provided.
24	5.98	Add discussion of contribution of snow pack	Consideration of snowpack in addition to extreme precipitation	YES			

[2] For meteorite induced tsunamis, assessments conducted to date do not demonstrate that the frequency of occurrence of these events exceeds the usually adopted screening level.

COMMENTS BY REVIEWER Reviewer: NUSSC, WASSC Date: September 21, 2009 Country/Organization: **United States of America** / NUSSC, WASSC				RESOLUTION			
Comment No. / Reviewer	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
			events is recommended.				
25	5.100 / 2-5	"…necessary to estimate water velocities and hydrodynamic forces on inundated structures. If increased roughness coefficients have been considered for the ~~conservative~~ estimation of water stage, adjustment of these roughness coefficients to obtain ~~conservative~~ realistic water velocity…."	The approach developed in paragraph 2.34 is "unbiased and realistic." Realism, not conservatism, should thus be required.			X	Para 2.34 refers to Probabilistic approach. Para 5.8 is in related to Deterministic approach Deterministic evaluation should be performed "conservatively".
26	5.117 / 1	"Proper inspection and monitoring should be ~~carried out~~ assured to detect gradual changes in…"	Replace the wording "carried out" - this may occur after operation			X	The proposal seems equivalent to the existing word.
27	6.1 / 3-4	"…considered separately, even if they occur simultaneously, ~~as~~ unless they ~~do not~~ interfere and increase a given hazard (e.g., freezing precipitation and winds, 4.17). However, meteorological events that drive hydrological events such as precipitation and runoff could be addressed in conjunction. Values for design purposes are derived by statistical treatment or by…"	Although precipitation is a meteorological event, it needs to be considered distinctly compared to tornado or other meteorological events. Chapter 2 of the document identifies meteorological hazards, including precipitation. The actual hazard is not from the precipitation as such (unless it is accumulation on structures) but the flooding that is generated from it.	Yes	New text: *For the different meteorological hazards considered in Chapter 4, extreme values are defined using the assessment methods described in Chapter 2. In general, each of the meteorological hazards is determined individually, even if they occur simultaneously, unless they interfere and increase a given hazard (e.g., freezing*		

COMMENTS BY REVIEWER Reviewer: NUSSC, WASSC Date: September 21, 2009 Country/Organization: **United States of America** / NUSSC, WASSC				RESOLUTION			
Comment No. / Reviewer	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
					precipitation and winds, 4.17).		
28	6.13 / 8-9	Define “a shorter recurrence interval”.	Needs elaboration			X	This means that we don’t combine maximum of both phenomena. With the maximum of one phenomenon, the second one is lower than the maximum or equivalently, is defined with a shorter recurrence interval.
29	7.1 / 9-10	“Study of possible interference between the structures for protection and parts of the plant. - Evaluation of operational procedures and mitigation mechanisms to minimize hydrological hazards.”	It is important to consider operational procedures and mitigation measures as part of the whole Protection Plan.	Yes			
30	7.7(b) / 3	“…conditions (e.g. wind and landslides, but excluding ~~extremely rare~~ highly unlikely combinations)…”	Vague term – need consistency with approach used in text.	Yes			
31	7.24 / 5	“…flooding event. Special provisions should be made for protection and evacuation of the families of plant personnel during floods, in order to help assure the effectiveness of personnel during the emergency. “	To assure that plant personnel are not distracted from critical duties because of concerns about their families.	Yes	New text: *Special provisions should be made for protection of the families of plant personnel during floods, in order to help assure the*		

COMMENTS BY REVIEWER Reviewer: NUSSC, WASSC Date: September 21, 2009 Country/Organization: **United States of America** / NUSSC, WASSC				RESOLUTION			
Comment No. / Reviewer	**Para/Line No.**	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/rejection**
					effectiveness of personnel during the emergency. "		
32	8.5	The selection of a particular IPCC AR for analyzing the impacts of climate change should be based on the choice of appropriate forcing scenario that reflects the trends.	IPCC scenarios are based on GHG forcings that in turn are based on a host of assumptions.			X	Trends are already mentioned in this paragraph. It is clear that the scenarios to be used are those reflecting these changes.
33	8.5 / 1	"The results of the most recent IPCC AR investigations or other pertinent studies should be used to analyse the…"	Added "other pertinent studies" to allow some flexibility. As is, the paragraph endorses one study that may become outdated, revised or is not appropriate for a given situation.	OK			