DS 541 – Assessment of Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations
Comments Resolution Table – NUSSC
Step 7

COMMENTS BY REVIEWER Reviewer: ROELANDT Caroline & BERNIER Frédéric Page.... of.... Country/Organization: Federal Agency For Nuclear Control, Belgium Date: May 8th 2025				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.10 *two last lines*	Add a sentence acknowledging that the guidance provided remains relevant for radioactive waste management facilities including disposals, especially during their operational phase, when they host radioactive material and are exposed to meteorological and hydrological hazards that may affect both operational safety and the long-term performance of the facility.	While the Safety Guide focuses on nuclear installations as defined in the IAEA Safety Glossary (2018 Edition), it may be helpful to acknowledge that the guidance provided could also support the evaluation of meteorological and hydrological hazards for **radioactive waste management facilities including disposals**, particularly during their **operational phase**. At this stage, the facility — remaining exposed to meteorological and hydrological hazards prior to closure — could face risks that impact both operational and long-term performance of the facility.		✓		Added this consideration as a footnote to para 1.10.
2	1.12	Refer to the IAEA's definition, as outlined in the Safety Glossary (2018 Edition) of "external event":	Add reference to IAEA glossary for clarity			✓	Paragraph 1.9 states that the terminology used in this document refers to

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		Events unconnected with the operation of a facility or the conduct of an activity that could have an effect on the safety of the facility or activity.					the IAEA Safety and Security Glossary.
3	After 2.13 (new paragraph proposed)	Add "**Combination of hazards** 2.14 In addition to assessing individual hazards, combined events and cascading effects should be systematically identified. This can be achieved, for example, by developing a matrix that maps potential combinations between meteorological, hydrological, and other natural phenomena, along with their possible amplification effects. Particular attention should be given to realistic sequences in which an initial event may significantly worsen the consequences of secondary phenomena."	While the guide acknowledges that multiple phenomena may occur simultaneously or sequentially, no structured approach is currently proposed to identify their combinations and cascading impacts. Past events (e.g., Fukushima Daiichi accident) have demonstrated that the most critical risks often arise not from a single hazard, but from a sequence of coupled events leading to compounded failures. Introducing a systematic combination and cascading effect analysis would significantly enhance the comprehensiveness and robustness of hazard assessments.		✓		Paragraph addressing combinations has been added.

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		Reassess the numbering in this section to ensure coherence following the inclusion of an additional bullet point.					
4	2.13	Add "d) Extended licensing period compared to initial projections."	While the guide correctly states that foreseeable changes in hazards over the lifetime of the installation should be considered, it does not explicitly acknowledge the fundamental uncertainty surrounding the actual duration of operation. In practice, installations may be extended far beyond initial licensing periods.			✓	The necessity of a Periodic Safety Review (PSR) is described in SSR-1, and references to PSR and license renewal are also included in SSG-48. The guidelines provided in SSG-18 cover hazard assessments that serve as inputs for PSR and license renewal. Therefore, the use of this guideline in the context of PSR and license renewal is clear from the requirements of SSR-1.
5	2.13	c) geological or– geomorphological processes, which may also lead to changes in hazards over time (e.g. uplift or subsidence, sediment transport).	Consider clarifying that the evaluation of geological or geomorphological processes should be limited to those that can realistically affect the installation during its operational and post-operational phases, in line with the scope defined in 1.10 and 1.11. Very slow geological changes (e.g.,		✓		"Changes in hazards over time" is understood to mean over the expected lifetime of the nuclear installation. Specific reference to tectonic uplift has been changed to "uplift".

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			tectonic uplift over millennia) should not be considered.				
6	**3.25 / lines 1 -3**	"Observational, historical or paleo-climatic records might not fully capture future climate and extreme event conditions due to climate change. Therefore, these records should be supplemented or extended by using outputs from climate models "	Refined for improved clarity	✓			Instead of "paleo-climatic records," the term "paleo information" is used, as it is used consistently throughout this document.
7	**4.7/lines 2-5**	Replace by "Extreme air temperatures and high atmospheric moisture content (resulting in increased enthalpy) could impair the performance of heating, ventilation, and air conditioning (HVAC) systems that maintain environmental conditions in rooms housing safety-important equipment (especially electronic devices), and could also affect the availability of the ultimate heat sink."	Reworded to enhance precision		✓ Extreme air temperatures and high atmospheric moisture content (resulting in increased enthalpy) could impair the performance of heating, ventilation, and air conditioning systems that maintain environmental conditions of rooms housing items important to safety (especially electronic devices) and could also affect the availability of the ultimate heat sink.		Abbreviation was removed, and the terminology was reviewed.

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8	4.9	Replace by "If a statistical approach is followed, a dataset of daily maximum and minimum air temperatures (representing the extreme recorded temperatures each day) should be collected. This dataset can be used to derive either annual maximum and minimum values (block maxima method) or temperature values exceeding specified thresholds (peak-over-threshold method). These data provide the foundation for the statistical analysis."	Adjusted for better readability	✓			The revision was made according to the comments.
9	5.3	Add “When evaluating storm surge hazards, interactions with other concurrent phenomena — such as tidal cycles, heavy precipitation, river flooding, and wave set-up — should be carefully considered, as these combinations may significantly amplify the overall hazard at the site. Appropriate models or conservative assumptions should be used to represent	The current text does not explicitly address the possible amplification of storm surge hazards due to interactions with other concurrent phenomena, such as tidal effects, heavy precipitation, river flooding, or wave set-up. These interactions can significantly worsen the flooding hazard. It is recommended to enhance paragraph 5.3 by explicitly requiring that potential concurrent effects be		✓ When evaluating storm surge hazard, a reference water level, such as tidal cycle or high lake level, should be assumed to occur coincidently with the storm surge. In addition, interactions with other concurrent phenomena such as heavy precipitation, river flooding, and		This has been reflected in paragraph 5.4.

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		such interactions where relevant."	considered in the evaluation and that appropriate models or conservative assumptions be applied when such interactions are possible.		wave set-up should be considered, as these combinations may amplify the overall hazard at the site.		
10	**5.87**	Add "The evaluation should consider both the direct effects of local precipitation on the site and indirect effects from upstream watershed runoff, while taking into account the potential for concurrent events and cumulative effects (e.g., precipitation coinciding with saturated soil conditions, or with high river stages)."	While paragraphs 5.87–5.89 provide a general framework for evaluating precipitation-induced flooding hazards, several critical factors are not explicitly addressed. These include the effects of antecedent soil saturation, cumulative precipitation events, rain-on-snow events, and the presence of flow obstructions (e.g., debris or ice jams). Moreover, there is no mention of the quantification of uncertainties associated with hydrologic and hydraulic modeling, particularly in the context of future climatic changes. Incorporating these elements would significantly strengthen the robustness of the hazard evaluation, align the methodology, and provide clearer guidance to ensure conservative and comprehensive site assessments. It is recommended to enrich	✓			The revision was made according to the comments.

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			paragraphs 5.87–5.89 accordingly.				
11	5.88	Replace by "An extreme precipitation event is characterized by heavy rainfall, snowfall, or other forms of precipitation within a specific period and geographical area. Precipitation events should be characterized not only by their intensity (e.g., mm/hr) but also by their duration and spatial extent. The evaluation should consider how catchment size affects the impact of precipitation events: a short, intense storm may cause significant flooding in a small watershed, while having little effect in a large watershed. Conversely, a long-duration, lower-intensity event over a large watershed may cause delayed but significant flooding downstream. The potential for flooding due to antecedent soil saturation, cumulative rainfall events, or snowmelt combined with rainfall (rain-on-snow	See paragraphs 5.87–5.89			✓	All of these considerations are addressed, although not in a single paragraph.

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		events) should be assessed. Furthermore, the possibility of obstructions (e.g., debris jams, ice jams) influencing runoff and flood behavior should be considered."					
12	5.89	Replace by "Flooding conditions at the site should generally be characterized using two successive steps. The first step involves the simulation of hydrologic processes such as precipitation, snowmelt, evaporation, infiltration, and surface runoff, to determine river discharge and overland flow. The second step involves hydraulic modeling to determine the flooding conditions at the site (e.g., water elevation, water velocity, duration of inundation). Where sufficiently long and reliable records of river discharge exist, hydrologic simulation may be replaced or supplemented by analysis of observed data. The evaluation should explicitly quantify and document the uncertainties associated with	See paragraphs 5.87–5.89		✓		Replaced last sentence of paragraph with "Where sufficiently long and reliable records of river discharge exist, hydrologic simulation may be replaced or supplemented by analysis of observed data." Uncertainties are addressed elsewhere in the text.

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		hydrologic and hydraulic modeling, particularly when projecting future scenarios under changing climatic conditions."					
13	5.119	*Add at the end of the paragraph* "In either case, future changes in climatic conditions — including potential increases in the frequency and intensity of extreme precipitation and flooding events — should be considered in the hazard evaluation, in line with current scientific understanding and available projections."	Paragraph 5.119 does not explicitly refer to the impact of climate change on future flood scenarios. Given the well-documented influence of climate change on extreme hydrological events, it is recommended to include a general statement ensuring that projected changes in climatic conditions are considered in site-specific flood hazard evaluations.	✓			Added the suggested sentence along with a pointer to Section 9 which specifically addresses climate change.
14	Chapter 5 *(general), or specifically paras 5.119 and/or 5.122*	It is recommended to add a general statement reminding that all flood hazard evaluations — including those based on hydraulic modelling at the site (paras 5.107–5.121) and those related to sudden release of impounded water (paras 5.122–5.139) — should consider projected future changes in climatic conditions. These may include changes in the frequency, intensity, and	While climate change and climatic variability are addressed later in Chapter 9 and in Annex IV, Chapter 5 lacks explicit reminders to integrate future climate conditions into hydraulic and flooding hazard evaluations. This is particularly important for design basis flood assessments and for cascading failure scenarios involving dams, ice jams, and glacial lake outbursts — all of which may become more frequent or		✓		Addressed in response to previous comment.

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		spatial distribution of extreme precipitation events, snowmelt patterns, and other hydrometeorological drivers, as informed by available climate projections.	intense under changing climate conditions. Including such a reference would reinforce consistency with climate-resilient safety planning and align Chapter 5 with the forward-looking scope of the rest of the Safety Guide.				
15	6.1 -6.6	Add in the paragraph an explicit reference to the role of climate change in increasing wildfire risk	This section on wildfires (paras 6.1–6.6) addresses the physical mechanisms and potential impacts in a comprehensive manner. However, it currently lacks an explicit reference to the role of climate change in increasing wildfire risk — an omission that may undermine the forward-looking nature of hazard assessment.		✓		Sentence on considering climate and land use change added to para 6.2
16	6.2	*Add at the end of the paragraph:* "Particular attention should be paid to regions where climate change is expected to increase the frequency or intensity of wildfires, for example due to prolonged droughts or higher summer temperatures."	Short reminder in para. 6.2 regarding the expected influence of climate change on wildfire regimes.		✓		Sentence on considering climate and land use change added to para 6.2
17	6.4 line 3-4	Replace last sentence by "If this likelihood is considered sufficiently high — for example, based on historical	The vague criterion "sufficiently high likelihood" in para. 6.4 would benefit from clarification (e.g., using	✓			The revision was made according to the comments.

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		fire frequency, fire danger indices, proximity of vegetation, and prevailing wind patterns — the hazard to the nuclear installation should be evaluated."	historical data, vegetation proximity, fire danger indices).				
18	6.6	*Add at the end of b)::* "These secondary hydrological effects may be long-lasting and should be accounted for in multi-hazard scenarios affecting the site."	The paragraph highlights the fact that wildfires can increase flooding and erosion risks by altering vegetation cover and soil stability. However, the persistence of these secondary effects is not explicitly mentioned, nor is their relevance to multi-hazard risk scenarios. The proposed addition would strengthen the section by encouraging the analyst to consider the long-term and compounding nature of wildfire impacts, particularly in combination with intense rainfall or flood events.	✓			The revision was made according to the comments.
19	7.8 last line	Replace last sentence by "Annex I contains example sets of meteorological design basis parameters used for nuclear installations. In addition, the evaluation of meteorological hazards and their combinations should consider potential changes in	The paragraph does not mention that the frequency or intensity of such events may evolve over time due to climate change. Including a reference to this dynamic context would strengthen the guidance, especially considering the long lifetime of nuclear installations			✓	Paragraph 7.9 has been revised in line with the comment. This seems to overlap with that revision.

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		frequency and intensity due to climate change, especially over the expected lifetime of the installation."	and the growing scientific consensus on the changing nature of extreme weather patterns. This addition would also improve alignment with Section 9 and Annex IV.				
20	7.9 line 4-6	Replace the two last sentences by "Consideration should be given to the potential for variability of hazard parameters over long time periods, including changes induced by climate change (e.g. increased air temperature, altered wind and precipitation patterns, increased frequency of extreme events), based on the expected lifetime of the nuclear installation. This consideration should be informed by the recommendations provided in Section 9 and relevant climate projections."	This paragraph does not explicitly mention climate change as a key driver of such variability. Given that changes in temperature, precipitation, and wind patterns are increasingly documented in climate assessments, and that these changes can affect the severity and frequency of design basis meteorological events, it is recommended to explicitly refer to climate change. This would ensure consistency with Section 9 and reinforce the need to use up-to-date climate projections in the derivation of design parameters.	✓			The revision was made according to the comments.
21	7.9	*Add at the end of the paragraph* "As a reference, an annual exceedance frequency of 10^{-4} per year (i.e. a 10,000-year return period) is often used for external events in design basis hazard assessments, as	The paragraph does not provide a reference frequency to guide users in selecting a target exceedance probability. Several IAEA Safety Guides (e.g. SSG-68, SSG-18) refer to an annual exceedance frequency of 10^{-4} per year as a			✓	Including specific numerical values in the main text is to be avoided.

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		reflected in SSG-68 and SSG-18. This target frequency should be confirmed or adapted based on national regulatory guidance."	conservative basis for external events such as flooding or extreme meteorological phenomena. Adding this information would provide clarity and promote consistency in the derivation of design parameters, especially where national standards are not explicitly defined.				
22	8.1 line 1	*Replace opening phrase to:* "This section **provides** recommendations on measures for protecting a nuclear installation site…" *Suggested rephrasing of the text in parentheses:* "…such as wildfires and flooding from nearby water bodies (i.e., situations where physical exclusion of the hazard from the site is feasible)."	Grammatical correctness The text within parentheses could be modified to improve clarity by explicitly stating the principle of physical exclusion, which is central to site protection logic.	✓			The revision was made according to the comments. Removed parenthetical.
23	8.3	*Add a sentence at the end* of 8.3 "Periodic safety reviews (PSRs), as required in SSR-1 [1], should be used to reassess site protection measures in light of evolving hazard information, new scientific knowledge (e.g.	Paragraphs 8.1–8.3 do not mention periodic safety reviews (PSRs), which are mandated in SSR-1 (Requirement 21). PSRs provide a systematic framework for verifying that protection measures remain appropriate over time and	✓			The revision was made according to the comments.

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		climate change projections), and operational experience."	under changing external conditions. Referencing SSR-1 here would reinforce the link between site hazard protection and the regulatory requirement for long-term safety assurance through periodic reassessment. This is particularly relevant in the context of uncertainties in hazard evolution and the need for adaptive risk management.				
24	9.6 line 4-5	Replace second sentence by: "The planned operating lifetime of a nuclear power plant is assumed to be **approximately**100 years. "	Tipping error (correction in bold)		✓		The statement was revised and moved to a footnote.
25	Annex IV - 3	Add: "(c) Early detection of emerging climate trends that may diverge from initial projections, enabling proactive safety measures. (d) Enhanced robustness of hazard assessments through iterative data integration, helping reduce uncertainty margins. (e) Stronger alignment with safety review processes such as the Periodic Safety Review (PSR), by	It is recommended to expand the discussion on the benefits of periodically updated climate change information beyond the two advantages currently listed. In addition to improving the spatial and temporal identification of expected changes and refining order-of-magnitude estimates for extreme events, regularly updated datasets enable: (i) early detection of emerging trends that may deviate from initial projections; (ii) improved robustness of long-	✓			The revision was made according to the comments.

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		supporting reassessment of design margins based on the most recent climate signals."	term hazard assessments by reducing uncertainty margins; and (iii) stronger alignment with regulatory instruments such as Periodic Safety Reviews (PSRs), where updated climate signals can help assess whether existing protection measures remain adequate.				
26	IV - 6	Replace by "The Coupled Model Intercomparison Project (CMIP) brings together contributions from numerous climate modelling centres around the world. As a result, the horizontal resolution of models varies, typically between 50 km and 250 km. The outputs from CMIP are widely used in major climate assessments, such as the Intergovernmental Panel on Climate Change (IPCC) reports, to support global climate policy and decision-making. Two key scenario frameworks are used in CMIP: **Representative Concentration Pathways**	The original description of RCPs and SSPs inaccurately suggests that RCPs are based on socioeconomic assumptions and that SSPs represent an "improvement" of RCPs. In fact, RCPs are concentration-based scenarios with predefined radiative forcing trajectories, independent of socio-economic context. SSPs, on the other hand, describe distinct socio-economic pathways and can be combined with RCPs to form fully integrated scenarios. The revised version clarifies the nature and relationship of these scenario frameworks, in line with the definitions used in the IPCC Sixth Assessment Report.				Resolution Pending. Will be addressed during Step 8.

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		(RCPs) are trajectories of greenhouse gas concentrations that correspond to specific levels of radiative forcing by the year 2100 (e.g. 2.6, 4.5, 6.0, 8.5 W/m²). These pathways are not based on specific socio-economic assumptions. **Shared Socioeconomic Pathways (SSPs)** describe alternative socio-economic futures, including narratives and quantitative projections for variables such as population, economic growth, and technological development. SSPs can be combined with RCPs to generate integrated climate scenarios (e.g. SSP2-4.5 or SSP5-8.5), allowing for a broader and more consistent exploration of future climate and societal conditions."					
27	IV – 11	*Add at the end of the paragraph* " (e) Some climate-related impacts, such as sea level rise and icesheet melt, are now unavoidable and irreversible	Consider expanding the current summary of IPCC AR6 conclusions to reflect additional findings relevant to nuclear site safety evaluations. This includes (1) **the long-**				Resolution Pending. Will be addressed during Step 8.

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		over centuries to millennia. These long-term trends should be considered in site lifetime assessments and infrastructure design margins. (f) Compound and cascading events (e.g. concurrent heatwaves and droughts, or storms and coastal surges) are projected to increase in frequency and intensity. Such scenarios should be integrated into hazard combinations and stress testing. (g) Given the uncertainty in regional climate projections, using multiple models, downscaled datasets, and scenario-based approaches is recommended to ensure robust hazard evaluation and conservative design margins.”	**term irreversibility** of certain climate impacts such as sea level rise, (2) the projected **increase in compound and cascading extreme events**, and (3) the need to rely on **ensembles of downscaled regional models** to reduce uncertainty in hazard projections.				
28	*FIG. IV-1. Trends in global mean temperature anomalies (relative to 1850-1900).*	Add references	Source references are missing.				Resolution Pending. Will be addressed during Step 8.

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29	*FIG. IV-~~12~~ Observed Ocean Heat Content from 1958 to 2023 (upper 2000 m).*	Correct the reference number	The figure reference number is incorrect.	✓			The revision was made according to the comments.
30	*FIG. IV-~~23~~. Trend of global mean sea level between 1993-2023.*	Correct the reference number and add the source	Source references are missing, and the figure reference number is incorrect.				Resolution Pending. Will be addressed during Step 8.

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	para 5.132	(d) Capacity (e.g.~~reservoir volume~~stage-capacity curve);	Editorial It is suggested to change "reservoir volume" to "stage-capacity curve". This term is more accurate and professional.		✓ The following sentence was added to paragraph 5.148. The stage–capacity curve, which defines the relationship between the water surface elevation (stage) and the stored volume in the reservoir, should be used to estimate the available water volume at the time of failure.		While the term "stage-capacity curve" is technically valid, "reservoir volume" is more appropriate in this context, as it refers to a basic parameter suitable for initial evaluations. Instead, recommendation for stage–capacity curve was added in the para. 5.148.
2	para 3.40	(c) Modification in water resource use(e.g. aquaculture);	Editorial It is suggested to add a paragraph. Because aquaculture will change the amount of aquatic organisms and debris in the water body.		✓ (b) Modifications in the watershed associated with structures such as dams and reservoirs, weirs and locks, levees and other flood protection structures along rivers, diversions into or out of the basin, flood ways, channel improvements and modifications (e.g. dredging), bridges and transport embankments, and water-related developments (e.g. aquaculture).		In SSR-1, the term "the present and future use of land and water" is used, and the suggested topic of aquaculture can be considered a part of water use. Therefore, instead of adding a new paragraph, a reference to aquaculture has been included in the explanation.
3	para 4.36 footnote	However, certain locations (e.g. locations atlow latitudes) may need a larger area of inspection	Editorial It is suggested to add a note. Considering that with the same are, the latitude and longitude scope in low-latitude regions is relatively smaller. Locations at low latitudes may need a larger area of inspection.			✓	This footnote describes how the investigation area is defined based on factors such as the characteristics of tornadoes and the homogeneity around the site. It is not intended to explain any apparent increase or decrease in area based on

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							latitude and longitude coordinates.
4	para 6.13	Expected potential impacts from these biological species on the nuclear installation(e.g. biological thermotaxis habit)	Editorial It is suggested to add "e.g. biological thermotaxis habit" to explain how organisms affect the water intake of nuclear facilities.	✓			"biological thermotaxis " was added in (b). (b) Potential initiators that can bring the debris to the site (e.g. marine currents, high river flow, winds, biological thermotaxis in organisms);
5	para 5.109	Add：Tropical cyclones can bring storm surge and rainfall at the same time, and coastal watershed flooding needs to be considered for both hazards.	Editorial Coastal watersheds are affected by both storm surge and rainfall and should to be considered in watershed flood analysis.		✓ 5.4 "When evaluating storm surge hazard, a reference water level, such as tidal cycle or high lake level, should be assumed to occur coincidently with the storm surge. In addition, interactions with other concurrent phenomena such as heavy precipitation, river flooding, and wave set-up should be considered, as these combinations may amplify the overall hazard at the site."		Combination of storm surge and precipitation was added in the Para. 5.4.
6	1.4/General	It is recommended that the special requirement for offshore location and transportation should be given clearly	the DS541 include new reactor site such as offshore location and transportation, as the site evaluation for offshore/ transportable reactor is different between stationary reactor			✓	Regarding site evaluation and the consideration of external events for FNPP and TNPP, a revision of SSR-1 is planned to describe overall concept of site evaluation for those. Within the scope of SSG-18, hazards applicable to FNPP, such as tsunami, storm surge, wave action, and icebergs have

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							been considered, but detailed guidance is not provided since there is little practical experience with this type of facility. Likewise, detailed guidance is not provided TNPP, since there is little practical experience with this type of facility, although certain aspects may be equivalent to those for stationary NPPs.
7	2.4	It is recommend the relevant requirements about climate change in this guide should be consistent with DS535（PSR）	In this guide， the affect of climate change should be considered during PSR		✓		DS535 was reviewed and found to be consistent with this guide (DS535 discusses the need to consider climate, but the detailed methods are in this guide). The connection to PSR is already addressed in paragraph 2.4. In addition, specific information is provided in Annex IV (IV-3).
8	2.12/6.26	The necessity of Meteoroids and meteorites should be further considered	Meteoroids and meteorites are the very rare event for land-based nuclear facility, it is should not include in site evaluation			✓	Consideration of these aspects is necessary; however, in most cases, they are expected to be screened out probabilistically. If the deployment of offshore NPPs is considered, the potential for tsunami generation due to objects falling into the sea should also be taken into account.
9	11.13	It is recommended some relevant standards or guide should be cited ,or some example should be given, to introduce the specific approach	The requirement of “risk informed approach” is very simple now ,			✓	As part of the graded approach applied to site evaluation, the availability of a risk-informed approach has been described. This indicates that, for nuclear

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							installations with lower risk, the level of detail in the site evaluation may be optimized through the use of a risk-informed approach. It is considered that this level of description is appropriate for a Safety Guide.

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1 General comment		By providing clear and well-defined methodology for meteorological, hydrological and other natural hazard evaluation, SSG-18 significantly enhances its value and usability for its users—a contribution we greatly appreciate. The establishment of clear definitions for the various methods to be employed in the evaluation of hazards will enhance the comprehension and usability of SSG-18 among its users. The detailed comments outlined below are intended to further refine its applicability and promote a deeper understanding.		✓			
2 General comment		Guidance should be provided or specifically referenced on how to deal with uncertainties in paragraph 9.6		✓			Sentence added on model ensembles and downscaling
3 General comment		Paragraph 9.7 should mention that regional, site-specific climate predictions must be considered for a fixed time frame and re-assessed with a specific frequency. This approach will take advantage of improvements and new knowledge in predictions, minimizing uncertainties. An example would be that models should provide relevant parameters for the following 10 years but in 5 years, models must be re-evaluated. Ensure that periodic review of data and models data, should be made		✓			Sentence added to mention updating climate projections as new information becomes available.
4 General comment		There is a clear distinction in the report between floods caused by watershed scale precipitation (pages 30-32) and floods due to extreme precipitation events (pages 55-69). The section on watershed scale precipitation seems to miss some aspects such as the use of discharge data and other possible methodologies (explained on pages 55-69 for				✓	Section 4 discusses methods for assessing precipitation, while section 5

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		extreme precipitation events), which would not be screened when the focus is put on watershed scale precipitation. It is advised to combine these two parts into one comprehensive section that includes all relevant information and include the entire range of floodings.					discusses how to use the precipitation estimates to develop flood hazard estimates.
5 General comment		The inclusion of different methods (deterministic, statistical, and probabilistic) for most hazards is very valuable. However, the differences in the results from these approaches are not always clear, as seen in the watershed example on page 31. The descriptions in sections 5.93 and 5.95 provide clear explanations of the results of these methods.				✓	See previous comment.
6 General comment		The document seems to focus primarily on approaches, methods, definitions, and data availability of the United States. Including examples, definitions and methodologies from other parts of the world could strengthen the guideline.				✓	Experts from Europe and Asia were included in the drafting of the document.
7 General comment		It is understood that no design frequency is advised for the different hazards although some are mentioned in the examples in annex. We would suggest to add a, item on the challenges of estimating the low frequencies of exceedance as illustrated in figure 33 (on page 91-92) of the IAEA SRS-120 publication “assessment of high wind and external flooding (excluding tsunami) hazards in site evaluation for nuclear installations”				✓	The SRS-series publications are a more appropriate venue for such detailed discussions.
8 General comment		Exploratory Data Analysis is an important part of quantitative analyses, especially of the statistical kind. In our estimation, more guidance about this analysis step may provide valuable input.				✓	Specific guidance on EDA is beyond

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							the scope of this document.
9 General comment		It seems that extreme water temperature hazards are missing in the guide. In SSG-68 this hazard can be found.				✓	Water temperature is discussed in paras 2.1, 7.6, 7.8, 9.9, 9.10, and in ANNEX I (Table I-1)
10 General comment		It is advised to reconsider the content of Chapter 7 in conjunction with the content of SSG-68 to avoid unnecessary duplication and risk of inconsistencies, and possibly readers' misunderstanding.				✓	The comment does not provide concrete examples of unnecessary duplication or inconsistencies and our review of this section did not reveal any such issues.
11	1.12	"The concept of external events[3] is intended to include more than those occurring in the external zone[4], since in addition to the area immediately surrounding the site area, the site area itself may contain features that pose a hazard to the installation, such as a water	- Add definition of 'External Event' as in the IAEA glossary as a footnote - Clarification for such features located inside the installation.			✓	Para. 1.9 cites the IAEA Nuclear Safety and Security Glossary as the source for terms used in this guide. The

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		reservoir. If such features are located inside the installation, they are considered as internal hazards. [3] "Events unconnected with the operation of a facility or the conduct of an activity that could have an effect on the safety of the facility or activity."					added text defining internal hazards is not consistent with the IAEA glossary.
12	1.16	The meteorological, hydrological, and other natural hazards addressed in this Safety Guide may need to be determined independently of the characteristics of the nuclear installation that is to be installed. For example, some hazard evaluations may be performed at the site selection and/or site characterization stages, possibly prior to the availability of information on the design of the nuclear installation. ~~Recommendations on the determination of the appropriate basis for the design and evaluation of a nuclear installation through the use and application of appropriate criteria are provided in IAEA Safety Standards Series No.~~	SSG-18 is a guide on site characterisation/evaluation. In case the no information on the nuclear installation is available, SSG-68 will not help to realise a 'decoupling' between siting and design. SSG-68 provides a graded approach, which is based on the potential radiological consequences, which is based on a set of (detailed) characteristics of the installation.			✓	Para. 1.16 merely discusses the scope of this document in relation to the scope of SSG-68.

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		~~SSG-68, Design of Nuclear Installations Against External Events Excluding Earthquakes [10].~~					
13	2.2	The hazards considered in this Safety Guide may simultaneously affect multiple units, modules or structures, systems and components (SSCs) important to safety at a nuclear installation site (e.g. electrical power supply systems, decay heat removal systems, other vital systems), introducing the potential for common cause failure. Defence in depth (i.e. providing adequate diversity as well as redundancy and physical separation) is vital in design against common cause failure. Recommendations on the design of nuclear installations against external events, including consideration of common cause failures, are provided in IAEA Safety Standards Series Nos SSG-67, Seismic Design for Nuclear Installations (para. X.Y) [11] and SSG-68 (para. X.Y) [10].	The hazards will not only simultaneously impact multiple SSC of a single unit, but the units & modules (for SMR) on the same site. Please indicate the references at the para. level in SSG-67 and SSG-68.		✓		Added proposed text "units, modules" Since the various IAEA safety guides are updated asynchronously, providing paragraph-level referencing to other guides is not advised.
14	2.5	High intensity winds: (i) Tornadoes;	Are cyclones being considered as covering all 'straight' wind		✓		Added (iii) Other extreme

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		(ii) Cyclones (tropical cyclones, typhoons, and hurricanes). (iii) Other extreme wind events like downburst, derecho, katabatic winds…	events? E.g. downburst, derecho, katabatic winds…				wind events such as downbursts, squall lines, katabatic winds, etc.
15	2.6	The hazard types listed id §.2.5 should be assessed individually or as combined hazards when appropriate. This consideration applies to both phenomena combination, and consequences initiated by a single hazard (for example a storm surge caused by a tropical cyclone may also cause flooding at the site, flooding then being a consequential hazard). On the other hand ~~For example,~~ high intensity winds may have a major bearing on the safety of a nuclear installation (direct effects) and may lead to initiating events that are to be included in the safety analysis for the installation (indirect effects). High intensity winds, particularly tropical cyclones and tornadoes may also generate flying debris and projectiles. This illustrates the case	This paragraph mixes the notion of phenomenological hazard (listed in §.2.5) combination and the study of several consequences caused by a single hazard. The proposed text describes both possibilities to identify potential relevant hazards combinations, if one wishes to keep both these possibilities. It might be clearer if the two notions were in two different paragraphs.		✓		Para. Modified as: "The hazard types listed in para. 2.5 should be assessed individually or as combined hazards where appropriate. This consideration applies to both phenomena combination, and consequences initiated by a single hazard (i.e., direct and indirect effects). For example, high intensity

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		of different consequences initiated by a single hazard, as does the example of extreme precipitation that may lead to both large loads on structures (e.g. roofs) ~~as well as cause~~ and flooding.					winds may have direct effects (e.g., wind forces) and may lead to other initiating events that are to be included in the safety analysis for the installation (indirect effects such as flying debris and projectiles). Storm surge associated with tropical cyclones may also cause flooding at the site. Extreme precipitation may lead to large loads on structures (e.g. roofs) as well as cause flooding.

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16	2.13	[…] (b) ~~Climatic variability and~~ climate change, which may have effects on the occurrence and/or intensity of extreme meteorological and hydrological conditions. […]	The paragraph is dedicated to foreseeable modification over the lifetime of the nuclear installation. The climatic variability, except for the part due to climate change, is not foreseeable. It is suggested to delete this part of the sentence.			✓	Climate variability (e.g., ENSO, PDO, NAO) are important considerations in addition to climate change.
17	2.19	[…] (a) increasing the observation time frame using data provided by historical accounts or paleo-information, if they can be considered as representative enough of the current situation […]	The environmental conditions as well as the anthropization may have changed, not to mention climate change.			✓	Paleo-data and historical accounts may provide valuable insights even if circumstances have changed. For example, informing use of interval data.
18	2.21	[…] Threshold selection should be performed carefully to ensure the selection of an appropriate number of peaks and that the peaks are statistically independent and identically distributed. […]	One requirement for Extreme Value Analysis is the identically distribution of the data/peaks. It could also be added that the threshold should be high enough to focus on extreme values but not so high that too few data points are left for analysis	✓			Proposed text added.

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19	2.21	Sensitivity analysis should be performed to ensure that small changes in the threshold or change in the block size does not lead to large changes in analysis results	The same precautions that are listed for the threshold selection apply to block size selection especially when a block size shorter than annual is selected to compensate for a short obervation period availability.	✓			Text modified as: Sensitivity analysis should be performed to ensure that small changes in the threshold (or perhaps change in the block size) does not lead to large changes in analysis results.
20	2.21, lines 6-8	Recommendation could be made clearer. For both block maximum and peak-over-threshold approaches, distribution parameters should be estimated from the data using statistical methods. The resulting estimated distribution functions should be checked to fit the extreme values under study.	The term "distribution function" can also be used to refer to the *types* of probability distributions (e.g., lognormal, beta…) regardless of their parameter values. The Block Maxima (BM) and Peak-over-threshold (PoT) methods are based on only one type of distribution (so-called GEV- and GPD distributions, respectively). *"Different probability distribution functions should be tested"* might mislead to use distribution types other than GEV / GPD, which is invalid		✓		In practice, many distributions other than GEV and GPD are used in meteorology and hydrology, so the recommendation needs to be rather general. Added goodness of fit as a focus of testing different distributions.

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			for BM and PoT, respectively. Values of GEV/GPD distribution parameters are estimated from the data with statistical methods (e.g., Maximum Likelihood). Regardless, goodness-of-fit should be checked after parameter estimation. This is done with the data used for estimation; for BM/PoT, these are only the extreme datapoints (defined as block maxima and exceedances over a high threshold, respectively).				
21	2.22	Extra explanation would be needed.	Some trends are clear and documented extensively, but other trends, such as cyclic trends, are less easy to identify. This difficulty can be due to the slow variation of the trend and the limitation of the available data. SSG-18 can give a suggestion on how to address this issue, especially with declining non-significant trends.			✓	More detailed discussion is beyond the scope of this type of document.

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22	2.23	From line: "Care should be taken in …" should go in new para.	This comment is applicable to all statistical models, not only Bayesian methods.	✓			New paragraph started here.
23	2.24	Suggestion to add a para.: The probabilistic methods require a lot of model calculations. This issue can be addressed by using fast models or by using a more advanced sampling technique like Latin Hypercube sampling or stratified sampling instead of the basic Monte Carlo sampling.	Extra info on how to overcome the issues of the probabilistic method. 5.15 mentions these optimal sampling methods but they should be mentioned in the general definition.		✓		Added footnote to address strategies.
24	2.28	The results of the hazard analysis should be compared with results of previous studies, observations, and historical or paleorecords and adapted if necessary[1]. *Footnote to be added* [1] Recognised industrial (non-nuclear) standards can also be relevant references.	WENRA guidance: *If the site specific hazard assessment for a DBE with a frequency not higher than 10^{-4} per annum leads to loads that are lower than those required according to recognized standards (e.g. Eurocode 1 (EC1)), as a minimum design basis event for meteorological hazards the requirements according to the recognized standards (e.g. Eurocode 1 (EC 1)) should be applied. There are dedicated Eurocode standards for snow loads (EN 1991-1-3:2003 [4]),*		✓		Added proposed text, but not the proposed footnote. The footnote is not relevant to topic of this paragraph.

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			wind loads (EN 1991-1-4:2005 [5]), and thermal loads (EN 1991-1-5:2003 [6]).				
25	2.30	In the statistical approach, uncertainty estimates (e.g. confidence intervals) should be produced as part of the analysis. Uncertainty can also be investigated by fitting different distributions to the data. ~~Conservatism can be applied by use higher percentile estimates instead of the mean.~~	Para. 2.29,2.30 and 2.31 are related to uncertainty evaluation. This sentence is relative to conservatism and is applied only for statistical approach while conservatism could be discussed for each method. Proposal to delete this sentence or to move it.	✓			Proposed deletion accepted
26	2.30, lines 2-4	Recommendation could be made clearer. Depending on the analysis, uncertainty can also be investigated by fitting different distributions to the data. In the Bayesian approach, conservatism can be applied by using high percentiles from the posterior distributions.	For the first sentence about different distributions, see the top of comment No.1 about different distributions and BM/PoT. In other types of analyses, fitting different types of distributions is common, however. Non-Bayesian (frequentist) methods consider only confidence intervals, not posterior probability distributions; thus the concept of using higher percentiles is natural only in the Bayesian			✓	No longer relevant because conservatism statement deleted in response to previous comment.

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			framework. Here, posterior distributions can be summarised by their mean, but also by the median, other percentiles, or the mode. Posterior distributions need not be symmetric, i.e. mean != median in general. Thus, the mean can be equal to a high percentile.				
27	3.3	Data collected by site monitoring systems that have been in operation since the preliminary phase of the site evaluation — although obtained over a short period of time — should be used to assess whether the data obtained from regional networks used to estimate the hazards at the site are representative of the specific characteristics in the vicinity of the site. The representativeness can be analysed through a correlation analysis resulting in a correlation coefficient for and a regression relation between on-site and off-site data. Collection of data and information should be continued throughout the lifetime of the	The representativeness can be expressed through a correlation analysis		✓		Added the following sentence: "One method to assess representativeness of regional data can be performing a correlation analysis between on-site and off-site data."

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		nuclear installation to support updates of the safety case (e.g. as determined by periodic safety reviews).					
28	3.4	~~To the extent possible, d~~Data should include the location and date/time at which it was measured/acquired. […]	A data without location and date/time at which it was measured/acquired seems to be useless for data analysis.	✓			Deletion accepted
29	3.7	Instrumental records, historical information and hazard analysis should be supplemented with paleoinformation, where available and compatible with the current situation (e.g. geologic or dendrochronological information). For example, tree ring data can be used to extend temperature and precipitation records, and geologic evidence can be used to extend the useful record for riverine and coastal flooding, but limitation in such records should be considered.	In some cases this additional information may be considered at the hazard analysis stage. For analyses of extreme values (Block Maxima / Peak-over-threshold), such data may only be used for rough plausibility checks of the results but not in the quantitative hazard evaluation itself (very imprecise and uncertain data). Because of climate change, these data may not be representative of the current and further evolving climate conditions, not to mention environmental and occupational changes.			✓	Use of paleo-information is part of the hazard analysis. Response to Comment No. 17 provided rational for not including the "compatible with current situation" qualifier. The qualifier regarding "limitation" is too vague to be useful.

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30	3.8	[…] (ii) Extreme ~~or threshold~~ air temperature and humidity conditions (e.g. the number of hours certain wet bulb temperature[11] values are exceeded each year) to establish loads for the design of heat sink systems, systems for the removal of containment heat following an accident, and ~~installation~~ heating, ventilation and air conditioning systems. […]	Use of threshold air temperature not understood. + a typo		✓		Thresholds exceedances are used in the design of certain equipment (e.g. HVAC). Added "nuclear" to clarify use of installation.
31	3.9	[…] In this regard, the specifications for measurements — including standards and best practices for instruments, instrument siting, observations, data management, the quality management system and homogenization — are available in publications of the World Meteorological Organization or Nuclear Safety Authorities.	There is also a set of nuclear standard for on-site program (e.g. RG 1.23). For on-site monitoring, it may not always be possible to have optimal conditions.		✓		Reference to national nuclear safety guides and standards.
32	3.13	Extra explanation would be needed to understand why this recommendation is introduced.	An explanation for the reason of this recommendation might be helpful to understand its intent.	✓			Example added to increase understanding.

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			Perhaps it would also be helpful to give an example or some conditions under which this paragraph is relevant (for example short observational records). For some analysis a full cycle is important so both the start as the end should be checked.				
33	3.15	Documentation of meteorological analyses should include a description of each meteorological station and the monitoring programme, including types of instrument, calibration history, geographical location, instrument exposure and altitude, data record period(s), ~~and~~ data quality and quality of the meteorological station.	Proposal to add this clarification to highlight that the meteorological station should fulfil some WMO requirements concerning its quality (e.g. : the potential impact of specific condition like lake, high threes, concrete areas on the measure).		✓		Paragraph revised to improve clarity.
34	3.19	There may be indirect evidence that long term measurements made at nearby meteorological stations can be considered representative of the site. Nevertheless, on-site data obtained during the short period of record of the site evaluation should be the basis for assessing the	On site data collection may not be necessary or can be significantly limited if there are representative meteorological measurements or if the facility characteristics (like underground final disposal			✓	The proposed text is too vague. Disposal facility example not relevant to scope of this guide.

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		repressiveness of nearby station data, since deviations from regional to local meteorological conditions may be caused by local topography, nearby bodies of water, or other unique site characteristics. Associated approach could be graded in terms of on-site data collection according to the actual representativeness of available measurements.	facilities) do not require that kind of measurements.				
35	3.25 (new para. suggestion)	3.25.a In using climate models, Impact of other, more local parameters can shall be considered. E.g. if at new sites, a forest is cut to prepare the construction of NPP, the disappearance of the trees, may impact the soils capacity to absorb water and increase direct exposure of the soil to sun. As a consequence there may be more drought, which can impact the temperature.	It is ok to use climate models, but other, more local parameters can also evolve. E.g. if at new sites, forest is cut to prepare the construction of NPP, the disappearance of the trees, may impact the soils capacity to absorb water and increase direct exposure of the soil to sun. As a consequence there may be more drought, which can impact the temperature.		✓		Added text to reflect this comment.
36	3.36	(d) Tsunami induced by iceberg collapse	As another phenomenon which could cause a tsunami		✓		Added item to list for tsunami associated with

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							ice shelf, iceberg, or glacier calving.
37	3.41	For relevant water control structures, the following information should be collected, when available or obtainable from the organisations operating them : […]	Some sensitive information regarding water control structures will not be public and the operators will not always agree to share data.		✓		Added a footnote discussing this point.
38	4.1	Nuclear installations are expected to be designed to withstand hazards associated with extreme meteorological conditions and with rarely occurring hazardous meteorological phenomena. The design and ~~continued~~ operation of a nuclear installation should consider the inclusion of parameters for rare and extreme meteorological events, as described in SSR-1 [1]. Meteorological hazards that could affect the safety of nuclear installations are required to be considered throughout the lifetime of the facility (see Requirement 7 of SSR-1 [1]).	To avoid misunderstanding like continuous operation is an absolute requisite.	✓			Agree that “continued” is not needed.

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39	4.3	~~Additionally, historical data alone might not fully represent future climate and extreme event conditions due to climate change. For sites that have a limited historical dataset, observational records should be supplemented or extended using climate model outputs or reanalysis data. Recommendations on the use of climate projection data are provided in Section 9.~~	This sentence seems redundant with 3.25			✓	It's appropriate to make the link between extrapolation of historical data and use of climate projections here.
40	4.4	Exploratory Data Analysis ~~Data processing~~ should be used to take into account the possible non-stationary behaviour of the stochastic process under consideration, which may reflect climatic variability and climate change, among other phenomena. In data processing, attention should be paid in order to retain these non-stationarities in the data.	*Data processing* usually refers to preparing raw data for further analyses. Properties of these data (such as non-stationarities) are usually investigated as part of an Exploratory Data Analysis. There are instances where data processing affects the way non-stationarities are reflected in the data. Example: Modelling seasonality of monthly temperatures with a sine curve when some months are (perhaps irregularly) missing in the data, affecting the phase of the curve. Thus, data processing should be		✓		Partially agree with comment. EDA should be used to identify nonstationarity behaviour, but EDA itself does not "account for nonstationarity." Other methods do this.

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			conducted with the later analyses in mind.				
41	4.9	Extend the list to other aggregation levels.	Why limit to daily maximum and minimum? If higher resolution data (for example hourly) is available statistical analysis of different aggregation levels (1h, 6h, 12h) can be performed to estimate the return levels of the peak values of these aggregation levels. IAEA_2011_SSG-18 from 2011 mentioned hourly data in §4.8.		✓		Added "Where available, sub-daily air temperature should also be collected."
42	4.10	[…] in the data analysis. For wet bulb temperatures, the distinction can be made between extreme wet bulb temperatures that can occur coincidentally with the extreme dry bulb temperatures and extreme wet bulb temperatures that occur independent from extreme dry bulb temperatures.	Wet bulb temperatures (WBT) represent a combination of a dry bulb temperature (DBT) and a certain degree of humidity (AH). During a heat wave, extreme DBT are generally accompanied by low AH. Outside heatwaves, relatively moderate (but still high) DBT can occur, but at high AH, representative for WBT that would exceed the ones during the heatwave. For some systems			✓	Covered in Para 4.12.

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			(like HVAC), combining extreme DBT with the (non-coincidental) WBT may be too restrictive from a design perspective.				
43	4.17	[…] should also be determined. The characteristics from wind-borne missiles shall be derived consistently with the considered wind speeds.	High intensity winds can cause wind-borne missiles.		✓		Added proposed text, but changed "shall" to "should"
44	4.31	The hazard evaluation for tropical cyclones, hurricanes or typhoons should result in an extreme wind speed for a given averaging period and corresponding to an established annual frequency of exceedance. Other features of interest for design, such as the vertical profile of the wind velocity, the duration of the wind intensity above specified levels and wind-borne projectiles should also be described. Cyclone generated projectiles should be specified in terms of their dimension, mass, and velocity. This can be a standard spectrum from available regulatory documents or a	As in para. 4.39		✓		Added "Cyclone generated projectiles should be specified in terms of their dimension, mass, and velocity."

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		site-specific spectrum derived from a site-specific analysis.					
45	4.32	[…] (d) The rainfall from tornadic storms may induce local floods and consequently may be the cause of additional indirect damage. Such rainfall is consistent with the guidance on local intense precipitation (items 4.44 – 4.47).	It is assumed that rainfall from tornadic storms is not different from other extreme rainfall.		✓		Added reference to local intense precipitation.
46	4.36.a	Proposed additional para.: In addition to the annual frequency of exceedance per tornado class, the damage footprint per tornado class is to be addressed. Inside the footprint, the tornado wind speeds can vary over the trajectory and lifespan of the tornado.	Generally, also the damage footprint is to be determined. Also, tornado wind speeds can vary over the lifespan of the tornado (Cfr WASH study)			✓	Para 4.36 discusses AEF of tornado wind speeds. Tornado path segments and wind speed in segments are part of the wind speed AEF analysis.
47	4.39	4.39. Tornado generated projectiles should be specified in terms of their dimension, mass, and velocity. This can be a standard spectrum from available regulatory documents or a site-specific spectrum derived from a site-specific analysis. To protect against […]	Standard spectrum (as in US NRC R.G. 1.76) or site specific spectrum.	✓			Added "This can be a standard spectrum from available regulatory guidance, or a site-specific spectrum

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
							derived from a site-specific analysis."
48	4.40	Tornado missiles and the resulting impacts on SSCs should be estimated ~~using computational codes[22] designed to analyse these specific phenomena~~.	It is proposed to delete this part of the sentence as there are other tools or means that can be used to evaluate those impacts (e.g. : structural/experimental testing, engineering judgments or comparisons of load cases used in other attacks (projectiles generated by high winds, etc.),...).		✓		Did not delete reference to computational codes, but added text to consider other methods
49	4.43	[…] Data from stations equipped with a continuously recording rain gauge suitable for resolving the temporal resolution of rainfall needed for the analysis (e.g. sub-hourly rainfall data is typically needed for site-scale local intense precipitation) should be used, where available. These data ~~should~~ can be complemented by weather radar data in case of limited of sparse rain gauges~~, where appropriate~~. Also, the results from long re-analysis model simulations (e.g. ERA-5) can provide extra	If the rain gauges data is sufficient the radar data does not have to be used. "where appropriate" leave a lot to interpretation. Also, the results from long re-analysis model simulations (e.g. ERA-5) can provide extra local info.		✓		Radar data can provide information on spatial variation not possible from rain gauges. Replaced "where appropriate" with "where available". Use of reanalysis mentioned as additional

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		local info. The complete set of precipitation data should be used to derive extreme values. […]					complementary information.
50	4.50	In some watersheds, snowmelt can be a significant contributor to flooding at a nuclear installation site. Data on extreme snowpack in the upstream basins and the pace at which the snow melt has occurred should be collected: this may be available from the national meteorological service or other entities. […]	Besides the snowpack, the pace at which the snow melt occurs is important. However, this will be covered in the EVA of the river flow rate.			✓	Melt sequences is mentioned in the following sentence.
51	4.53/4.54	**4.53**. For deterministic local intense precipitation flooding assessment, the precipitation input in the form of depth-area-duration or intensity-duration-frequency tables or curves […] **4.54**. For statistical local intense precipitation flooding assessment, the precipitation input should be provided in the form of depth-duration-frequency or intensity-duration-frequency curves, from which the hydrologist should develop design rainfall events	In Europe IDF (intensity – Duration Frequency) are used frequently for this analysis. It would be good to at least mention other available methodologies.	✓			Added IDF in these two locations.

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		corresponding to the return period(s) of interest. […]					
52	4.65	[…] Depending on the location of the nuclear installation site, maps depicting the estimated snow load may be available in building codes and standards. This load case shall be adapted to nuclear practice (e.g. in terms of appropriate return period).	The European building codes and standards provide most likely values for limited return periods (e.g. 50 yrs). In the Eurocode, there is a formula in appendix to extrapolate the value to higher return periods.		✓		Added "This load case should be adapted to nuclear safety practice (e.g. in terms of appropriate exceedance frequency)."
53	Footnote 24 (to 4.70)	Positive lightning is more dangerous than negative lightning because it originates from the tops of thunderstorms and can strike up to 40 km away, making it unpredictable and potentially deadly. It often hits areas far from the storm centre. Negative lightning, while still hazardous, comes from the lower levels of thunderstorms and usually strikes directly beneath the storm in the rain shaft. Its shorter, more direct path makes it more predictable compared to positive lightning. Positive lightning discharges are less frequent than negative lighting discharges. IEC	To estimate the frequency of exceedance of a certain lightning intensity, it is important to know that PLD (positive lightning discharges) are less frequent than NLD (negative lighting discharges). IEC 62305-1 assumes a ratio of 10% PLD and 90% NLD.		✓		Added "Positive discharges are typically less frequent than negative discharges." To the footnote

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		62305-1 assumes a ratio of 10% positive lightning and 90% negative lightning.					
54	4.73	~~The lightning strike frequency should be determined, which is the product of the equivalent collection area of the structure or object[25] and the flash density per unit time in the area where the structure is located.~~ Lightning data records (place, date and time, intensity) should be collected, when possible, taking into account the uncertainties from the estimation process.	The distribution curve of lightning shocks depends on the regions. These data may give access to flash density or estimated annual frequency of exceedance for lightning strike depending on the kind of method (deterministic or risk evaluation) that is used. The equivalent collection area of the structure is not sufficient to take into account para. 4.74			✓	Proposed text provides less information than existing text.
55	4.75	(d) Long …	Looks like something is missing.		✓		This is a typo; deleted.
56	4.76	Suggestion to clarify in a footnote that impulse charge and specific energy are only provided for the first positive lightning strike.	Impulse charge and specific energy are only provided for the first positive lightning strike (Cf. IEC 62305).		✓		Parenthetical regarding first positive strike added to items (d) and (e).
57	5.4	When evaluating storm surge hazard, a reference water level, such as the high tide (spring tides) or high lake level, should be assumed to occur coincidently with the storm surge.	“high tides” seems too vague, better use spring tides (or 'king tides')		✓		Added “(e.g. spring tide or king tide)”

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58	5.7	[…] The surge data should be available as still water levels, excluding the influence of high frequency waves and astronomical tides. This is normally the case when instrumental surge data for a certain region are available. In case the surge is combined with high tide for the hazard assessment the skew surge is advised.	A small phase shift is often observed when comparing astronomical tide and measured tide. This can result in large artificial momentaneous surge values. By using the skew surge (difference between the astronomical and the measured high tide value) this can be avoided. The IAEA publication SRS-120 "Assessment of high wind and external flooding (excluding tsunami) hazards in site evaluation for nuclear installations" does include this explanation on page 93 (Fig.34)			✓	The cited reference does not discuss skew surge or combining it with storm surge.
59	5.16	[…] To compute the maximum storm surge elevation using a deterministic method, a set of maximized (but still credible) hypothetical storms should be constructed taking into account the information, knowledge and results from the evaluation of meteorological hazards. […]	The credibility should be addressed to not being over conservative. E.g. maximizing each contributing parameter is too restrictive. In this context, a sensitivity analysis on the contributing parameters can be interesting.		✓		Changed to "credible maximized hypothetical storms"

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60	5.105	Once the data set has been developed, an annual frequency of exceedance for large floods (e.g. a frequency of 10^{-3} per year or less) should be computed through extrapolation by using a probabilistic model. To allow for uncertainties in sampling, the selected river discharge value is usually a confidence level upper limit, not the mean value, for the chosen recurrence interval. In more complex river systems with multiple tributaries or tidal downstream boundaries a multivariate statistical model can be applied to take the correlations into account before sampling. A safety factor should be added to take into account uncertainties. This safety factor should be added to the river discharge rather than the still water elevation.	Suggested additional recommendation for complex river systems	✓			Proposed text added.
61	5.114	A large flood event can generate breaches of levees along the river that modify the water levels both in the river and in the floodplain. The behaviour of the levees during the	The parameters variation used in failure calculation can be described in a distribution and thus included in the probabilistic sampling without	✓			Proposed text added.

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		flood event should be evaluated considering possible failure mechanisms (e.g. piping, overflow and overtopping, shearing of the backside slope). The behaviour assumed for these structures (breach or resist) could also be justified based on its unfavourable nature for the site flooding conditions or can, in case of a probabilistic approach, be included in the sampling.	having to assume the most unfavourable situation.				
62	5.116	In addition to inundation, floods could potentially affect the safety of the nuclear installation by undermining flood protection barriers, by causing direct hydrodynamic forces on any inundated buildings, by sedimentation and/or clogging of safety features on the site, or by eroding and destabilizing structures. Also the direct impact loads caused by any kind of debris (e.g. flotsam….) should be considered.	It's not just hydrodynamic forces. Also the direct impact loads caused by all kind of debris should be considered.		✓		Added "Impact loads due to water-born debris should also be considered."
63	5.121.	[…]	Cf. comment #5.116.	✓			Added "(f) Debris

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		(f) Debris transport (size, mass, velocity…).					transport (e.g., size, mass, velocity)"
64	5.123	[…] (l) Wave induced erosion and breaching	Wave induced erosion and breaching could be mentioned	✓			Added "(k)(l) Wave induced erosion and subsequent breaching"
65	6.13	[…] (c) Expected potential impacts from these biological species on the nuclear installation (it could account for potential foreseeable climate change impact); […]	IAEA analysis show a clear increase in IRS related to biological phenomena. Some of them are linked to climate change (e.g. excessive growth due to rising sea water temperature).			✓	The impacts should be considered regardless of cause.
66	6.15 – 6.24	Suggestion to move 6.15-6.24 to chapter 4.	It is not clear why ice (frazil ice and ice floes) and iceberg are not considered as meteorological phenomena?			✓	Frazil ice and ice floes is not a purely meteorological phenomena.
67	6.27.	The ~~probability of~~ estimated exposure to space weather hazards related consequences (GIC mainly) should be evaluated in the site characterization process. [...]	The site location has a limited impact on the original space weather hazard. It can however modify the consequences for sites according to their latitudes, their locations on the national grid, etc...		✓		Changed "probability of" to "estimated exposure to." Discussion of consequences gets into engineering

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
							considerations, which beyond the hazard assessment.
68	7.27	To be removed	It does not look correct to speak about cliff edge effect in a guide that is related to site evaluation, as a cliff edge introduces the plant response. Besides, if the cliff edge effect is maintained, it would be fair to add the External Event PSA as a complement to or alternative for the deterministic approach to identify cliff edge effects.			✓	This para explains the linkage between hazard evaluation and cliff edge effects. Also, this document may be used in period reviews, where information regarding cliff edge effects may be more readily available than during initial site characterization.
69	8.2	From our perspective, it seem better to remove section 8	Item 8.2 specifies that section 8 focuses on protection of the site, whereas SSG-68 provides specific recommendations on the design of the nuclear			✓	Section 8.2 describes the relationship/interface between this guide and SSG-68. SSG-

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			installation (i.e. specifically the SSCs of the installation). When comparing with SSG-68 this does not seem to be correct. E.g. SSG-68 also speaks about the dry site concept…				68 refers back to SSG-18 on the "dry-site" concept.
70	9.8	[…] Results for the distant future are still affected by large uncertainties resulting from both greenhouse gas emission scenarios and climate models. Also, extreme weather events may behave differently than expected in a changed climate, e.g. it may become drier on average, but extreme precipitation may become more intense. Local observations…	Climate is not the same as weather; hence also extremes weather events may behave different than the change in climate.			✓	Although the proposed statement is correct, this level detail is not needed here.
71	11.17	The extent to which a graded approach can be applied to hazard evaluation will depend on the nature of the specific event under consideration. Some hazards, due to the nature of the phenomena, cannot reasonably be evaluated using a graded approach ~~(e.g. lightning)~~. […]	Why not? If a (maximised) lightning event will not result in major radiological consequences? Depending on the location, lower maximum lightning intensities can be witnessed.			✓	Modified the sentence to increase clarity but kept the example of lightning.
72	12.2	[…] The management system for hazard evaluations should be integrated with and fulfil	Suggestion to include IAEA SSG-77 'Protection Against Internal and External Hazards			✓	Site protection is not within the scope of this

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		requirements of the overall safety management system for the nuclear installation project. IAEA Safety Standards Series No. SSG-77 'Protection Against Internal and External Hazards in the Operation of Nuclear Power Plants' provides specific recommendations on protection against internal and external hazards and combinations of hazards in the operation of nuclear power plants.	in the Operation of Nuclear Power Plants'.				section. Section 8 discusses site protection. SSG-77 is cited there.

COMMENTS BY REVIEWER Reviewer: Page.... of.... Country/Organization: FINLAND/STUK Date:				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	2.1	The hazards considered in this Safety Guide are grouped into meteorological hazards, hydrological hazards, and other natural hazards:	Please see consistency throughout the document	✓			Proposed text was added.
2	2.6	High intensity wind combined with freezing precipitation or snow could block the emergency diesel generator combustion and cooling air intake structures and cause simultaneously station black-out (loss-of grid).	Please consider to add a separate table or matrix in appendix or annex on possible hazard combinations, which should be considered in different regions.		✓		Proposed text was added, with modification. However, the requested table/matrix of combinations for different regions is beyond the scope of this safety guide. This would be best suited for a Tecdoc
3	6.15	(c) pack ice which may lead to ice jams in cooling water intake structures lead to damage to cooling water intake structures	**Please include pack ice as a phenomena: Pack ice** , any area of sea ice (ice formed by freezing of seawater) that is not landfast; it is mobile by virtue of not being attached to the shoreline or something else. Pack ice expands in the winter and retreats in the summer in both hemispheres to cover		✓		Pack ice added to list item (b).

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			about 5 percent of the northern oceans and 8 percent of the southern oceans.[Source Britannica]. This phenomena was included in recent site characterization and evaluation in Finland.				

COMMENTS BY REVIEWER Reviewer: **Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)** (with comments of GRS) Pages: 3 Country/Organization: **Germany** Date: 19.05.2025				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	1.1	Requirements for site evaluation for nuclear installations are established in IAEA Safety Standards Series No. SSR-1, Site Evaluation for Nuclear Installations [1]. This Safety Guide provides recommendations on meeting ~~these~~ requirements of SSR-1 [1] in relation to the evaluation of meteorological (Requirement 18), hydrological (Requirement 20), and selected other natural hazards (Requirement 21) ~~(e.g. wildfire, drought, ice impacts, debris, biological phenomena) that potentially might affect nuclear installation sites~~.	A specification of the exact requirements this Safety Guide is targeting would be helpful		✓		Text modified to identify the specific requirements in SSR-1 for meteorological, hydrological, and other natural hazards.
2.	1.2 New footnote	Meteorological hazards are associated with extreme meteorological conditions and with rarely occurring[1] hazardous meteorological events. Hydrological hazards are associated with external flooding events, as well as low water level conditions. Other natural hazards, selected for this Safety Guide are ~~(~~e.g. wildfire, drought, ice impacts, ~~debris~~, biological phenomena and debris[2]~~)~~ ~~can also potentially affect nuclear installation sites~~. Footnote 2. For the purposes of this Safety Guide, debris represents any material, organic or non-organic, that is advected through the air and/or water. This does not	Clarification Additionally add the footnote (now Nr.47) to this para about debris, also emphasize that Requirement 21 of SSR-1 is referring to another type of debris.	✓			Proposed text with slight edits and footnote added.

COMMENTS BY REVIEWER Reviewer: **Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)** (with comments of GRS) Pages: 3 Country/Organization: **Germany** Date: 19.05.2025				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		include debris avalanche, referred to in SSR-1 [1].					
3.	1.5	Additionally, this Safety Guide clarifies the distinction between the process for assessing site specific meteorological, hydrological and other natural hazards – carried out during siting and the process for defining the relevant design basis and beyond design basis parameters – carried out during design of the ~~for~~ nuclear installations . As a result, it fills in gaps and avoids undue overlapping of the two processes, which are ~~performed~~ to be continued and revised at various stages during the lifetime of nuclear installation.	Clarification			✓	Proposed text is not needed.
4.	1.11	This Safety Guide provides recommendations on the evaluation of external hazards associated with meteorological, hydrological, and selected other natural phenomena for nuclear installation sites, carried out during site selection and site evaluation. Additionally, actualisation of ~~E~~external hazard evaluations ~~needed~~ required over the entire lifetime of the nuclear installation ~~project, from site survey, through the site evaluation process (i.e. site selection and site characterization stages from which the design bases are derived, up until the end of the operational period)~~.	Please make it clear that such hazard evaluation is essential and fundamental for the site selection and site evaluation. Actualization is required. We guess not only for operational period, but for decommissioning as well.			✓	The original text is clear. Decommissioning is not within the scope of this safety guide.

COMMENTS BY REVIEWER Reviewer: **Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)** (with comments of GRS) Pages: 3 Country/Organization: **Germany** Date: 19.05.2025				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
5.	1.17 Line 9	… Section 10 is dealing with ~~provides recommendations on meeting requirements for~~ monitoring and warnings for the protection of the nuclear installation site.	Do we have Requirements for warning? If yes – please give a corresponding reference. Else – please change the wording. We made a suggestion.		✓		Removed reference to ” requirements.”
6.	2.1	The hazards considered in this Safety Guide are grouped into meteorological hazards, hydrological hazards, and other hazards: see Sections 4–6, respectively. These hazards could affect the safety functions of a nuclear installation in multiple ways . For example, the ability of the ultimate heat sink to perform its function adequately could be affected by ~~hazards associated with water temperature and water level conditions and drawdown could all affect the ability of the ultimate heat sink to perform its function adequately. Inadequate cooling might be caused by~~ extreme water temperature associated with heatwaves~~. . Limitation of cooling water supply (e.g. low flow rate or low water level) may be caused by~~ severe drought in the region, obstruction of channels, loss of water source due to dam failure, downstream failure of water control structures, and anthropogenic effects such as the pumping of groundwater. In other cases, the ultimate heat sink may be impacted by a drawdown	Clarification	✓			Proposed modification to text adopted

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Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		of the sea level resulting from a surge, seiche or tsunami.					
7.	2.4	Changes in hazards over time, including due to climate change, are important considerations for the further development of hazard parameters in the site re-evaluation process. Re-evaluation of hazards on regular basis should be considered, e.g. during the periodic safety review of a nuclear installation.	Clarification			✓	Proposed text would change the intended meaning of the sentence.

COMMENTS BY REVIEWER Reviewer: Ahmad Karamloo Country/Organization: Iran/Iran Nuclear Regulatory Authority (INRA) Date: 13 May 2025				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	1.1	This updated Safety Guide supersedes SSG-18 (2011), providing comprehensive recommendations for assessing meteorological and hydrological hazards.	Emphasizes replacement of previous version and guide comprehensiveness			✓	This statement is provided in para 1.6
2	1.3	The Guide aligns with the latest IAEA Safety Requirements SSR-1, SSR-2/1 (Rev.1), SSR-3, and SSR-4.	Ensures consistency with current safety standards			✓	SSR-3 and SSR-4 refer back to SSR-1. SSR-2/1 focuses on design.
3	2.2	Meteorological and hydrological data should be collected from reliable global and regional sources with appropriate temporal and spatial coverage.	Highlight data reliability and coverage importance			✓	Data collection is addressed in Section 3.

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4	3.1	Use of synthetic datasets and advanced modeling is recommended to supplement historical data gaps.	Update data analysis methodologies			✓	These topics are mentioned elsewhere, including but not limited to paras 3.10, 3.25, and 3.26.
5	4.4	Combined hazard assessment methods (e.g., joint probability of hurricane and flooding) must be performed using advanced statistical techniques.	Addresses complexity of hazard combinations		✓		Comment accepted, but it would be better to discuss this in a previous section. So, added "Advanced statistical and probabilistic techniques may be needed to perform assessment of combined hazards (e.g. joint probability of hurricane and flooding)." to para 2.14

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6	5.3	Flood assessments should consider upstream dam breach effects and combined flow scenarios.	Ensures comprehensive hydrological hazard coverage			✓	Dam breach is discussed elsewhere (para 5.152).
7	6.2	Design basis parameters must account for uncertainties in modeling and data.	Incorporates uncertainty considerations into design			✓	Already discussed in Section 7.
8	7.1	Site protection measures should be updated adaptively and aligned with SSG-68 and SSR-1.	Ensures consistency and modern approaches		✓		Text on reassessment of protection added to para 8.3.

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9	8.2	Climate change impacts must be considered as a key factor in periodic hazard reviews.	Addresses long-term environmental changes			✓	Already addressed in paras 9.2 and 9.3.
10	9.3	Warning systems should have regular testing and validation to ensure optimal performance	Guarantees reliability of warning systems		✓		Proposed text added to para 10.5.
11	10.1	A graded approach for hazard assessment in non-power nuclear installations (e.g., SMRs, research reactors) should be described.	Tailor assessment to installation types			✓	The discussion of the graded approach in Section 11 is based on radiological hazard and is technology neutral. So, the recommendations are meant to apply to SMRs, research reactors, etc. SRS-94 specifically

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							addresses research reactors.
12	1.5	Technical terminology should be harmonized with the IAEA Safety Glossary (2018).	Standardizes technical vocabulary			✓	IAEA Safety and Security Glossary cited in para 1.9. Other specific terms defined in footnotes.
13	2.4	General recommendations should include consideration of multi-event hazards and cascading effects.	Covers complex and cascading hazards		✓		This comment has been addressed by edits made to para 2.6 made in response to ENISS comment no. 15

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14	3.5	New meteorological data sources such as airport station data and tropical cyclone tracks should be incorporated.	Update data sources			✓	Meteorological data sources is addressed in paras 3.8 – 3.23.
15	4.7	Limitations of probable maximum parameter estimation methods in risk-based approaches should be clarified.	Clarifies technical limitations			✓	The comment does not seem to apply to para 4.7. The limitations of probable maximum estimation (i.e. deterministic methods) are discussed in several sections of this guide (e.g. para 2.31).
16	5.7	Tsunami modeling should employ state-of-the-art technology and up-to-date data.	Enhances modeling quality			✓	The comment does not seem to apply to para 5.7, which addresses storm surge. The importance of selection of tsunami modeling is already described at para. 5.61. The

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							importance of the tsunami database is already described at para. 5.57.
17	6.4	Design basis parameter determination should consider effects on multiple units or adjacent sites.	Addresses multi-unit site complexities			✓	The comment does not seem to apply to para 6.4, which addresses wildfire. This SSG supports site hazard characterization but does not differentiate between multi-unit or single-unit sites.
18	7.3	Hazard management must include continuous review and updating of protective measures documentation.	Ensures sustainability of protection		✓		The comment does not seem to apply to para 7.3, which addresses hazard evaluation. This comment is addressed by edits made to para 8.3 in response to Belgium comment No. 23.

COMMENTS BY REVIEWER Reviewer: Ahmad Karamloo Country/Organization: Iran/Iran Nuclear Regulatory Authority (INRA) Date: 13 May 2025				RESOLUTION			
19	9.5	Monitoring systems should comply with NS-G-3.2 and SSR-1 standards.	Aligns with relevant standards			✓	The comment seems to apply Section 10, not Section 9. Compliance with SSR-1 is addressed in paras 10.1 and 10.2. Compliance with NS-G-3.2 is cited elsewhere (paras 1.3, 1.13, 2.10, 3.18).
20	11.1	The hazard management system should be designed for rapid response to changing environmental conditions.	Increases management system flexibility		✓		This seems to apply to Section 12, not Section 11. Text added to para 12.2 to address this comment.
21	New Meteorological hazards section (e.g., paragraph 2.1 or section 4)	It is recommended to include a dedicated section on dust hazards and their potential impacts on the safety of nuclear sites.	Dust is a significant meteorological hazard, especially in arid and semi-arid regions, affecting equipment, visibility, and personnel health, and should be			✓	Paras 4.81 – 4.83 discuss characterization of dust storms and sandstorms.

COMMENTS BY REVIEWER Reviewer: Ahmad Karamloo Country/Organization: Iran/Iran Nuclear Regulatory Authority (INRA) Date: 13 May 2025				RESOLUTION			
			considered in a comprehensive hazard assessment.				
22	New Meteorological hazards section (e.g., section 2 or 4)	It is recommended to address frost, fog, and hail as important meteorological hazards in the hazard assessment.	These phenomena can affect equipment performance and site safety but are less emphasized in the current document.			✓	Hail is discussed in paras 4.86 to 4.88 Freezing precipitation and frost related phenomena are discussed in paras 4.90 to 4.94. Fog is not a direct hazard to safety related SSCs but may modify assessments of human-induced external hazards (e.g. transportation near the site). Human-induced external hazards are addressed in SSG-79.

COMMENTS BY REVIEWER Reviewer: Ahmad Karamloo Country/Organization: Iran/Iran Nuclear Regulatory Authority (INRA) Date: 13 May 2025				RESOLUTION			
23	New Hydrologic al hazards section	It is recommended to include hazards related to sudden groundwater level changes and small-scale surface runoff in the hazard assessment.	These hazards may be significant in some sites and including them enhances the comprehensiveness of the assessment.			✓	Small scale runoff already addressed in para 5.88-5.121 (local intense precipitation) High groundwater levels is addressed in paras 5.177-5.181.
24	New Related biological hazards section	It is recommended to dedicate a separate section to biological hazards related to meteorological and hydrological hazards.	These hazards can affect safety and personnel health and require specialized assessment.			✓	Biological hazards are addressed in Section 6 (para 6.9-6.14).
25	New Hydrologic al and geological hazards section (e.g., section 5 or related)	It is recommended to include land subsidence as an important hydrogeological hazard in the site hazard assessment and to describe its monitoring and management methods.	Land subsidence caused by groundwater depletion and geological factors can have significant structural and safety impacts on facilities and should be included in a			✓	Subsidence is already addressed in the Section 9 (paras 9.13, 9.20).

COMMENTS BY REVIEWER Reviewer: Ahmad Karamloo Country/Organization: Iran/Iran Nuclear Regulatory Authority (INRA) Date: 13 May 2025				RESOLUTION			
			comprehensive hazard assessment.				
26	New Meteorological hazards section (e.g., section 2 or 4)	It is recommended to include regional monsoon winds such as the 120-day Sistan wind and assess their potential impacts on nuclear site safety.	Regional monsoon winds can cause dust storms, reduce air quality, damage equipment, and pose health risks, making them important for local hazard assessment.	✓			Added regional monsoon winds to para 4.13
27	New Hydrological hazards section (e.g., section 5 or related)	It is recommended to include seiche as an important hydrological hazard in coastal areas in the site hazard assessment.	Seiche can cause water level oscillations and structural impacts in coastal regions and should be included in a comprehensive hydrological hazard assessment.			✓	Seiche is already discussed in Section 5 (paras 5.24, and paras 5.80-5.86).

COMMENTS BY REVIEWER Reviewer: Ahmad Karamloo Country/Organization: Iran/Iran Nuclear Regulatory Authority (INRA) Date: 13 May 2025				RESOLUTION			
28	New Section related to electrical and electronic hazard assessment (e.g., I&C related sections)	It is recommended to include a section addressing hazards caused by high humidity and clay dust that can lead to short circuits in electrical and electronic circuits, impairing alarm and I&C system functions.	This phenomenon can cause power outages, malfunction of control systems, and emergency conditions, which are critical for nuclear facility safety.		✓		Text and footnote added to para 4.82 to address this scenario.
29	New Environmental and water quality hazards section (if applicable)	It is recommended to include surface oil pollution (large oil spills) as significant environmental hazards in comprehensive site hazard assessments.	These pollutions can severely impact water quality and aquatic ecosystems and should be considered in comprehensive environmental hazard management.			✓	Oil spills are covered in SSG-68 and SSG-79 under Human Induced External Events.

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Country/Organization: Japan / NRA May, 2025			Page of Date:16,	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	2.1.	The hazards considered in this Safety Guide are grouped into meteorological hazards, hydrological hazards, and other natural hazards: see Sections 4–6, respectively. ...	In this draft, 'other hazards' is often used, as in para 2.1. This should be changed to 'other natural hazards' consistent with the document title. This should be reviewed throughout the document.	✓			All "other hazards" s and "other phenomena" s were changed to "other natural hazards" s and "other natural phenomena" s.
2.	2.2.	The hazards considered in this Safety Guide may simultaneously affect multiple structures, systems and components (SSCs) important to safety at a nuclear installation site (e.g. electrical power supply systems, decay heat removal systems, other vital systems), introducing the potential for common cause failure. ~~Defence in depth~~Multi protection (i.e. providing adequate diversity as well as redundancy and physical separation) is vital in design against common cause failure.	Wording.			✓	"Defense in depth" is a high-level IAEA safety requirement.
3.	2.24.	Probabilistic hazard assessment aims to combine the strengths of deterministic and statistical approaches. The probabilistic approach generally uses the same mechanistic models used in deterministic approaches but treats model structure and model parameters as epistemic uncertainties[7] represented by probability distributions or quantified by logic trees. ~~Sampling from each of these distributions provides realizations of the physical system.~~ Aleatory uncertainties[8] are also represented by probability distributions. Propagation of these uncertainties to quantify their contribution to the final results (e.g. hazard parameters) should be addressed. This is generally accomplished via a logic tree approach or two-staged nested Monte Carlo simulation approach. The logic tree approach represents the epistemic uncertainties using a set of branches for alternative models and parameter values, and the mean or percentile hazard curves (i.e., magnitude-	Besides the two-staged nested Monte Carlo simulation approach, another common approach, i.e., the logic tree approach, should be mentioned in this para. As mentioned in 5.71 and Annex II, the logic tree approach has been adopted for probabilistic tsunami hazard assessment in some member states. The logic tree approach has been widely applied for probabilistic seismic hazard analysis by member states and mentioned in SSG-9 (Rev. 1).	✓			The document has been revised in accordance with the comments.

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Country/Organization: Japan / NRA			Page of Date:16, May, 2025	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		frequency curves) can be calculated from a suite of hazard curves generated for the individual logic tree branches. In the Monte Carlo simulation approach, ~~where~~ the epistemic parameters are sampled in the outer loop…					
4.	3.4.	~~To the extent possible, d~~Data should include the location and date/time at which it was measured/acquired. Data should be presented clearly, using maps of an appropriate scale, graphs and tables. In general, ...	It seems mandatory to include this information from the viewpoint of data quality.	✓			The document has been revised in accordance with the comments.
5.	3.7.	Instrumental records and historical information should be supplemented with paleo-information, where available (e.g. geologic or dendrochronological information). For example, tree ring data can be used to extend temperature and precipitation records, and geologic evidence can be used to extend the useful record for riverine and coastal flooding. It should be noted that the absence of geological evidence for floods does not prove that there were no floods in the past.	Clarification.	✓			The document has been revised in accordance with the comments.
6.	3.29.	The tidal water level range should be determined for sites located in coastal areas affected by tides. The tidal range can vary greatly from place to place, and astronomical tides fluctuate on a time scale of hours to years. Tide predictions, as well as tide data obtained at coastal gauge stations in the site region should, where possible, be obtained from the national authorities. Data should cover a period that includes all the cyclical phenomena producing the tide (i.e. approximately 19 years).	Is it the common to consider the 19-year tidal cycle in hazard assessment for site evaluation? The basis for using the 19-year cycle as a criterion for hazard assessment should be presented. If any member states use the 19-year cycle as a criterion, it would be better to state this in a footnote as an example of some member states, along with the basis.			✓	The ~19-year tidal cycle is a function of the earth-moon-sun system that governs astronomical tides. This is not a reference to any particular member state regulation/criteria

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Country/Organization: Japan / NRA May, 2025			Page of Date:16,	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
7.	3.34.	Two different sets of geophysical and geological data should be considered with regards to tsunami, as follows: ~~(a) specific site geology; and (b) sources of the tsunami phenomena, if appropriate to the site. The specific geological data in the vicinity of the site that should be collected include the following:~~ (a) Specific site geology. The specific geological data in the vicinity of the site that should be collected include the following: ~~(a)~~(i) Stability and erodibility of streambanks and shorelines; ~~(b)~~(ii) Sediment characteristics that influence sediment transport, such as grain size distribution, density, and chemical composition, especially near the water intake structures of a nuclear installation; ~~(c)~~(iii) Hydrogeological characteristics such as permeability and porosity; ~~(d)~~(iv) The potential for landslides. (b) Sources of the tsunami phenomena, if appropriate to the site. Tsunamigenic sources include seismogenic structures, submarine and subaerial landslides and volcanic activity.	It is unclear what 'geophysical and geological data' refers to. This subsection (paras. 3.34-3.36) seems to be recommendations for collecting data on tsunami. Therefore, it should be made clear that these data are related to tsunami. Additionally, we suggest adjusting the bullet system to more clearly express the contents of these datasets.			✓	This section refers to geophysical and geological data that is used in all flood hazard assessments, not just tsunami.
8.	4.27.	Despite the availability of aircraft reconnaissance data accumulated over recent decades, certain pertinent tropical cyclones parameters might not be fully measured in each storm. Substantial changes in the inner core region in some mature cyclones have been noted to occur rapidly, and these changes should be considered.	The meaning of 'substantial changes' should be stated. In order to clarify the intent of this recommendation, it should be clearly indicated what changes have occurred and what should be taken into consideration.		✓		This text was from the 2011 version and was referring mainly to rapid intensification. The text has been modified to reference uncertainty in TC parameters, not specifically rapid intensification.

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Country/Organization: Japan / NRA May, 2025			Page of Date:16,	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
9.	4.36.	4.36. The annual frequency of exceedance at which a particular nuclear installation site will experience tornado wind speeds in excess of a specified value should be derived from a study of the tornado inventory. However, if there are not enough confirmed tornadoes to calculate the annual frequency of wind speeds exceeding the threshold, the maximum wind speed of the largest tornado in the vicinity of the site should be considered. A homogeneous region centred at the site should be considered for developing the tornado inventory. In addition, when determining the scope of a "homogeneous area", it is important to give due consideration to areas with meteorological conditions similar to those in which tornadoes occur in the vicinity of the site.	The largest tornado in the site's history should be considered if the annual exceedance frequency of tornado wind speeds cannot be calculated. When determining the scope of a "homogeneous area," it is important to give due consideration to areas with meteorological conditions similar to those in which tornadoes occur in the vicinity of the site.		✓		Clarification added with respect to homogeneous region. The text recommending use of the largest tornado in the site vicinity is not appropriate. The wider region needs to be considered to develop the tornado inventory since tornados at any site are rare events (see footnote).
10.	4.37.	The results of a hazard evaluation for tornadoes should be the annual frequency of exceedance at which a particular site will experience tornado wind speeds in excess of a specified value. In addition, consideration should be given to the most severe tornadoes that have occurred within a smaller area surrounding the site (e.g. within a 50 km radius). However, the area to be investigated for tornado occurrence should be based on the meteorological conditions of the location, without being limited to its shape and size.	Added a note that the study area for tornado occurrence need not be limited to shape and size.		✓		Revised the existing text for clarity but did not add proposed text.
11.	4.65.	If significant snowfall occurs in the region, an assessment should be made of the snowfall distribution. Remote sensing data taken after snowstorms at the site may be helpful ~~in this task~~ in	Clarification.			✓	Existing text is clear.

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No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		evaluating the accumulation of snow due to snowstorms. The variables that should be considered include precipitation rate and snow depth, packing density, and snow cover. Depending on the location of the nuclear installation site, maps depicting the estimated snow load may be available in building codes and standards.	The reason why remote sensing data are obtained after snowstorms seems unclear.				
12.	5.46.	(e) Several large waves could be observed; the first one might not be the largest. ~~A recession of the sea could be observed in general before the first wave and between each consecutive flooding.~~ A tsunami could cause inland inundation because its wavelength is so long that a huge mass of water follows behind the wave front. Propagation along the rivers towards inland is also common.	Could not be said to be in general.		✓		The term “in general” was changed to “in many cases”.
13.	5.48.	Earthquakes are the most frequent source of tsunamis. An earthquake induced tsunami is generated by a seafloor deformation associated with submarine and near-coast earthquakes with shallow depth (e.g. < 50 km), large magnitude (e.g. M > 6.5) and dip–slip mechanism.	Clarify the values as examples. The values are not internationally defined values but are considered to be examples of criteria.	✓			Proposed text added.
14.	5.53.	As an initial assessment, a simplified screening criterion should be applied (see Fig. 1). Using publicly available information (see para. 3.35), evidence of past occurrences of tsunamis should be reviewed for the site region. The evidence should be collected as far back in time as possible. For this purpose, the information collected should be organized and a list of tsunamis relevant to the nuclear installation site should	Clarify the values as examples. The values are not internationally defined values but		✓		The criteria of distance was changed to 20 km. Furthermore, the “or condition” between the

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No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		be prepared. No further investigations and studies need to be performed to analyse the tsunami hazard for the site provided that: (a) … (b) The site is located more than e.g. 10 km from the sea or ocean shoreline, or more than e.g. 1 km from a lake or fjord shoreline, as appropriate; or (c) The site is at more than e.g. 50 m elevation from the mean water level.	are considered to be examples of criteria.				distance and height was changed to "and condition". According to this modification, FIG.1 was also revised.
15.	5.66.	~~The collection of site specific long term data tends to reduce uncertainties. However, s~~Some of the data that are used indirectly in the evaluation of tsunami hazards might not be site specific; for example, the seismogenic data used to characterize the generation mechanism of distant sources. There may therefore be a part of the uncertainty that is irreducible with respect to site specific investigations.	It is difficult to say that observational data can reduce uncertainties. The interval between major tsunami is much longer than between small ones.	✓			Proposed deletion accepted.
16.	5.67. (b) (ii)	…… (b) …… (ii)Determine applicable seismic tsunami scenarios in accordance with the seismogenic sources identified in (~~ia~~);	Editorial.	✓			Accepted
17.	5.69.	Note that for megathrust earthquakes of Mw ~~98~~-class or greater, the tsunami should be numerically simulated using a non-uniform slip model.	We also consider that Mw8-class earthquake tsunami should be simulated using a non-uniform slip fault model.	✓			Proposed text added
18.	5.76.	Owing to the small size of a source in comparison with that for an earthquake induced tsunami, the impacts of a landslide induced tsunami are generally limited around the source ~~and~~ , but sometimes they are ~~generally not~~ observed at more than several tens of kilometres from the source. The impact of a landslide tsunami around the source will depend mainly on the slope gradient map of the bathymetric data near the coast and bathymetric data e.g. up to the continental shelf is	This could lead to an underestimation of far fields tsunamis(e.g. massive landslides: 5.52). 5.74 states that "e.g. slope gradient map of bathymetric data, material	✓			Proposed edits adopted.

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Country/Organization: Japan / NRA May, 2025			Page of Date:16,	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		necessary to take into account the landslide sources. If the landslide source is near the coast, then the tsunami effect is more prominent; if the source is in the ocean and far from the coast then its height at the coast may be negligible. Therefore, the landslide source size and location should be taken into account.	characteristics and other available data". In some cases, the continental shelf is not well developed.				
19.	5.91.	If active drainage systems are necessary to provide adequate flood protection, ~~defence in depth~~Multi protection should be ensured through the implementation of appropriate preventive and mitigating measures to be incorporated into the design and operation of the drainage system.	Wording.			✓	"Defense in depth" is a high-level IAEA safety requirement.
20.	6.4.	The likelihood of fire ignition and propagation to the site should be assessed. Factors such as weather conditions, forested areas close to the site (i.e. within typically 10–30 km), historical fire patterns and the most probable wind direction should be considered.	Clarify the values as examples. The values are considered to be comprehensive examples of criteria in Member States.		✓		Added "typically" and deleted "i.e."
21.	6.28.-6.31.	6.30. ~~To~~ If it is necessary to evaluate the hazard to a nuclear installation from a meteorite impact, a spectrum of meteoroids at the top of the atmosphere — ranging at least from several centimetres in diameter to several tens of metres —with a range of impact velocities and impact angles at the top of the atmosphere should be considered. 6.31. For meteorites hitting the earth's surface with most of their initial velocity, several other impacts on the nuclear installation site (i.e. in addition to a direct hit on SSCs) are possible and should be	Meteoroids and meteorites are very low frequency events. In some member states, there are no regulatory requirements for hazard evaluation of these events. Should all of the recommendations in this subsection be carried out in site evaluation? At least paras 6.30 and 6.31 seem to be		✓		Added "In some member states, there are no regulatory requirements for hazard evaluation of these events." To the footnote in para 6.28. Added proposed edits to para 6.30 and 6.31.

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Country/Organization: Japan / NRA May, 2025			Page of Date:16,	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		evaluated, if necessary. Meteorites with most of their initial velocity create craters with depths and diameters commensurate with the impact energy on the earth's surface. These impacts produce ejecta, pressure waves, heat blasts, vibratory ground motions and — if they impact on large water bodies — tsunami-like phenomena all of which may hit a nuclear installation even if the impact point is far away from the nuclear installation site. The potential impacts should be considered in the hazard evaluation.	recommendations to be carried out if the hazard level exceeds a certain threshold.				
22.	8.5.	In some cases, protection can be achieved by a combination of the two approaches outlined in para. 8.4. For both approaches, ~~a defence in depth~~ multi protection strategy should be adopted.	Wording.			✓	"Defense in depth" is a high-level IAEA safety requirement.
23.	8.9.	Nuclear installation sites should implement various practical safety measures to protect from wildfire. Common precautions include: (a) Vegetation should be maintained to be ~~and~~ cleared for an appropriate distance surrounding the installation to reduce the potential impact of wildfires spreading to the facility. This can be achieved through vegetation management practices.	The relationship between "maintained" and "cleared" seems unclear.		✓		Changed "maintained" to "managed"
24.	11.6.	In the radiological hazard categorization approach a graded approach is typically applied on the basis of the consequences of an uncontrolled, unmitigated radioactive release from the nuclear installation	It seems better to use the same wording as Table 1.	✓			Proposed edit adopted.

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Country/Organization: Japan / NRA			Page of Date:16, May, 2025	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		(some applications of the approach may consider mitigation; see para 11.11). Four radiological hazard categories, based on the consequences of unmitigated releases, are defined in Table 1. Categories range, from 'high', which corresponds to large nuclear power plants, to 'conventional', which corresponds to industrial facilities that have no or negligible radiological consequences ~~negligible or no radiological hazard~~.					
25.	ANNEX I JAPAN I-5.	Table I–4 provides examples of ~~criteria used in Japan for defining~~ the design basis parameters for a given meteorological variable for existing nuclear power plants in Japan. These meteorological design basis parameters correspond to single load cases that are associated in design codes with different load combinations and different load factors for designing SSCs. Reference [I–5] defines criteria for Tornadoes design basis parameters. TABLE I-4. EXAMPLES OF THE DESIGN BASIS PARAMETERS~~JAPANESE CRITERIA~~ FOR CHARACTERIZING METEOROLOGICAL AND HYDROLOGICAL VARIABLES AS TAKEN FROM THE PRACTICE IN JAPAN	Table I-4 is not criteria. It should be changed to the appropriate title~~.~~	✓			Proposed edits adopted
26.	ANNEX II–6	Based on the seismological, geological, and geophysical background and field survey data for past tsunamis (paleo and historical tsunamis), the	Editorial.	✓			Proposed edits adopted.

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Country/Organization: Japan / NRA			Page of Date:16, May, 2025	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		following events and their combinations need to be considered as tsunami sources: (a)Inter-plate earthquakes; (b)Intra-plate earthquakes in oceanic(subducting) plate; (c)Offshore ~~active faults~~ crustal earthquakes; (d)Submarine and subaerial landslides; (e)Volcanic phenomena (e.g. eruptions, mountain collapses, caldera collapse)					
27.	ANNEX II–11	The first step in the second part of the process is to select the potential zones in which earthquake, submarine and subaerial landslides, and volcanic phenomena induced tsunamis can occur. Generally, the effects of near field tsunamis are greater than those of far field tsunamis. The latter cannot be neglected, however, because the effects depend on geographical conditions and directional relations to the tsunami source. In Japan, major source areas are at tectonic plate boundaries ~~(the Kurile trench, the Japan trench and the Nankai trough), the eastern margin of the Sea of Japan (East Sea)67~~ and Offshore active ~~submarine~~ faults around the Japanese archipelago for near field tsunamis, and off the west coast of South America for far field tsunamis.	Editorial.	✓			Proposed edits adopted.

COMMENTS BY REVIEWER Reviewer: Japan NUSSC member Country/Organization: Japan / NRA			Page of Date:16, May, 2025	RESOLUTION			
No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
28.	ANNEX II–16	For verification of the design basis tsunami, the two conditions of para. II–22~~18~~ need to be confirmed. The concept of verification is shown in the lower part of Fig. II–2.	Editorial.	✓			Proposed edit adopted.

COMMENTS BY REVIEWER Reviewer: Poke Mashita Page 1 of 1 Country/Organization: National Nuclear Regulator, South Africa Date: 19.05.2025				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.		No comment	Draft is consistent with the DPP. Objectives and scope are addressed properly, etc.	✓			Thank you!

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC			Date: May 18, 2025				
Comment No.	Para/ Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Page 6 Hydrological Hazards 2.7	Include “Combined events”	There is mention of combined events flooding on page 81. However, it is important to state in the list the potential combined events flooding effect from two different floods causing mechanisms. NRC NUREG/CR-7046 provides additional information. Combined events could include coastal and non-coastal flooding, or dam breach and flooding in streams and rivers, etc.	✓			Added (h) Credible combined events.
2	Page 6 Hydrological Hazards 2.7 (g)	Backwater effects due to impoundments	It’s unclear how backwater effects are being considered as a phenomenon beyond what would normally be included in riverine flooding analysis. Recommend deletion or further clarity. ”		✓		Section on impounding (paras 5.165-5.168) discusses scenarios other than the usual backwater effects in the riverine flooding analysis. Modified (g) to read “(g) Backwater effects due to downstream blockages or impoundments”

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC			Date: May 18, 2025				
Comment No.	Para/ Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
3	Page 6	There is no mention of surface water – groundwater interaction. This is important because the hydrologic process is comprised of the interaction between surface water and groundwater. The analysis of accidental or operational release of radioactive liquid effluents is governed by transport mechanisms that span across surface water and groundwater depending on where the source term is located.	Include a discussion on the interaction between surface water and groundwater with a focus on the accidental and operational release of radioactive liquid effluents.			✓	This comment seems to refer to the impact of the installation on the surrounding environment. This topic is address in NS-G-3.2 "Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants"
4	Page 49	Tsunami analysis flowchart (Figure 1)	The distance of >10 km might need to be revisited because mega-tsunamis could potentially travel 20 km or more. Some language that either use "and" instead of "or" with some descriptive language to tsunamigenic sources might be worth considering.	✓			These criteria depend on regions, as commented by the reviewer. And, it is inappropriate to apply the criteria alone, because damage was occurred up to 12 km from the shoreline when the 2011 Tohoku earthquake.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC			Date: May 18, 2025				
Comment No.	Para/ Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
							So, 10 km from the shoreline was changed to 20 km from the shoreline. Furthremore, "or condition" was applied to between the conditions on the distance from the sea or lake and those on the height were connected by but it was changed to "and condition".
5	Page 56	Local intense precipitation flooding. Consider storm maximization recommendations to address temporal and spatial variations.	One example would be consideration of different precipitation loading scenarios (such as front, middle, and back) during the development of flood simulation model.	✓			Added “Different precipitation temporal distributions (such as front-loaded, middle-loaded, and back-loaded) should be considered.” To para 5.90.
6	Page 96	The graded approach recommended will be based on radiological hazard categorization or risk-informed approach. Is there a dose based quantitative measure that will be used to enhance the qualitative description provided in Table 1?	Consider including a dose based and proximity-based criteria to enhance the discussion			✓	Individual Member State regulations provide dose-based quantitative criteria. These are beyond the scope of this guide.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC			Date: May 18, 2025				
Comment No.	Para/ Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		Also, is there consideration for multi-unit sites or sites that are in very close proximity to an existing nuclear facility?					Everything in this section applies to both single-unit and multi-unit sites.

DS 541 – Assessment of Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations
Comments Resolution Table – WASSC
Step 7

COMMENTS BY REVIEWER Reviewer: WASSC Member Page 1 of 1 Country/Organization: Republic of Korea (ROK)/Korea Institute of Nuclear Safety (KINS) Date: May 16, 2025				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Page 82/ Para 7.4 Line 6	The following is suggested. (before) ~~~ off-site resources used in the response to site emergencies. (after) ~~~ off-site resources used in the emergency preparedness and response.	o In my opinion, the term of site emergencies could be ambiguous. So, it should be replaced with it based on the IAEA glossary.	✓			The revision was made according to the comments.