



COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member Country/Organization: Japan NUSSC				Date: 21 Oct, 2016			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Chapter 7, 7 <sup>th</sup> bullet	• <u>Asphyxiant and</u> Toxic Gases.	“Asphyxiant” is very important external events with toxic gases.	x			
COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)</b> (with comments of BfE) Country/Organization: <b>Germany</b>				Date: 2016-10-25			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2. Background	Which life cycles of the facilities are discussed in this document? Will this scope of this document also include operating phases like post-operational phase and decommissioning? In my opinion this would be an added value to this safety guide.				x	It is a Design Safety Guide – applicable requirements are provided by SS-R-2/1 Operation is under SS-R-2/2 - Out of Scope. Decommissioning is out of scope also since in decommissioning phase the facility is not anymore a nuclear installation.
2	2. Background	The IAEA safety guides NS-G-1.5	Grammar	x			
3	5. Scope	• Malicious acts are not included in the scope of this safety guide.	Objects that are not included in the scope should be put at the end of the list of bullet points.	x			
4	6. Place in the overall structure	Preparedness and Response for a Nuclear or Radiological Emergency (GSR Part 7 )	One bullet point too much	x			

5	7. Overview	Other Extreme Meteorological Conditions	<p>What kind of conditions?</p> <p>Possible supplementary conditions: extreme temperatures, long-running dryness, high and low moisture, blizzards, snowfall, icing, heavy rainfall, hail, lightning</p>			x	As defined in IAEA applicable Safety guides (SSG-18).
6	7. Overview	Biological Phenomena	<p>What kind of phenomena?</p> <p>Possible supplementary phenomena: biological flotsam, shell vegetation, large amount of fish, jelly fish or algae, large amount of leaves and weed, rodents, microbiological corrosion</p>			x	As described in existing NS-G-1.5.
7	7. Overview	External Floods	Is “Tsunami” declared as a potential risk of flooding?	x			
8	7. Overview	Aircraft Crash (unintended)	For the reason that malicious acts are not included	x			
9	7. Overview	<ul style="list-style-type: none"> <li>•External Floods</li> <li>•Extreme Winds</li> <li>•Other Extreme Meteorological Conditions</li> <li>•Biological Phenomena</li> <li>•Volcanism</li> <li>•External Fire</li> <li>•External Explosions</li> <li>•Toxic Gases</li> <li>•Corrosive and Radioactive Fluids</li> <li>•Aircraft Crash (unintended)</li> <li>•Electromagnetic Interference</li> <li>•Collisions of Floating Bodies with Water Intakes and Ultimate Heat Sink</li> </ul>	List of hazards could be ordered by natural events (External Floods, Extreme Winds, Other Extreme Meteorological Conditions, Volcanism, Biological Phenomena), man-made hazards (External Fire, External Explosions, Toxic Gases, Corrosive and Radioactive Fluids, Aircraft Crash, Electromagnetic Interference, Collisions of Floating Bodies with Water			x	<p>For hazard assessment are ordered as you suggested.</p> <p>For Design we follow the list from the NS-G-1.5.</p>

		(UHS) components •Combination of Hazards	Intakes and Ultimate Heat Sink (UHS) components) and Combinations				
<b>COMMENTS BY REVIEWER</b> Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)</b> (with comments of GRS) Country/Organization: <b>Germany</b>				<b>RESOLUTION</b>			
			Date: 2016-10-18				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	p.2 , l. 6	<del>Malicious acts are not included in the scope of this safety guide.</del>	According to the introductory sentence, the bullet list is about relevant changes. In principle, the statement in the first bullet is true and appropriate, but should nevertheless be deleted as this is no change compared to the previous version of the guide.		o.k.  Moved as last bullet.		
2	p.2, l. 17	<u>As far as possible,</u> The new guide will propose a common approach for all the external hazards and address applicable combinations of external hazards.	Given the very different characteristics of the hazards addressed in this guide and in line with the statement at the end of page 3, a common approach in all aspects of hazard characterization will probably not be feasible. Therefore, a weaker statement is recommended.	x			
3	p. 2, l. 28	The new safety guide will be directly related to NS-R-3 rev.1, SSR-2/1 rev.1, <del>SSR-3</del> NS-R-4, NS-R-5 and will have interfaces with a number of safety guides on hazard evaluation and safety of nuclear installations, among them the following ones:	NS-R-4 has been replaced by SSR-3.	x			

COMMENTS BY REVIEWER				RESOLUTION			
Country/Organization: USA/NRC		Date: 10/20/16					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	p.3, section 7	Insert additional bullets: - <u>Landslides and avalanches</u> - <u>Sandstorms and dust storms</u>	These are potentially hazardous phenomena that should also be included in DS498 (e.g., TECDOC-1341)			x	Landslides and avalanches are dealing with site protection – out of scope (covered by SSG-18 and NS-G-3.6). Sand storms and dust storms are included in “Other Meteorological Events” (Same in SSG-18)
2.	Section 5, bullet 7	Modify sentence “The new guide will <del>propose a common approach for all the external hazards and</del> address applicable combinations of external hazards.”	Common approach does not appear practical given large differences in phenomena and use of both probabilistic and assessment deterministic methods in applicable safety guides.		As far as possible, the new guide will propose a common approach for all the external hazards and address applicable combinations of external hazards		
3.	p. 3, last sentence	Modify sentence “ <del>There will be aspects for these hazards receiving a common treatment, but Although</del> each of these hazards needs specific considerations, <u>DS498 will develop a common framework for multi-hazard assessments.</u> ”	As in Comment 1, not clear how disparate hazards can have a “common treatment” whereas revision places emphasis on a stated objective of DS498.		As far as possible, there will be aspects for these hazards....		
4.	p. 4, outline item 7	Insert additional bullets: - <u>Landslides and avalanches</u> - <u>Sandstorms and dust storms</u>	These are potentially hazardous phenomena that should also be included in DS498 (e.g., TECDOC-1341).			x	Landslides and avalanches are dealing with site protection – out of scope (covered by SSG-18 and NS-G-3.6).

							Sand storms and dust storms are included in "Other Meteorological Events" (Same in SSG-18)
5.	General	We recommend using the concept of "graded approach," (or risk-informed decision-making) in the design of nuclear installation based on potential risk from external events. Currently, the document appears to treat all nuclear installations at the same level regarding its design to minimize risk from external events. We believe the document could benefit by adding a Section on using "graded approach" in addressing potential risk from external events."	Completeness to address using the concept of graded approach in design of nuclear installation to minimize risk from external events.		x A chapter about Graded Approach was introduced		
6.	General	The document should indicate that this safety guide is applicable to all phases of facilities lifecycle, from licensing, commissioning, to operation, through decommissioning of facilities.	Clarity: It is unclear if the guidance is applicable all phases of facilities lifecycle.			x	This document is applicable for Design Phase only as stated in Objective and Scope. Operation and Decommissioning are out of scope.
7.	General	Operational software design and cyberattack protection.	It is unclear if operational software design and its protection from external event such as cyberattack is considered in this guide.			x	This safety guide is limited to external hazards. Cyberattack are malicious acts and are out of scope.
8.	General	The document could benefit from inclusion in the design evacuation consideration for nuclear installations in order to add additional protection features for workers and potential impacted population in case of external events.	Completeness to consider evacuation in the design safety case when addressing external events.			x	The safety guide is for design of nuclear installations against external hazards. Infrastructure needed for implementing emergency measures is out of scope.

9.	Background and Scope	Add detailed definitions of design extension conditions (DECs).	As a minimum include a description of the plan for incorporating design extension conditions (DECs) into the revised document. DECs are mentioned in the background and scope sections, but no information is provided about how they will be addressed in the revised safety guide. It is expected that there will be wide variation in the treatment of DECs with respect to: hazard type, NPPs vs other nuclear facilities, state of practice in individual member states, etc.			x	<p>DEC is defined in SSR-2/1 for NPPs, SSR-3 for research reactors and SSR-4 (DS478) for nuclear fuel cycle facilities. DEC is mentioned in the Scope:</p> <p>“The new guide will address the design and/or protection of safety features for DEC against external hazards (when applicable).”</p> <p>Discussions about treatment of DEC for external hazards is covered by Chapter 6.</p>
10.	Section 7	“When resource constraints are a major consideration in the analysis of external events, experience has shown that foremost attention should be placed upon those external events which apply to most facilities and contribute consistently to risk, i.e., seismic (addressed elsewhere), flood and extreme winds. Notwithstanding that, other external events may also be important on a case-by-case basis and should be considered based upon unique circumstances at each facility.” External hazards should be defined as primary external events or secondary external events.	U.S. experience has suggested that the hazards could be segregated into the more important ones and lesser ones. The more important external hazards, other than seismic which is to be handled elsewhere, that apply to virtually all plants, could be listed as “Primary EEs,” while remaining external events can be listed as “Secondary,” with the caveat that their importance will rise or fall depending on the plant-specific environment. The benefit of this approach is that, as a			x	<p>Generally all hazards that potentially may challenge the safety functions and require a design basis (design protection measures) will have similar treatment.</p> <p>All other hazards are considered screened out during site evaluation phase (hazards screening is out of scope for this Safety Guide).</p>

			key international standard on external events, it will focus attention (and limited resources) on the most important generic challenges other than seismic-external flood and high winds (including missile effects.) that have emerged from U.S. experience. The others individually may be important but only to a small subset of plants around the world.				
11.	Section 7	<p>Add these additional external events, e.g.:</p> <ul style="list-style-type: none"> <li>- Extraterrestrial events (e.g. solar flares and meteorite impacts)</li> <li>- Landslides</li> <li>- Sinkholes</li> </ul>	<p>The external hazards listed in this section are limited to only those addressed in IAEA Safety Guides? Extraterrestrial events (e.g. solar flares and meteorite impacts) should be added, although the listed EM interference partially covers that topic. Landslides, sinkholes, and similar natural hazards are not included –it’s not clear if these are grouped with the excluded earthquake hazard.</p>			x	<p>Extraterrestrial events to our knowledge have never been considered in the design of the new NPPS, RR or other nuclear installations and more technical basis need to be developed. IAEA cannot go beyond the state of practice.</p> <p>This Design Safety Guide addresses hazards that require developing a design basis of the nuclear installation.</p> <p>Hazards such as Landslides Sinkholes are considered in Site Protection measures addressed by other Safety Guides</p>



COMMENTS BY REVIEWER				RESOLUTION			
Country/Organization: FRANCE		Date: 22 October 2016					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	§3		As the scope includes all types of nuclear installations, would it be appropriate to not exclude <i>a priori</i> that additional guidance specific to NPP or fuel cycle facilities or... may be needed and presented in an appendix ?		Yes Appendices will provide such additional guidance. It is too early to define the content of Appendices.		
2	§5	Malicious acts are not included in the scope of this safety guide <i>even if some events may be similar in nature although their severity may differ</i>	Some malicious act may actually be similar (fire, explosion...)		This is correct. Malicious acts are addressed by Security Publications. Engineering aspects for some malicious acts are pretty similar (e.g. aircraft impact)		
3	§5	<del>The content of the safety guide will be updated to incorporate modern technology in protection of nuclear installation</del>	Consider deletion or complementary explanations. The sentence is not really understandable. Proven technologies are generally expected for safety. Modern technology is not too open to interpretation	x			
4	§6	<i>Geotechnical aspects of Site Evaluation and Foundations for Nuclear Power Plants NS-G-3.6</i>	Geotechnical hazards should be considered and added in the list of §6.			x	Geotechnical hazards are addressed in NS-G-3.6.
5	§6		What about publications from the Nuclear Security Series ?			x	Design protection against malicious acts is out of scope.
6	§7	It is planned that the safety guide will address the external hazards addressed in IAEA Safety Guides for site evaluation excluding earthquake, <i>including:</i>	Not only extreme events have to be considered.  Accuracy level of the proposed		For hazard assessment the list as you suggested is		

		<ul style="list-style-type: none"> <li>• External floods,</li> <li>• <del>Others relevant</del> rare and even extreme meteorological conditions, including <ul style="list-style-type: none"> <li>○ Heat waves and drought,</li> <li>○ Cold waves,</li> <li>○ Severe winds, hurricanes and tornadoes,</li> <li>○ Severe rainfalls,</li> <li>○ Severe Snow falls,</li> <li>○ Lightning and electromagnetic interferences,</li> </ul> </li> <li>• Volcanism</li> <li>• Geotechnical hazards</li> <li>• Human-induced events, including: <ul style="list-style-type: none"> <li>○ External fires</li> <li>○ External explosions</li> <li>○ Toxic gases releases</li> <li>○ Corrosive and radioactive fluid releases</li> <li>○ Aircraft crash</li> </ul> </li> <li>• Biological phenomena (including UHS clogging aspects for NPPs),</li> <li>• Sand or mud accumulation in the water intake channel,</li> <li>• Collisions of floating bodies with water intakes and UHS components,</li> <li>• Combination of hazards (including earthquake).</li> </ul>	<p>list is not homogeneous and might ignore several hazards with a strong impact on safety and with a occurrence frequency quite high.</p> <p>France considers that a more detailed list describing most common external hazards to be considered in the design is better in order not to forget any significant hazard. Several of these hazards could be screen-out with justification.</p> <p>Even if the scope of the guide exclude earthquake, combination of earthquake with other external events should be addressed (for example flooding and low water level due to tsunami). This remark could be also applied to internal hazards.</p>		<p>O.K.</p> <p>For Design we follow the list from the NS-G-1.5 which covers all hazards you mentioned.</p> <p>Geotechnical hazards such as: Cavities, land slide, liquefaction, are included in Site Protection (is out of scope of this Safety Guide).</p> <p>The Safety Guide will address as the extent possible all hazards for which there are guidelines and sufficient technical basis for developing design basis.</p>		
7	§7	<p>[...]</p> <p>The following topics will be addressed in the safety guide:</p> <ul style="list-style-type: none"> <li>• Application of safety requirements to the design for protection against</li> </ul>	<p>The DS498 project provides topics to be addressed in the safety guide.</p> <p>France proposes a more</p>		<p>Some of the items are included and covered by the scope of the</p>		

		<p>external events,</p> <ul style="list-style-type: none"> <li>• Use of Hazard characterization of external events for design basis and for DEC assessment,</li> <li>• Safety assessment rules to apply (single failure, combination between external events to assess, combinations of external event with internal events...) and associated safety objectives,</li> <li>• Effects of external events on nuclear installation,</li> <li>• Detection, protection and mitigation of the impact of external events,</li> <li>• Design measures for prevention of failures and common cause mode induced by external hazards,</li> <li>• Design measures for prevention and limitations of the propagation of the effects induced by external hazards to other area,</li> <li>• Safety classification and equipment qualification of SSCs.</li> <li>• Design Basis for External Events</li> <li>• Detection, protection and mitigation of the impact of external hazards.</li> <li>• Design measures for prevention of failures and common cause modes induced by external hazards.</li> <li>• Design measures for prevention and limitation of the propagation of the effects induced by external hazards to other areas,</li> <li>• Additional considerations for sites where multiple nuclear installations are collocated</li> </ul>	<p>exhaustive list not to forget any point in the safety assessment guidance (e.g. safety classification and equipment qualification of SSCs shall be done after knowing design basis hazard and provision taken to cope hazard –and hazard combination)</p> <p>Sites with multiples facilities (several NPPs or various installations, including with various licensees) should also be addressed</p>		<p>present safety guide (see Section 5 Scope).</p> <p>All items from your list related to design safety requirements applicable for external hazards will be addressed.</p> <p>Such level of details cannot be captured in the list of the Main Chapters.</p> <p>DEC for External Hazards is covered in Chapter 6. Hazard Characterization is part of Site Evaluation (out of scope). Safety Assessment of the design is out of scope (is under GS-R-4 and supporting safety guides.)</p>		
8	§7	<p>[...]</p> <p>§ 5 - Design basis for external events</p> <p>- 5a – Hazard characterization and</p>	<p>The proposed list of content provides the §5 for design basis aspect but no § is</p>		<p>Hazard characterization is out of scope.</p>		

		<p>hazard intensity targeted for design basis</p> <ul style="list-style-type: none"> <li>- 5b – Safety assessment rules, load combinations and acceptance criteria</li> <li>- 5c – safety margins and cliff-edge effects</li> </ul> <p>§6 - External events within DEC assessment</p> <ul style="list-style-type: none"> <li>- 6a – Intended target</li> <li>- 6b - Safety assessment rules, load combinations and acceptance criteria</li> <li>- 6c – Cliff-edge effects</li> </ul> <p>[...]</p>	<p>forecast for consideration of hazards within “DEC assessment”.</p>		<p>Safety Assessment of the Design is out of scope.</p> <p>Safety Margin is addressed in Chapter 6.</p> <p>DEC for external hazards is addressed in Chapter 6.</p> <p>See changes o the Table of Content for the SG. Combination of Hazards is addressed in Chapter 7.</p>		
9	§ 7	<p><del>§8 Safety design provisions for nuclear installations other than nuclear power plants</del></p> <p>Potential specificities of installations to be considered</p>	<p>The proposed list of content provides a §8 “safety design provision for NI other than NPP”. Why distinguish in the state of a guide specific provision for other installation as the objective of the guide is to align the practices for different installation?</p> <p>Hazard characterization and provisions against external hazard are generic whatever is the type of installation (dykes, air-conditioners, building design, ground net, etc.).</p>		<p>Specificity of other nuclear installations is provided by: Graded (Chapter 4) Approach and Chapter 8 Safety Design Provisions for Nuclear Installations Other Than NPPs (to keep consistency with SSG-9, SSG-18, etc.)</p>		
10	§7	<p>8. Safety Design Provisions For Nuclear Installations Other Than Nuclear Power Plants.</p> <p>9. Additional considerations for sites where multiple nuclear installations are collocated</p>	<p>Sites with multiples facilities (several NPPs or various installations, including with various licensees) should also be addressed</p>			x	<p>This is mainly addressed by Safety Assessment of Multi unit sites (out of scope)</p>

		10. References Appendices					of the design safety guide). IAEA has ongoing projects to develop technical basis for addressing safety issues related to Multiunit Sites.
COMMENTS BY REVIEWER Reviewer: Mikhail Lankin Country/Organization: Russian Federation				RESOLUTION Date: 23 October 2016			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Page 3, chapter 7	Add the following phenomena to the list of external hazards: - landslides; - mudflow; - land collapse (e.g, caused by karst or thermal karst); - avalanches; - cryogenic processes; - failure of waterworks (e.g. damage of water reservoir dam).	List of external hazards presented in DPP is not comprehensive and shall be widen.			x	The listed phenomena are addressed in Site Evaluation (Hazards Characterization). They are relevant mainly for Site protection (out of scope) or already addressed for the hazards for which design basis needs to be developed.
COMMENTS BY REVIEWER Reviewer: Civil and Site Studies Group, CNS Country/Organization: Pakistan				RESOLUTION Date:			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	7/Page 4	7. SAFETY DESIGN PROVISIONS AGAINST EXTERNAL EVENTS a. External Floods, <b>Tsunami</b>	The text in bold may be added. a. Tsunami may be added	x			

		b. Extreme Winds c. Other Extreme Meteorological Conditions d. Volcanism e. External Fire f. External Explosions , <b>Missiles, Shockwaves</b> g. Toxic Gases, <b>flammable vapor clouds, toxic chemicals</b> h. Corrosive and Radioactive Fluids i. Aircraft Crash j. Electromagnetic Interference k. Biological Phenomena l. Collisions of Floating Bodies with Water Intakes and UHS components m. Combination of Hazards	along with External flood. f. External explosion shall be considered with missiles and shock waves generated in case of explosion. g. flammable vapor cloud and toxic chemicals may prove extreme hazardous if not taken care during external hazards. Accidents at nearby civilian or military facilities, or from nearby transportation routes, might produce missiles, shock waves, flammable vapor clouds, or toxic chemicals which might affect the nuclear power plant itself or the plant operators.				
<b>COMMENTS BY REVIEWER</b>				<b>RESOLUTION</b>			
Reviewer: Dana HAVLÍN NOVÁKOVÁ							
Country/Organization: Czech Republic/ SÚJB				Date: 13. Oct 2016			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	<b>Page 3,</b> 7. OVERVIEW – List of external hazards, <b>Page 4</b> list of contents	THE INFLUENCE OF GROUNDWATER ON STRUCTURES, SYSTEMS AND COMPONENTS	It is not clear, if the groundwater influence is included in the part „Corrosive and Radioactive Fluids“.		It is normally considered in the foundation design (mainly covered by NS-G-3.6).		
2	<b>Page 3,</b> 7. OVERVIEW – List of external	OTHER GEODYNAMICAL HAZARDS excluding seismicity and volcanic activity (for example tectonic activity; susceptibility to	These types of hazards are included e. g. at NS-R-3, rev. 1 and NS-G-3.6, but unfortunately not			x	Most of these hazards are related to site protection measures addressed in other

	hazards, <b>Page 4</b> list of contents	movement of the slope e.g. landslide, mudflow, rockfall; geotechnical features of the foundation soils; deformations of surface – by mining subsidence, karst cavern, ground uplift etc.)	included in chapter 7. SAFETY DESIGN PROVISIONS AGAINST EXTERNAL EVENTS.				safety guides (out of scope).