

## Form for Comments

### *Investigation of Site Characteristics and Evaluation of Radiation Risks to Public and Environment in Site Evaluation of Nuclear Installations (DS529)*

#### General Comments

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: ENISS		Page 1 of 7		ENISS			
Country/Organization: ENISS		Date: May 2024					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General comment	The document deals with exposure in normal operation and in accident situations, sometimes in the same paragraphs. It is not always clear to understand what type of exposure is considered, this has to be clearly indicated in each case. It is felt important to consider this general comment so that an efficient guidance is provided to Member States.		x			Document has been revised where appropriate.

**Remaining**

COMMENTS BY REVIEWER				RESOLUTION			
Country/Organization: FRANCE		Date: 6 Oct 2023					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	General	There would be benefit in refining the detailed structure of the draft guidance to enhance the similarities and differences mentioned when considering normal operation and when considering accident conditions	The similarities and differences between works to be performed for normal operation, accidental situations for safety case and emergency preparedness. This would be still consistent with the DDP	x			Document has been revised where appropriate.

### Comments on Section 1

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dr. M. Moinul Islam, Director, Physical Science Division		Page. 1 of. 2					
Country/Organization: Bangladesh Atomic Energy Commission		Date: 15 Feb 2024					
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Para 1.4, Line 5, Page: 3	In new text example of 'other nuclear installation' may be included	To have an idea of 'other nuclear installation'			x	In para. 1.13, for the other nuclear installation, reference is made to IAEA Safety Glossary.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer:		Page.... of....					
Country/Organization: FINLAND / STUK		Date: 4.4.2023					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified	Rejected	Reason for modification/rejection

					as follows		
1	Introduction		Would be good to explain the level / relations of GSR, SSR, NS, etc.	x			This is a normal format for IAEA safety Standards. At the beginning of the safety standards, it is presented. It will be added before publication.
2	Introduction		NS-G-3.2 has special importance and possibly differences for SMRs, if separate site licence will be available.	x			This publication covers all nuclear installations including SMRs. There is a section on how to use given recommendations for different installations.
3	Introduction		Possible relation of NS-G-3.2 to EPZ sizing?	x			Text is added to Scope.

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Pages: 50 Country/Organization: <b>Germany</b> Date: 08.04.2024								
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	1.	1.2  New footnote	This Safety Guide takes into account progress in the investigation of site characteristics and assessment of the radiological environmental impact of nuclear installations, as well as in regulatory practices in Member States, considering lessons	Wording “accidental release” is not explained in IAEA Glossary.  We suggest to add a footnote with definition.	x			

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Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Pages: 50 Country/Organization: <b>Germany</b> Date: 08.04.2024								
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			identified from discharges <sup>1</sup> and accidental releases <sup>footnote</sup> at nuclear installations, feedback from safety review missions and the results of recent research in this area.  <u>Footnote: “accidental release” in this Safety Guide is understood as “radioactive release from a nuclear accident”</u>	Alternative – change to “accident conditions”.				
2	2.	1.7 Line 6	... The recommendations are <u>discussed</u> appropriately <u>their</u> application in consideration of its characteristics of the site.	This sentence is not clear enough, can you please check the meaning? We made a suggestion.		x		Sentence is deleted.
2	3.	1.7-1.8	<del>1.7. This Safety Guide provides recommendations on the development of the site evaluation report for a nuclear installation. It also provides recommendations on the development of the radiological impact assessment, which is part of the environmental impact assessment report, and relevant sections of the safety analysis report. The recommendations are applicable to the site evaluation process and other assessments performed during the lifetime of a nuclear installation (e.g. periodic safety review) or following a change in</del>	We suggest to change the order of paras 1.7 and 1.8 in the text to stick to the logical sequence of para 1.5, namely: 1) investigation of site characteristics; 2) evaluation of radiation risks; 3) specific recommendations on radiological environmental impact assessment.	x			

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Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<p><del>the site characteristics. The recommendations are appropriately applied in consideration of its characteristics of the site.</del></p> <p>1.8. <u>1.7.</u> This Safety Guide provides recommendations on how to assess the radiological environmental impact of a new or existing nuclear installation on people and the environment due to discharges and accidental releases. It covers the investigation of site characteristics, including population distribution, uses of land and water in the region, background levels of radioactivity in the environmental media, and meteorological, hydrological and hydrogeological characteristics of the region.</p> <p><u>1.8. This Safety Guide provides recommendations on the development of the site evaluation report for a nuclear installation. It also provides recommendations on the development of the radiological impact assessment, which is part of the environmental impact assessment report, and relevant sections of the safety</u></p>					

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Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<u>analysis report. The recommendations are applicable to the site evaluation process and other assessments performed during the lifetime of a nuclear installation (e.g. periodic safety review) or following a change in the site characteristics. The recommendations are appropriately applied in consideration of its characteristics of the site.</u>					
2	4.	1.12	Environmental impacts of alternatives <del>actions</del> , that need to be considered as part of the environmental impact assessment, are not subject of this Safety Guide. The conditions at the site and in the vicinity could change over time (e.g. population size and distribution) and this needs to be assessed; however, this Safety Guide covers <del>existing</del> <b>present</b> conditions(e.g. current nuclear facilities on the site) as part of the assessment of environmental impacts from the proposed actions.	Clarification	x			
1	5.	1.12A New para	<u>In addition to site characteristics, investigated in this Safety Guide, there are other site characteristics</u>	This statement is very important and should be mentioned on the very	x			

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Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<u>considered in the site evaluation for a nuclear installation. They relate to natural external hazards and include seismicity, slope instability, subsidence, soil liquefaction, volcanism, flooding, and extreme meteorological events (e.g. high winds, tornados, storms, precipitation), as well as to human-induced events such as potential incidents in other nuclear or non-nuclear facilities and in land, water and air transference corridors in the vicinity of the site. They also affect the radiological impacts of nuclear installations either by altering the source terms (the quantities, physical and chemical form, and timing of radionuclides released to the environment during an accident) or by changing the frequency of potential accident scenarios. These characteristics are covered in more detail in SSG-18 [15], and IAEA Safety Standards Series Nos SSG-9 (Rev.1), Seismic Hazards in Site Evaluation for Nuclear Installations [18], SSG-21, Volcanic Hazards in Site Evaluation for Nuclear Installations [19], NS-G-3.6,</u>	beginning of this Safety Guide, not in para. 7.2, as it is done now. Please remove and reformulate accordingly.				

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Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<a href="#">Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants [20] and SSG-79, Hazards Associated with Human Induced External Events in Site Evaluation for Nuclear Installations [21].</a>					
1	6.	1.14	The assessment of radiological environmental impacts due to <del>sabotage of</del> <b>malicious acts</b> on nuclear installations are outside the scope of this Safety Guide, although some of the recommendations provided might also be consistent with the needs of nuclear security.	There could be more reasons beyond sabotage could be not the only reason, please check if the more general term “malicious act” is more suitable here, as nuclear security “denotes the prevention and detection of, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities”.	x			
1	7.	1.15 Line 17	... The Appendix <del>Annex</del> provides an example of <del>applying a graded approach to the</del> <b>determining the most appropriate level of complexity for</b> modelling radionuclide transfer in groundwater.	1) Please change to "Annex", as an example should not be an official part of Safety Guide, an Appendix is an official one. 2) The term “graded approach” is used for a		x		1) Appendix presents a methodology for application of a graded approach to the modelling of radionuclide



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Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
				<p>system of control, such as a regulatory system or a safety system, a process or method in which the stringency of the control measures and conditions to be applied is commensurate, to the extent practicable, with the likelihood and possible consequences of, and the level of risk associated with, a loss of control (GRS-Part 3). Hence the application of the term “graded approach” to modelling is misleading. Please change it here and all over the text.</p> <p>3) The categorization of sites, presented in this Annex, is not an official IAEA categorisation, this should be communicated clear enough.</p>				<p>transfer in groundwater. Text amended to clarify; Appendix is not an example.</p> <p>2) IAEA Safety and Security glossary also states “The use of a graded approach is intended to ensure that the <b>necessary levels of analysis</b>, documentation and actions are commensurate with, for example, the magnitudes of any radiological hazards and non-radiological hazards, the nature and the particular characteristics of a facility, and the</p>



1.	1.1/ Para 1-2	<p>Text may merged as following</p> <p>1.1. IAEA Safety Standards Series No. SSR-1, Site Evaluation for Nuclear Installations [1] establishes requirements for;</p> <p>(a) Defining the information to be used in the site evaluation process;</p> <p>(b) Evaluating a site such that the site specific hazards and the safety related site characteristics are adequately taken into account, in order to derive appropriate site specific design parameters;</p> <p>(c) Analysing the characteristics of the population and the region surrounding the site to determine whether there would be significant difficulties in implementing emergency response actions effectively.</p> <p>(d) <b><u>Potential effects of a nuclear installation on people and the environment to be considered in site evaluation and requirement on the investigation of site characteristics and assessment of the radiological environmental impact of nuclear installation. IAEA safety standard series No SSR-3</u></b></p>	<p>Improvement in text</p> <p>In para 1.1, 2<sup>nd</sup> paragraph may be merged together by introducing para (d) in text</p>	x		<p>Text is modified. This publication mainly supports SSR-1.</p>
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COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Country/Organization: Russia / Date: State Atomic Energy Corporation "Rosatom" Rostechnadzor / SEC NRS				Page:			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
6	1.13	Thus recommendations provided in this Safety Guide are applicable to all types of nuclear installation as defined in the IAEA Nuclear Safety and Security Glossary [6] with the exception of transportable NPPS [x]. IAEA INTERNATIONAL ATOMIC ENERGY AGENCY Applicability of IAEA safety standards to non-water cooled reactor and small modular reactors, Safety Reports Series No. 123, IAEA, Vienna (2023).	Para. 1.5 of DS529 states that the main objective of DS529 is to provide recommendations on the investigation of site characteristics and the evaluation of radiation risks to the public and the environment in site evaluation for nuclear installations in order to meet the applicable safety requirements established in SSR-1, at the same time Appendix II of SRS No. 123 states that the provisions of SSR-1		x		Text is revised.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC				Date: 04/26/2024			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Page 3	Recommend the addition of a new section to the Table of Contents reflecting a	The scope of the revised Safety Guide is intended to cover the investigation of site			x	Section 7 presents summary of

		summary of the site characteristics that form the basis for the radiological assessment.	characteristics including population distribution, uses of land and water, etc. in the region of the nuclear power plant site as well as an evaluation of potential radiation risks. However, there is nothing in the proposed Table of Contents describing/summarizing those site characteristics that later form the basis for the radiation risk assessment.				site characteristics for the radiation risk assessment.
5	1.3	(d) <del>Full-spectrum-Developing a complete set</del> of potential release scenarios;	Given the list the item provided is out of place from a sentence structure standpoint.	x			
6	1.11	Although an environmental impact assessment covers potential radiological and non-radiological impacts, the latter are out of the scope of this Safety Guide. Nevertheless, attention should be paid to ensure the non-radiological impact assessment is <del>performed in a consistent way</del> with the radiological impact assessment in terms of <del>estimating the transfer in the environment and defining the representative person.</del>	Improve readability.	x			
7	1.15	The first period should be a comma.	Editorial comment	x			

## Comments on Section 2

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dr. A.F.M. Mizanur Rahman Country/Organization: Bangladesh Atomic Energy Commission			Page.... of..... Date:				
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Page - 16 Para -2.32 Line no. 3	It was mentioned in the text "2.32. The components of radiological environmental impact assessment for protection of the public and of non-human species in normal operation, and for consideration of potential exposure are shown in Fig. 2 and 3 of GSG-10 [8]."  Fig. 2. and 3 of GSG-10 could be added in this text also.	Everywhere in this text reference with quotation was used but here only reference 'Fig. 2 and 3 of GSG-10' was given but without figure. To see the figures only you have to open GSR-10 that is why both figures could be given here for better understanding.			x	Figure cannot be reproduced in this publication due to IAEA style.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dr. M. Moinul Islam, Director, Physical Science Division Country/Organization: Bangladesh Atomic Energy Commission			Page. 1 of. 2 Date: 15 Feb 2024				
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	Para: 2.10 Line 2, Page: 5	In new text example of 'other pathways' may be included	To have an idea regarding other pathways'			x	In para. 2.13, "other pathways" is used because we do not want to preclude existence of other pathways. It would be for the analyst to determine if there are any other pathways and what they might

							be.
3	Para: 2.36, Page: 10	In new text may include example of 'climate change affect' in this para	To have an idea of 'climate change affect'		x		Para 2.40 has been expanded compared to the one you have looked at. Changes would involve any of the parameters being monitored.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Canadian Nuclear Safety Commission Country/Organization: Canada			Page 1 of 18 Date: April 30, 2024				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	2.14 Line 8	“However, if the conditional probability of a consequence is determined entirely with a <del>certain</del> <u>reasonable</u> level of confidence <u>that is considered acceptable to the regulatory authorities</u> , and it still does not make a significant contribution to the overall risk, then detailed analysis of the consequence may not be needed.”	Ref. [9] clause 17 states that: <i>“Conditional probabilities must be used with care, since they can be manipulated and combined only if the conditions applying to them remain unchanged”</i>  The text here suggest that certain confidence level can be used to judge the conditional probability; however, the word “certain” is broad and can imply the selection of any value. A more robust criterion is needed. The confidence level for conditional probability, if it is used, needs to be reasonable and acceptable to the regulatory authorities.	x			

2.	2.18 Line 8	<p>“Direct discharge to groundwater is unlikely to be authorized or permitted. However, radionuclides might enter groundwater indirectly, for example through the exchange with river water in which discharges are allowed or via an atmospheric release and subsequent deposition on the ground.”</p>	<p><b>Comment:</b></p> <ul style="list-style-type: none"> <li>• NPP rod bays where spent fuel is stored can develop leaks over time resulting in discharge to soil then groundwater.</li> <li>• Makes specific reference to groundwater, but not soil or surface water <ul style="list-style-type: none"> <li>o Section is also on atmospheric releases, so reason for mention of "direct discharge to groundwater" is not clear (e.g., there are direct discharges to surface water, but these aren't mentioned, nor should they be in this section)</li> <li>o Direct discharges are also unlikely to ground surface, but can be to surface water</li> </ul> </li> </ul>	x			Text is revised.
3.	2.19	<p>“The significant exposure pathways from atmospheric releases can also be identified through monitoring of the environment (see Section 8). Ideally, this monitoring should be performed over an extended period of time so that any periodic (e.g. seasonal) or long term trends can be observed; this will depend on local site conditions.”</p>	<p><b>Comment:</b></p> <p>Monitoring should be expected to continue from construction to decommissioning. If this is not the case in some situations, please specify or provide examples.</p>	x			Text is revised.



4.	2.27	<p>“Resuspension of deposited radionuclides which are then inhaled leads to a longer term impact to the public, but given that only a small fraction of the plume is deposited and then resuspended, the impact on any individual is insignificant in comparison with direct inhalation. For those people who do not inhale the plume directly during an accidental release, resuspension should be considered as a possibly significant pathway.”</p>	<p><b>Comment:</b> Should also include uptake and accumulation of I-131 in plants and resulting dose to animals/humans as a possible significant pathway in the weeks following an accident.</p>			x	<p>The comment is covered in the previous paragraph where ingestion is mentioned.</p>
5.	2.30 Line 2	<p>“Discharges to groundwater are unlikely to be permitted or authorized, as explained in para <del>2.16</del> <u>2.18</u>, although there might be indirect pathways through the exchange with river water in which discharges are allowed or via atmospheric releases and then rainfall.”</p>	<p>Wrong paragraph referenced.</p>	x			<p>Addressed. Text is now deleted in response to your comment 2 above.</p>
6.	2.31 Line 1	<p>“As with releases to groundwater (see paras <del>2.16</del> <u>2.18</u> and 2.30), planned direct discharges to the ground surface are unlikely to be permitted or authorized.”</p>	<p>Wrong paragraph referenced.</p>	x			<p>Addressed as above.</p>

7.	2.33 Line 14	<p>“For other types of nuclear installation, a similar or simplified approach may be adopted depending on the type and complexity of the installation. <u>To the best extent possible, in light of the available data, several source terms should be selected corresponding to the different reactor states (normal operation, anticipated operational occurrences to severe accidents) and considering the number of the operating units to fully capture the environmental impact for normal and accident conditions (see paras 4.8 to 4.10).</u> Further recommendations on selecting the source term(s) are provided...”</p>	Suggest adding text for consistency with the intent of paragraphs 4.8 and 4.10.	x			
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8.	2.37		<p><b>Comment:</b>  Screening assessments (i.e., discharges below limits, or measured media concentrations below environmental guidelines) are conducted to determine which potential contaminants require a more detailed exposure assessment (i.e., pathways modelling). This is the method used in ERAs / EIAs to identify potentially significant pathways and focus efforts. It is also not clear in this section whether assessment is for an existing or proposed nuclear facility.</p>		x		<p>There is no proposal for some revised text.  Text amended to address last sentence.</p>
9.	2.39 Line 1	“ <u>C</u> umulative impacts from new and existing installations should also be considered.”	The term “cumulative impacts” should be defined.	x			

10.	2.40 Line 3	“Due to <u>the long-term trends associated with dynamic nature of the climate change, the environmental impact assessment and the associated monitoring plans should be periodically reviewed and updated to reflect any for-continuous monitoring of the changes that are identified, in the conditions,- identifying significant changes, and to take any updating the assessment, and taking necessary actions should be made to reduce potential impacts to the environment</u> ”	Clarification.	x			
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COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Country/Organization: STUK Date: 4.4.2023		FINLAND /		Page.... of....			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
4	2.14		Would be good to define risk (consequence / dose / frequency / probability).	x			Text added
5	2.17, 4.15		Note: The IAEA Safety Glossary has a simpler definition of ‘source term’. However, the parameter list of NS-G-3.2 is better as it is now.	x			Noted
6	2.26		Would be good to elaborate ‘aggregate very low doses over large numbers of people’. Where is the limit; whole globe affected?	x			References to ICRP and UNSCEAR added but they don’t give limits so not possible to do so here.

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Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	8.	2.10	In addition, there may be exposure due to <del>activity</del> <u>irradiation</u> directly deposited on skin or clothing <u>of contaminated people from the site/its vicinity</u> and direct exposure from <del>activity</del> <u>irradiation</u> on the site ( <del>i.e. direct exposure to gamma radiation,</del> see the additional exposure pathways described in para. 5.29 of GSG-10 [8])) without any activity having been released <u>from the facility</u> . As these would also be expected pathways for accidental releases, their relative importance is much higher during such situations.	Clarification		x		
2	9.	2.11	The first step in evaluating <u>radiation risks of</u> a site for a nuclear installation should be to identify all possible exposure pathways and then determine <del>the most</del> significant ones in terms of exposure of the public or the environment	Clarification.  Additionally, please put in line with paras 2.12 - 2.13, as the difference between “all significant”, “most significant” and “significant” is not transparent and not clear enough.	x			
2	10.	2.13	Although the exposure pathways listed in para 2.9 are usually the most significant, there might be other pathways. It should therefore be confirmed that all significant pathways have been identified, especially if there are specific characteristics about the reactor/ <u>facility</u> design, its operation,	The document is intended to be relevant for various nuclear installations. A rewording or extension is required.		x		

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Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			the site, land use around the site, farming practices or the surrounding location. For example, the presence of desalination plants producing water (either at or close to the discharge outlets) for drinking or irrigation might give rise to exposure pathway					
1	11.	2.15	Once the significant exposure pathways have been identified, the local environment should be characterized sufficiently to allow exposure from the <u>identified significant</u> pathways listed in para. 2.9 to be calculated with an appropriate level of detail. The detail and level of characterization should be commensurate with the importance of the pathway for the particular scenario being modelled. In accordance with para. 4.1 of SSR-1 [1], a graded approach, <u>commensurate with the radiation risk posed to people and the environment</u> , is required to be applied for this purpose (see also Section 10).	1) not the list in 2.9, but the identified significant pathways  2) please put in line with SSR-1	x			
1	12.	2.16	During normal operation <u>and anticipated operational occurrences</u> , there are <del>usually</del> <u>typically</u> authorized and regulated effluent discharges to the atmosphere and surface water. In <del>accidental releases</del> <u>accident conditions</u> , there might also be <u>additionally</u> direct releases to groundwater or to the ground surface. The initial release into	The first part of this para is not only applicable to normal operation but also to other operational states, meaning AOOs.  For the wording of accidental releases, see comment on para 1.2, as		x		Para. 2.16 is revised. AOOs are usually considered with accidental releases, not normal operation.

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Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			each of these media and the resulting important exposure pathways are discussed in paras 2.44 <del>17</del> – 2.31.	“accidental release” is not explained in IAEA Glossary.				
2	13.	2.17	<p>The pathways that are significant depend on the nature of the atmospheric release, including the source term, location and medium <del>into</del> <u>through</u> which the release is made. Recommendations on the determination of the source term for releases to the environment for anticipated operational occurrences and accident conditions are provided in IAEA Safety Standards <u>Series</u> No. SSG-2 (Rev. 1), Deterministic Safety Analysis for Nuclear Power Plants [10]. The source term defines the quantities and physical, isotopic and chemical forms of the radionuclides released, the time profile of the release, and other factors that affect its subsequent transfer and behaviour in the environment (e.g. physical stack height, energy associated with the atmospheric release).</p>	<p>Medium might be understood as an atmosphere, as this term is used in this meaning within this Safety Guide.</p> <p>We assume, that medium can be chimney, steam, gas etc. Plume rise is also important.</p> <p>Can you perhaps select another word for “medium” for this case?</p> <p>We made a suggestion for rewording.</p>		x		
1	14.	2.18	<p>For discharges under normal operation <u>and anticipated operational occurrences</u>, the measures taken to mitigate the atmospheric release, to control the discharge and to ensure that exposures are as low as reasonably achievable, <u>economic and social factors being taken into account</u></p>	<p>Actually GSG-9 is quoting GSR Part 3 here, this statement is not originating from GSG-9, please check</p>		x		Text is revised. See our response to your comment 12.

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<p><u>(ALARA)</u> (see <i>IAEA Safety Standards Series No. GSG-9, Regulatory Control of Radioactive Discharges to the Environment [11]</i>) <u>and in compliance with regulatory and operational limits</u> tend to focus on nuclides and pathways that are radiologically significant. For this reason, some less obvious radionuclides (e.g. radionuclides radiocarbon (14C) and tritium (3H)), which can be difficult to remove) and those that might accumulate in the environment during the lifetime of the installation and/or less obvious pathways might become more significant. Direct discharge to groundwater <u>should not</u> <del>is unlikely</del> to be authorized or permitted. However, radionuclides might enter groundwater indirectly, for example through the exchange with river water <del>in</del> <u>to</u> which discharges are <del>allowed</del> <u>authorized</u> or via an atmospheric release and subsequent deposition on the ground <u>(for accidental conditions see para. 2.30)</u>.</p>					
2	15.	2.20	Discharges from nuclear installations are expected to continue throughout the lifetime of nuclear installations, from construction to decommissioning, and therefore accumulation of activity in the environment over this period should be considered for <i>longer lived nuclides</i> .	Which nuclides should be considered, what exactly is meant by "longer lived nuclides"?	x			



COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	16.	2.21	The radionuclides radiocarbon (14C) and tritium (3H) can be particularly difficult to model in the environment because, whatever chemical form they are released as, they can soon be incorporated into CO2 or water, respectively, or be incorporated in organic molecules in environmental media and become part of the food chain, <u>contributing this way to collective dose</u> . Further guidance on the <u>estimating use</u> of collective dose is provided by GSG-9 [11].	The indirect contribution to the collective dose is of importance for 14C and 3H and should be mentioned here.		x		
3	17.	2.22 Line 2	... The most common scenario is an accidental atmospheric release, <u>which is</u> usually making direct inhalation of the plume <u>to</u> the most significant pathway in the short term, because this is a direct route of ...	Editorial		x		
1	18.	2.23	Other pathways that can lead to exposure <u>in accident conditions</u> are ground shine (radiation from activity deposited on the ground), sky shine (radiation deflected by the air) and cloud shine (radiation from activity in an airborne plume). These pathways are usually less significant than direct inhalation for members of the public <u>under normal operating conditions</u> .	Is this para about operational states (discharges) or about accident atmospheric release? Please clarify, otherwise misleading.		x		
3	19.	2.26 Line 9	... Ingestion of forest food might be less amenable to control, but its impact is usually limited to areas close to the original contamination. Ingestion <u>of</u>	Editorial	x			

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<u>this type</u> can be a significant contributor to the individual risk of exposure for any one exposed <u>and</u> hence to societal risk (e.g. the total number of fatalities in the exposed population); however care should be taken not to aggregate very low doses over large numbers of people.					
2	20.	2.27	Resuspension of deposited radionuclides which are then inhaled leads to a longer term impact to the public, but given that only a small fraction of the plume is deposited and then resuspended, the impact on any individual is <u>negligible compared to insignificant in comparison with</u> direct inhalation. For those people who do not inhale the plume directly during an accidental release, resuspension should be considered as a possibly significant pathway.	"Negligible" is more accurate as it implies that the impact is too small to be significant.		x		
1	21.	2.28	For discharges, the <del>relative impact of aquatic pathways compared with terrestrial pathways</del> depends on the respective quantities discharged and the radiological significance of the nuclides involved. For accidental releases <del>to surface water</del> , the shielding provided by the water, the lower likelihood of anybody being directly exposed in comparison with an atmospheric release, and the greater dispersion (especially for releases to	The statements comparing the "aquatic" and "terrestrial" dispersion pathways is not correct and cannot be accepted		x		

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			the sea) usually means that aquatic pathways are less significant than terrestrial pathways. <del>These factors should be taken into account in determining the relative significance of surface water pathways.</del>					
1	22.	2.30	Discharges to groundwater <u>should not</u> <del>are unlikely to</del> be permitted or authorized, as <del>explained in para 2.16,</del> although there might be indirect pathways through the exchange with river water <del>in</del> <u>to</u> which discharges are allowed or via <u>authorized</u> atmospheric releases and then rainfall, <u>as explained in para 2.16.</u> Accidental releases to groundwater <del>could</del> <u>might</u> occur, for example as a result of spillage of radioactive waste or core melt through the basemat <u>for old-generation NPPs or through accident atmospheric release.</u> Unlike direct releases to the atmosphere, which lead to immediate exposure, activity released to groundwater might be transferred through the groundwater for many years before it reaches a location where exposure of the public could occur. During this time, short lived radionuclides decay, and the shielding of the ground will significantly limit exposure by direct radiation. <u>However, it is possible that groundwater may reach the surface through pumping and the exposure pathways described in</u>	1) Discharges to groundwater should not be permitted or authorized, this must be stated.  2) NPPs should be build in such a way, that releases to groundwater are as small as possible even in accident conditions.  3) there are situations, when the exposure pathways may become relevant before short		x		1) There is no IAEA safety requirement to reference such a statement. 2) This is scope of design standard. 3) Text is revised. 4) We do not agree this is credible. Groundwater in most cases is as shallow as root depth.

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<p><u>para 6.34 may become relevant before short lived radionuclides decay.</u> These accidental releases could, however, lead to long term contamination with few, if any, remediation solutions. <u>Additionally, radionuclides can migrate from contaminated groundwater into the soil and into the rhizosphere of plants. Depending on the chemical speciation of the radionuclides, they can be bioavailable and thus be taken up by plants, which can lead to an accumulation in the food chain.</u></p> <p><u>All</u> These factors should be considered in determining the significance of this pathway.</p>	<p>lived radionuclides decay, this must be mentioned.</p> <p>4) So far, this point (foot chain) has been neglected in this section, however, it should be considered. The next section focuses only on the ground surface.</p>				
1	23.	2.31	<p>As with releases to groundwater (see paras 2.16 and 2.30), planned direct discharges to the ground surface <u>should not</u> are unlikely to be permitted or authorized.</p>	<p>Discharges to groundwater should not be permitted or authorized.</p>			x	See response to previous comment.
2	24.	2.32	<p>The components of radiological environmental impact assessment ... are shown in Fig.-2 <u>“Components of a radiological environmental impact assessment for protection of the public in normal operation”</u> and Fig. 3 <u>“Components of an assessment for consideration of potential exposures”</u> of GSG-10 [8].</p>	<p>Fig. 2 of GSG-10 is "The process for developing a new safety standard or revising an existing standard". Actually there are two Figs 2.</p> <p>We suggest to include Titles of Figures, to make it distinct.</p>	x			

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	25.	2.33	<p>The first step in conducting the assessment is to select the source term(s). The selection process might be complex, taking into account factors such as reactor design, materials used, additives to the coolant and changes of inventory during operation of the facility (e.g. due to fission products). For nuclear power plants employing technology that is known and used elsewhere, the data from these other operations <del>should</del> <u>could</u> be used to select and provide certainty in the source term. For nuclear power plant developments where the reactor technology is yet to be decided, the plant parameter envelope approach could be taken initially, whereby the maximum source term for the options under consideration is used, based on published data from the reactor vendors or from previous projects. For small <u>modular</u> reactors, based on current technology, one option could be to scale the source terms from large reactors, <u>taking modularity in account.</u> For novel types of reactors (e.g. evolutionary and innovative designs) the only data available might be from the reactor vendors; in this case, the project developers should ensure that the source term estimates are conservative. For other types of nuclear installation, a similar or</p>	<p>The modularity needs to be mentioned as it is an important aspect of SMRs that are meant here.</p> <p>For a graded approach on nuclear installations the deciding factor is the potential hazard associated with it.</p>		x		<p>This publication categorizes nuclear installations in accordance with their hazard. "SMR" is not explicitly used in this publication.</p>

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			simplified approach may be adopted depending on the type, <u>on the</u> <del>and</del> complexity <u>and on potential hazard associated with</u> <del>of</del> the installation					
2	26.	2.34	The next step is to model the <u>release</u> <del>and</del> dispersion of the radionuclides in the environment (see Sections 4–6). The end points of the radiological environmental impact assessments are generally activity concentrations in the various environmental media (e.g. air, water, ground) that can lead to human exposure. These activity concentrations are then used to calculate the doses to a representative person (see Section 7).	Only dispersion? What about "direct irradiation, dispersion and transfer in the environment", as in Fig.2 of GSG-10? Please verify.		x		Text revised. The release is already modelled as an input function in modelling dispersion.
2	27.	2.37	It might not be necessary to model explicitly every single process involving the transfer of radioactivity between different environmental compartments. However, all processes should be considered, and their relative significance assessed, allowing some processes to be discounted if their significance is small, in terms of the impact on the end points being considered. <u>If the effort involved</u> would be disproportionate to the difference in the calculated end points — and considering other uncertainties, such as those in the source term — then few insights would be gained from detailed modelling. For example, for a	How to understand “effort involved”, please clarify.	x			

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			postulated accidental release to atmosphere, the uncertainties in the source terms might be larger than any differences in the end results <u>caused by differences in the detailed modelling</u> . Inevitably in these situations some judgement may be involved, but any simplification made in the analysis should be justified. In making such judgements, the overall objectives of the analysis (e.g. demonstrating regulatory compliance) should be considered.	Clarification.				
1	28.	2.38	Existing sites have the advantage that the environment should already have been characterized and there <del>may</del> <u>will</u> be data from measured discharges and environmental monitoring that can inform the modelling of proposed discharges	There should be data from measured discharges and environmental monitoring, as both measuring discharges and environmental monitoring are obligations.			x	Some installation may have made no discharges.
3	29.	2.40	Climate changes in terms of the meteorological, hydrological and geological conditions in the region of the nuclear installation site over the lifetime of the installation should be <del>taken into consideration</del> <u>considered</u> in the radiological environmental impact assessment.	Wording	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Country/Organization: Russia / State Atomic Energy Corporation “Rosatom” Rostekhnadzor / SEC NRS			Page: Date:				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	Section 2.15	.... In accordance with para. 4. 1 of SSR- 1 [1], a graded approach to identifying and characterization exposure pathways, based on the level of hazard and the stage of reporting is required to be applied for this purpose (see also Section 10).	There are no definition of (graded approach) and description of aims of “graded approach” in the document (and also in SSR-1 ).	x			Definition of graded approach is given in IAEA safety and security glossary. Foote is added. Aim is obvious, to fulfill principle “Optimization of protection”.

Reviewer: USNRC							
Country/Organization: USNRC			Date: 04/26/2024				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	2.13	Replace the word “reactor” with “nuclear installation”.	The section is IDENTIFICATION OF EXPOSURE PATHWAYS IN SITE EVALUATION FOR NUCLEAR INSTALLATIONS which includes according to the IAEA glossary “Any nuclear facility subject to authorization that is part of the nuclear fuel cycle, except facilities for the mining or processing of uranium ores or thorium ores and disposal facilities for radioactive waste.” This document	x			Text is revised where appropriate.



			needs to account for fuel fabrication facilities, waste processing facilities, etc.				
3	2.33	<p>The first step in conducting the assessment is to select the source term(s). The selection process might be complex, taking into account factors such as <del>reactor</del> <b>the nuclear installation</b> design, materials used <del>additives to the coolant</del> and changes of inventory during operation of the facility (e.g., due to fission products). For <del>nuclear power plants</del> <b>nuclear installations</b> employing technology that is known and used elsewhere, the data from these other operations should be used to select and provide certainty in the source term. For <del>nuclear power plant developments</del> <b>new installations</b> where the <del>reactor</del> technology is yet to be decided, the installation parameter envelope approach could be taken initially, whereby the maximum source term for the options under consideration is used, based on published data from <del>the reactor</del> vendors</p>	<p>This paragraph is under GENERAL APPROACH TO RADIOLOGICAL ENVIRONMENTAL IMPACT ASSESSMENT FOR NUCLEAR INSTALLATIONS which applies to ALL nuclear installations not just reactors. The word reactor is mentioned 7 times.</p>	x			

		<p>or from previous projects. For small modular reactors, based on current technology, one option could be to scale the source terms from large reactors. For novel types of reactors (e.g. evolutionary and innovative designs) the only data available might be from the reactor vendors; in this case, the project developers should ensure that the source term estimates are conservative. For other types of nuclear installations, a similar or simplified approach may be adopted depending on the type and complexity of the installation. Further recommendations on selecting the source term(s) are provided in IAEA Safety Standard Nos SSG-2 (Rev. 1) [10], SSG-3 (Rev. 1), Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants [12], and SSG-4, Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants [13].</p>					
8	2.21	The radionuclides radiocarbon ( <sup>14</sup> C) and	Suggest deleting the last sentence as the paragraph		x		Text is revised to include collective dose

		tritium (3H) can be particularly difficult to model in the environment because, whatever chemical form they are released as, they can soon be incorporated into CO2 or water, respectively, or be incorporated in organic molecules in environmental media and become part of the food chain. <del>Further guidance on the use of collective dose is provided by GSG-9 [11].</del>	does not discuss collective dose directly. If the sentence is retained, then discuss collective dose.				following comments from other MSs.
9	2.23	Please correct the hyphen in activity.	Editorial comment	x			
10	2.37	It <del>might</del> is <del>be</del> not necessary to model explicitly every single process involving the transfer of radioactivity between different environmental compartments.	There are always processes that are not evaluated in detail because it is known they are insignificant or de minimus (MPL).	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: ENISS		Page 1 of 7		ENISS			
Country/Organization: ENISS		Date: May 2024					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	2.9	“(a) Inhalation of airborne material in an atmospheric plume (e.g. gases,	What is the difference between aerosols and particles?	x			

		vapours, aerosols, particles);”					
3	2.21	“The radionuclides radiocarbon ( <sup>14</sup> C) and tritium ( <sup>3</sup> H) can be particularly difficult to model in the environment because, whatever chemical form they are released as, they can soon be incorporated into CO <sub>2</sub> or water, respectively, or be incorporated in organic molecules in environmental media and become part of the food chain. <del>Further guidance on the use of collective dose is provided by GSG 9 [11].</del> “	The link with collective dose appears as inconsistent with the text before		x		Text is revised to include collective dose.
4	2.26	“The quantities of nuclides deposited by deposition are also important in determining the dose by ingestion. <del>Compared with direct inhalation, the impact is usually less since only a small fraction of the plume will be deposited and incorporated into</del>	The respective part of the dose contribution from inhalation and ingestion depends on large number of factors. Hence the proposed deletion.			x	We prefer to keep it to assist MSs.

		the food chain and there is some time delay before consumption, during which short lived nuclides can decay. “					
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### Remaining

Reviewer: USNRC							
Country/Organization: USNRC			Date:10/6/2023				
Comment No.	Para/ Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
28.	General, around §2.25	Consider introducing a pathways diagram to the discussion of surface water releases.	It is common practice when publishing guidance on dose assessments to provide a diagrams illustrating the elements and relationships of those assessments. We believe that the use of graphics is an effective communication tool to identify the pathways that are usually more or less significant rather than relying extensive text.	x			Reference to Fig. 1. Of RS-G-1.8 is given in Para. 2.9.

### Comments on Section 3

COMMENTS BY REVIEWER	RESOLUTION
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Reviewer: Dr. A.F.M. Mizanur Rahman Country/Organization: Bangladesh Atomic Energy Commission			Page.... of..... Date:				
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dr. A.F.M. Mizanur Rahman Country/Organization: Bangladesh Atomic Energy Commission			Page.... of..... Date:				
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
3	Page -18 Para – 3.3 Line - 3	The point of paragraph 4.6 of SSR 1 "(a) The effects of natural and human induced external events occurring in the region that might affect the site;" could be added here.	The point 'a' is directly related to the next section "3.4 Requirement 14 of SSR-1 [1] states:"			x	In SSR-1, Scope of Para. 4.6 (a) is outside the scope of this publication.
4	Page -19 Para – 3.6 Line - 4	Mentioned in the text "This can be done as part of a review of the site evaluation within the framework of the periodic safety review as stated in para 4.48 of SSR-1 [1]." Para 4.48 of SSR-1 " <b>4.48. The data shall be maintained and reviewed periodically, and/or as necessary as part of a review of the site evaluation within the framework of the periodic safety review of the nuclear installation, for example, to address developments in data gathering techniques and in the analysis and use of data and to confirm that the data remain relevant to the site within the context of evolving hazards.</b> " could be added here of this text.	For better and clear understanding.	x			

5	Page -24 Para – 3.42 Line - 3	Mentioned in the text “.... representative for the site..”. It would be ““ .... representative for the site.”	Typing error.	x			
6	Page -22 Para – 3.30 Line - 3	The section “3.30:” could be deleted.	After the Section 3.29 the use of “3.30:” is meaningless.	x			Typo error.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dr. M. Moinul Islam, Director, Physical Science Division Country/Organization: Bangladesh Atomic Energy Commission			Page. 1 of. 2 Date: 15 Feb 2024				
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
4	Para: 3.6, Page: 11, Line 3	In new text example of 'several years' may be included	To have an idea regarding time frame for site characterization		x		Text has been modified giving further explanation however, we can not specify a number of years. Because it depends on complexity of the site.
5	Para 3.38, Page:16, Line-5	In new text example of 'several years' may be included	To have an idea regarding time frame	x			Text already revised and addressed the comment.
6	Para 3.56, Page :18, Line-2	In new text meaning of 'region' may be elaborated	To have an idea about 'region' around proposed installation			x	Region for investigation for hydrological and hydrogeological studies is defined as catchment area within which the nuclear installation is located.
7	Para 3. 65 (h), Page :21	In new text a brief explanation 'phytoplankton' and 'zooplankton' may be included	To understand the appropriate meaning of 'phytoplankton' and 'zooplankton'			x	Definition of these terms are widely available. Also, this level of information is not considered appropriate in IAEA safety standards.
8	Para 3. 66 (a), Page :22	In new text a brief explanation of 'Hydrostratigraphical' may be included	To understand the appropriate meaning of 'Hydrostratigraphical'			x	Definition of this term is widely available. It is self-explanatory term. Also, this level of information is not considered appropriate in IAEA safety standards.

COMMENTS BY REVIEWER		RESOLUTION
Reviewer: Canadian Nuclear Safety Commission Country/Organization: Canada	Page 1 of 18 Date: April 30, 2024	

Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
11.	3.6 Line 1	“To meet the requirements quoted in paras 3.2 and 3.3, the selected site for a new nuclear installation is expected to go through a <del>a</del> characterization process.”	<b>Comment:</b> The site investigations will also inform the environmental impact assessment (i.e., collection of baseline information). ERAs (at least in Canada) are periodically reviewed (i.e., typically every 5 years) where data collected is reviewed and associated monitoring program is updated accordingly.	x			It is already addressed in the para.
12.	3.7 and 3.8		<b>Comment:</b> Should add reference here to baseline environmental conditions for both the site and applicable reference locations. Need reference locations to differentiate background environmental changes (natural and/or other human impacts) with those from proposed nuclear installation. Need to also consider background levels for non-radiological contaminants and physical stressors (e.g., noise).			x	There is no requirement in IAEA safety standards that mentions anything about needing reference locations. Therefore, we cannot introduce something new in this publication. Non-radiological environmental impact is out of scope of this publication.



13.	3.8 Line 8/last para	“The background environmental data needed for assessing non-radiological impacts (see para. 1.9), such as <u>chemical, physical, and</u> socioeconomic impacts and the impact on culturally and historically significant properties at or near the site, is desirable to be compiled contemporaneously with the data needed for radiological impact assessments.”	One would expect to see chemical and physical stressors mentioned here (i.e., non-radiological) prior to mention of cultural, historical, and socioeconomic impacts.	x			
14.	3.30		Consider moving text of 3.30 into 3.29	x			
15.	3.41 and FIG.1	“Investigations should be undertaken in the region of the site to collect specific meteorological information. This information should be compiled <del>in</del> for analysis and estimation of site-specific values of meteorological parameters. Further recommendations are provided in SSG-18 [15]. <u>If site-specific meteorological information is not available, the information from a nearby site can be used after accounting for the impact of topographical differences (e.g., impact on wind direction).</u> ”  And change text in pink box of FIG.1 to: “Historical meteorological data for the site <u>(or nearby site)</u> ”	Site-specific data may not be available for the timeframes suggested in clause 3.42 but data from a nearby site may be available. In this case, in my opinion, we can use these data but with some considerations.			x	Your proposal is accommodated in para. 3.59 where numerical weather prediction data is discussed. On the other hand, there is also enough time to collect required data.
16.	3.47	“Meteorological investigation activities should be undertaken in accordance with accepted international standards.”	Consider listing a few examples of applicable international standards	x			

17.	3.68		<b>Comment:</b> Consider mention of ice cover and fish spawning areas (habitat) along shoreline. In Canada, whitefish embryos can be susceptible to thermal plume during embryonic stage in winter	x			
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COMMENTS BY REVIEWER				RESOLUTION			
Reviewer:		Page.... of....					
Country/Organization:		FINLAND / STUK					
Date: 4.4.2023							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
7	3.48, 4.32		How to consider near-field effects in urban built environment?	x			New paragraph added at the end of the section on Atmospheric Dispersion Models
8	3.17		Definition of 'external zone'? Relation with PAZ, UPZ ?	x			Definition of external zone is modified in accordance with IAEA safety glossary.
9	3.53		Measuring turbulence with Doppler radar is also a good method.	x			
10	3.58		For wind direction vector averaging, consider the use of the so-called circular mean (from circular statistics).	x			

Reviewer: PAEC Country/Organization: PAKISTAN/ Pakistan Atomic Energy Commission (PAEC)			Page 1 of 4 Date: 09-04-24				
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	3.23	The population data collected should be presented in a suitable format and scale to permit their correspondence with other relevant data, such as data on atmospheric dispersion and on uses of land and water. The data on permanent population and temporary population should be clearly indicated, <del>for</del> for example, population data should be presented either in tabular form or graphically, <del>for example</del> <u>either</u> using concentric circles and radial segments with the site as the origin. More details on population data should be given for areas closer to the site, especially within the external zone.	Repetition of words require rephrasing of text		x		Para. 3.23 is revised.
3	3.29	3.29. The data on different water uses should include the following depending on the relevance of the site <del>3.30.</del> : (a) For ..	3.30 is a continuation of 3.29 therefore 3.30 should be made part of 3.29	x			

4	3.6	To meet the requirements quoted in paras 3.2 and 3.3, the selected site for a new nuclear installation is expected to go through <del>an</del> a characterization process. The investigations for site characterization should begin several years before the application for a <del>license to construct</del> <b><u>construction license</u></b> the proposed nuclear installation is submitted to the regulatory body.	Grammatical correction and rephrasing required	x			
5	3.72	Text may be added as following: (j) Possibility of Tsunamis in the area	For sites near shores and oceans possibility of tsunamis should be considered			x	It is not relevant to add to this para.
6	3.8	For the <del>purposes</del> <b><u>purpose</u></b> of assessing the radiological environmental impact of a nuclear installation, background environmental data on the areas listed below should be compiled:	Grammatical Mistake	x			

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
3	30.	Section 3, title	“BASELINE ENVIRONMENTAL DATA INCLUDING POPULATION DISTRIBUTION”	Typo. Same for title of Section 10.	x			
3	31.	3.7 (b)	Using <del>Using</del> <u>Applying</u> calculational models for prospective radiological dose assessments;	Wording	x			
2	32.	3.8 (e)	Hydrological, <u>geological</u> and hydrogeological characteristics of the site catchment for surface water and groundwater.	Geological characteristics can have influence on the surface water and groundwater as well, please include.	x			
2	33.	3.8 Line 9	The background environmental data needed for assessing non-radiological impacts (see para. <del>1.11-1.9</del> ), ...	Para 1.11 seems to be more suitable, please verify	x			
1	34.	3.10	The extent of the geographic area over which these data are compiled should be based on the anticipated effects of the environment on the safety of the <del>proposed</del> nuclear installation <u>intended to be built</u> and the anticipated effects of the nuclear installation on the environment under <del>normal operation</del> <u>operational states</u> and accident conditions.	Please put in line with IAEA Glossary: operational states = normal operation and anticipated operational occurrence	x			
1	35.	3.11	The spatial and temporal resolution of data collection activities should follow <del>a graded</del> <u>an</u> approach, as described in Section 10; consequently, more data should be collected for locations with a higher radiological impact <u>and with a</u>	Term “graded approach” is used for a system of control, such as a regulatory system or a safety system, a process or method in which the stringency of the control measures and conditions to		x		Please see our response to your comment 7.

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<u>higher potential radiological hazard associated with them.</u>	be applied is commensurate, to the extent practicable, with the likelihood and possible consequences of, and the level of risk associated with, a loss of control (GRS-Part 3). Application of term “graded approach” to data collection is misleading. Please change here and all over the text.				
2	36.	3.22	The representative person associated with each nuclear installation should be identified (see <del>Section 7 paras 7.14–7.19</del> of this Safety Guide, Section 5 of GSG-10 [8], and Ref. [14]).	Clarification	x			
2	37.	3.24	The operation of a nuclear installation might affect the uses of land and water in the surrounding area. The availability of cooling water is an important consideration for the siting of a nuclear power plant. <del>In addition, the characteristics of the land and water utilized in the region should be addressed in evaluating the feasibility of planning effective emergency response actions.</del> Therefore, as part of the site evaluation, the site topography (e.g. flat plains, mountains, hills, creeks, wetlands, valleys, forests) should be described, and the uses of land and water should be investigated. <u>In addition, the characteristics of the land and water utilized in the region</u>	Please change the order of sentences, as current chapter is firstly about baseline environmental data.  Please add “have an impact on exposure pathways and they should be addressed” for clarification.		x		

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<u>have an impact on exposure pathways and they should be addressed in evaluating the feasibility of planning effective emergency response actions.</u>					
2	38.	3.25	The investigations should cover the following <u>aspects</u> depending on <u>their</u> <del>the</del> relevance for the site: ..... (g) Direct and indirect pathways for potential radioactive contamination of the food chain; (h) Products <del>imported to or</del> exported from the region that may form part of the food chain; (i) Forest food and seaweed.	1) wording 2) as this subchapter is about uses of land and water in the region of the site, please check if “products imported to a region” are relevant here.	x			1) Ok 2) It is relevant.
3	39.	3.28 Line 3	... groundwater could be <del>for</del> a significant exposure pathway.	Editorial	x			
2	40.	3.29	The data on different water uses should include the following <u>data</u> depending on <u>their</u> relevance <del>of for</del> the site: 3.30.: (a) For water used for drinking by humans and animals, and for municipal and industrial purposes: ...	Clarification	x			
2	41.	3.31	These investigations should cover a reasonably large area in the region of the site. The area should be identified according to the hydrological characteristics (relating to the basin or sub-basin) and hydrogeological characteristics (including possible recharge and discharge areas of the	Investigations on use of land and water are not sufficient if they do not lead to quantitative and validated predictive models			x	This section deals with data collection and scope of the investigation. The methodology and the need for modelling

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			groundwater system) of the region where the site is located. <u>A full-scale hydrological model might need to be provided for certain nuclear installations. ...</u>					are discussed in Section 5 and 6 in more detailed.
2	42.	3.35 Line 19	... However, some of the environmental sampling locations should extend further to serve as control locations that could indicate potential changes in the composition of the background <u>radioactivity</u> during the operation of the installation.	Clarification	x			
3	43.	3.41	Investigations should be undertaken in the region of the site to collect specific meteorological information. This information should be compiled in <del>for</del> <u>the</u> analysis and estimation of site-specific values of meteorological parameters. Further recommendations are provided in SSG-18 [15].	Editorial	x			
2	44.	3.43	The meteorological data collected should be compatible — in terms of their nature, scope and precision — with the methods and models in which they are used in evaluating the radiation exposure of the public and the radiological impact on the environment for assessment against each regulatory <del>objective</del> <u>requirement</u> (see Section 4).	Please change “regulatory objective” to “regulatory requirement”, as last wording is more common. Same para 3.52 and 4.29.	x			
3	45.	3.45	For <u>the purposes of</u> atmospheric dispersion analysis <del>purposes</del> , data on the following meteorological	Editorial	x			



COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			parameters should be obtained concurrently: ...					
2	46.	3.48	<p>If meteorological equipment is installed, it should be positioned so as to obtain data representing the dispersion conditions at projected or actual release points. <del>The terrain in the range of several kilometres around a nuclear installation site should be examined, paying particular attention to topographical features such as valleys, principal ridges and coastlines and plant structures (such as cooling towers and masts supporting meteorological sensors) as well as building wake effects might influence the representativeness of the data obtained.</del> Equipment should be unobstructed and should be positioned far enough from any obstacles to minimize their effects on measurements. Ground cover and vegetation should be managed for the duration of the investigation programme, so that it does not obstruct the equipment. The positions and settings of the equipment should be selected for maximum exposure to the meteorological conditions. Activities should be undertaken in accordance with accepted international standards, for example Ref. [16].</p>	Paras 3.44 and 3.48 contain redundant information. We suggest to delete the redundant part in current para.	x			
2	47.	3.49	If the meteorological investigation is to be conducted for a new facility at		x			

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			an existing site and there is a certain distance between the meteorological equipment of the existing facility and the proposed location of the new facility, it may be appropriate to conduct a validation study to utilize the existing meteorological data. This validation should be based on measurements to be made at the location of the new facility at a scale that provides a certain <u>high</u> level of confidence.					
2	48.	3.54	For some computational models, the height of a mixing or boundary layer may need to be determined (see also <u>para. 4.35-Section 4</u> ).”	This topic is dealt with specifically in para. 4.35; hence, this paragraph should be referred to in brackets.	x			
2	49.	3.60	<i>The local data collected should be compared with any available concurrent and long term data from synoptic meteorological stations in the surrounding area to determine long term trends for the site or, if the local results seem anomalous, to investigate possible causes.</i>	Statements in this para are very similar to that, given in para 3.46. Redundant? Please verify.	x			
2	50.	3.64	The geology and surface hydrology of the site area <u>and its evolution over relevant time horizons</u> should be studied in sufficient detail...	Hydrology might not be constant over relevant time frames		x		
3	51.	3.67	For sites on rivers, the <u>collection of</u> hydrological and other information should cover the following: ...	Wording	x			

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	52.	3.69 New issue	For sites on human-made lakes, the information should include the following: ..... <u>(j) If applicable, the extent of the seasonal ice formation</u>	Please add this new issue, as ice formation can also be an issue for human-made lakes	x			
3	53.	3.75	In terms of climatological data, in regions where rainfall makes a substantial contribution to groundwater, hydrometeorological data on daily and monthly rainfall and the data needed to calculate the potential and actual evapotranspiration that have been systematically collected should be analysed for <u>a period</u> as long as they are available.	Wording. Please reword for more clarity.	x			

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: Country/Organization: Russia / State Atomic Energy Corporation "Rosatom" Rostechnadzor / SEC NRS					Page: Date:			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection	
7	3.36	If there are other sources of human-made radioactivity enhanced natural radioactivity (e.g. another near nuclear installation)	Para 3.120 GSR Part 3 states: 3.120. The government or the regulator shall establish or approve constraints dose and constraints on risk to be used in of protections and safety of members of the public. When establishing or approving		x		Text is revised.	

		<p>or industrial facility or natural occurring radio-active materials) that contribute to the radioactivity levels in the vicinity of the site, this should also be measured. determine the cumulative exposure of people around site to human-made radiation. Cumulative exposure of people around the site to human-made radiation should be determined taking into account the planned changes in activity of nearby nuclear installations, for example: the commissioning of new units of nearby NNP s.</p>	<p>constraints in respect of a sources within a practice, the government or the regulatory body shall take into account, as appropriate:  ) Dose contributions from other authorized practices or from possible future authorized practices, estimated at the design and plan stage,  so that the total dose to members the public is not expected to exceed the dose limits at any time after the start of operation of the sources:</p>				
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COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC				Date: 04/26/2024			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
11	3.42	Separate “beat” into “be at” and remove the extra period at the end of the sentence.	Editorial comment	x			
12	3.68, 3.69	Merge the two sections, eliminate duplicate items.	There is no explanation of the technical difference between a man-made lake and a natural lake with respect to discharge of radioactive material to them. Stated differently, the guidance		x		Text is revised.

			should provide some justification as to why it is necessary to differentiate between the two environments.				
13	3.77 (a)		pH and redox potential are widely regarded as chemical properties not physical properties.	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: ENISS		Page 1 of 7		ENISS			
Country/Organization: ENISS		Date: May 2024					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
5	3.9	<p><del>“Efforts should be made to collect data that will allow transboundary impacts to be assessed.”</del></p> <p>“When a site is near a State’s national border, there should be appropriate co-operation with neighbouring countries in the vicinity of the nuclear installation. Efforts should be made to exchange relevant information.”</p>	The wording adopted in the previous NS-G-3.2 para 5.2 was more precise and deserves being restored.		x		3.9 is retained since there is IAEA requirements on this. However, a text is amended as you propose.
6	3.21	“A projection of the present population in the region should	The modification aims at precisising that projection of present population may not			x	We prefer to keep it as it is.

		<p>be made both for the expected year of commissioning of the nuclear installation and for selected years (e.g. every tenth year) over the lifetime of the installation, <b>if this is feasible and the population is projected to change appreciably in the future.</b> Projections should be made on the basis of population growth rate, migration trends and plans for possible development in the region, including the project itself. The projected figures for permanent population and temporary population should be extrapolated separately if these population data are available.”</p>	<p>always be feasible and/or necessary or justified.</p>				
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**Remaining**

Country/Organization: USNRC			Date:10/6/2023		Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
Comment No.	Para/ Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection	
4.	p. 21 Sec. 3.69	Recommend that consideration be given to introducing language should be introduced to DS529 that discusses the different types of groundwater systems potential at a nuclear installation site.	In the area of groundwater characterization, DS529 does not acknowledge the different type of groundwater regimes (confined, unconfined, perched, artesian) and the implications for characterization as well as potential implications for contaminant fate and transport studies.	x			Conceptualization and characterization of a groundwater system results in definition of the groundwater regime that prevails at the site of interest. Implications for characterization and potential implications for contaminant fate and transport studies would be details for a guide, which is avoided also for the integrity of the guide and for the sake of “balance” among chapters. However, a few lines can be added in this regard, without violating the integrity of the guide.	
5.	p. 19, Sec. 3.60(b) and p. 36, Sec. 5.21	Recommend that consideration be given to amending the text in question to call for the analyst to understand what effect instantaneous stream	In the matter of open channel flow, the 2012 flood hazard revaluations at one site revealed the sensitivity of the river discharge estimates to the use of instantaneous flow data.	x			In most cases instantaneous flow data is not available. Even if such a gauge	

		<p>flow data might have, if any, on estimated dose assessments. Those flow data that result in higher predicted doses should be relied on for the purposes of DS529.</p>	<p>The use of instantaneous flow data demonstrated higher flow rates for the river system in question. DS529 recommends the use of monthly flow averages.</p>				<p>is installed for this purpose, the time-series of the flow data will be limited when the timeline of the site evaluation is considered. Daily flow measurement, however, can be recommended. it is not practically applicable to suggest instantaneous flow gauging for all sites. However, a few lines can be added to the text just to make the analyst be aware of this fact and let him/her decide when such a gauging strategy needs to be applied.</p>
39.	3.57	<p>In reference to the following (third) sentence: “Areas from which contaminated surface water might directly enter an aquifer should be determined.”</p>	<p>The intent of this text is unclear. Surface water does not always directly enter an aquifer. Clarification is recommended.</p>	x			<p>Correct..</p> <p>The text intends to refer to sinking streams in karstic terrains. This will be clarified.</p>
41.	3.62	<p>It is recommended that the proposed guidance in</p>	<p>It isn't clear why there are significantly different lists for man-made or natural lakes. Shouldn't</p>	x			<p>Text is revised.</p>



		§3.61 and §3.62 be combined.	<p>the requirements be mostly the same with perhaps some differences for man-made where it could be indicated that that in addition to list A the items in list B apply to man-made lakes.</p> <p>Perhaps the best approach is to provide a general list that applies to each water body type, then provide specific additional items that are unique to each water body type.</p>				
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#### Comments on Section 4

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dr. M. Moinul Islam, Director, Physical Science Division Country/Organization: Bangladesh Atomic Energy Commission			Page. 1 of. 2 Date: 15 Feb 2024				
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
9	Para 4.39 (d), Page: 28	In new text a brief explanation of 'Pasquill-Gifford' and 'Doury scheme' may be required	To have an idea of 'Pasquill-Gifford' and 'Doury scheme'			x	This level of information is not considered appropriate in IAEA safety standards

COMMENTS BY REVIEWER		RESOLUTION
Reviewer: Canadian Nuclear Safety Commission Country/Organization: Canada	Page 1 of 18 Date: April 30, 2024	

Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
18.	4.15(d)	<p>“<del>Release rate and F</del>low speed and the thermal energy associated with the release...”</p>	<p>Usually the release is quantified by its volumetric rate and velocity but additional assumptions might be required to estimate the flow speed or velocity.</p> <p>This is because flow speed would be a function of the release point geometrical and hydraulic characteristics which might not be fully known and assumptions or supplementary analysis would be required to identify them (e.g., for power reactor, detailed containment failure or cracking analysis might be required to identify the release point characteristics)</p>		x		Text is revised

19.	4.18 Line 2	<p>“...if there are several barriers to the release then the fraction released through each barrier needs to be assessed or modelled as well as the processes that might lead to the mobilization of the source term.</p> <p><u>Radionuclides retention and deposition mechanisms associated with source term mobilization are important mechanisms that contribute to reduce the total release to the environment. Therefore, they should be modelled using representative values or correlations that are validated for the simulated accident conditions. Any deviations from the validation bases of their models should be justified and supported by sensitivity analysis to demonstrate its impact.</u> For potential exposures...”</p>	<p>Radionuclides retention and deposition are important mechanisms that are used in safety analysis codes to reduce the releases to environment and, in my opinion, it is important to bring the reader attention to importance of appropriate modelling of these mechanisms. Also, the suggested text complement clause 4.19.</p> <p>The suggested text can also be considered under 4.19.</p>			x	This level of details is not scope of this publication.
20.	4.25	<p><u>(c) The model cannot be used in calm or very low wind speed conditions. In this case, an interpolation for the intervals of low or calm wind speed need to be performed with a reasonable degree of conservatism that is consistent with the analysis scope.</u></p>	<p>Meteorological data may include low wind speed due to the anemometer threshold and the reader needs to be aware that this is a disadvantage, but it is a problem that can be dealt with.</p>		x		Text is modified.

21.	4.38	<u>(f) If the meteorological data distribution was modeled as individual clusters or pins then the impact of the number (or width) of these clusters needs to be investigated.</u>	Some numerical codes (like ADDAM) divide the meteorological data to a number of clusters and then calculate the radiological dispersion and the corresponding doses for each cluster. Therefore, the size of these clusters become an important parameter for sensitivity analysis			x	It is covered in (a) in general.
22.	4.42	(a) Conservative source terms are used (e.g. <u>a fraction of the entire inventory under stable full power conditions up to the entire inventory</u> );	To specify what is meant by the entire inventory in this context, and to also not give the reader the impression that the default value of a conservative source term is releasing the whole inventory.			x	Para. Is referring to low hazard facilities where simple and conservative assumptions are needed. Therefore, we do mean the whole inventory.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer:		Page.... of....					
Country/Organization:		FINLAND / STUK					
Date: 4.4.2023							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
11	4.3		How to define ‘representative year’? Rather, consider several years, whenever technically possible.	x			It is addressed in para. 3.42.
12	4.4	‘can results’ >> ‘can result’	typo	x			
13	4.21		Why only Gaussian and Lagrangian mentioned? Also Eulerian / CFD are being used.			x	CFD is mentioned later in para 4.29.

14	4.16	Activation products formed by the activation of substances present in the coolant water, which can be released when coolant is released or by off-gassing (e.g. radionuclides tritium ( $^3\text{H}$ ), radiocarbon ( $^{14}\text{C}$ )).	Remove $^{41}\text{Ar}$ , because the predominant formation mechanism of $^{41}\text{Ar}$ is activation in the air outside the reactor. Therefore, $^{41}\text{Ar}$ is not a good example of activation products in coolant water.	x			
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COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	54.	4.3 Line 8	... As mentioned in Section 3 above para. 3.42, the meteorological site data should be collected over several years so that it is possible to select a representative year or years from the records.	Clarification, as this topic is dealt in para. 3.42.	x			
2	55.	4.3, last sentence	... time and spatially gridded data for use in Lagrangian modelling for example (see para. 4.23 4.22) may need to be acquired ...	Reference to para 4.23 seems to be a correct one, please verify.	x			
2	56.	4.4	Accidental releases can occur at any time under any meteorological conditions which can results in very quite different radiological consequences (e.g. the wind could be blowing out to sea or inland toward populated areas e.g. from different wind directions and with wind speeds). One way to assess this is to perform multiple calculations for different meteorological conditions sampled from the hourly collected meteorological data set (Level 3 PSA (in the frame of a Level 3 probabilistic safety assessment (PSA))).	Clarification  See also comment on para 7.18.		x		
2	57.	4.6 (b)	In summary, the results of the meteorological investigation should be used for the following purposes: .... (b) To provide a baseline environmental data for site evaluation;	Clarification	x			
3	58.	4.11	For nuclear installations other than nuclear power plants (e.g. nuclear installations with low potential hazard), analysis of a few or even only one potential exposure pathway might be sufficient.	Editorial.	x			

2	59.	4.15	<p>In addition to the quantities of radionuclides released, all the parameters that might affect their subsequent dispersion or behaviour in the environment should be characterized. This characterization should include the following:</p> <p>...</p> <p>(c) Release point and its height (for an atmospheric release) or depth below surface (for an aquatic release)</p>	This subchapter deals with atmospheric releases	x			
2	60.	4.16 bullet (c)	<p>Radionuclides from the fuel matrix, fuel cladding, coolant circuit or containment. Volatile radionuclides can be released into coolant through fuel rod failures or by a uranium contamination remaining on the outside surface of the cladding from the manufacturing process (so-called 'tramp uranium') and, therefore, can be released when coolant is released or by off-gassing during normal operation.</p>	<p>Terminological clarification. The term 'tramp uranium' is not very commonly used. For these reasons, it is recommended adding a short explanation of what the term stands for, to support the reader of this Safety Guide.</p>		x		
2	61.	4.24 (d)	<p>The advantages of the Gaussian model are as follows:</p> <p>....</p> <p>(d) It is principally considered to be generally conservative with respect to more detailed models; however, under specific conditions, e.g. for locations close to the location of the release, the results may not be conservative.</p>	<p>Clarification. It should be made clear under which conditions the Gaussian model does not yield conservative results.</p>	x			
2	62.	4.25	<p>The disadvantages of the Gaussian model are as follows:</p> <p>(a) Other than the more advanced Gaussian Lagrangian models mentioned above, it cannot satisfactorily model complex terrain;</p>	<p>Lagrangian models perhaps? Please verify.</p>			x	<p>The more advance gaussian models being referred to are for example ADMS. <a href="#">CERC &gt; Environmental software &gt; ADMS model</a> However, we could not refer to a specific software.</p>
3	63.	4.28 Line 7	<p>... For sites with complex topography and short-range analysis, then the more advanced Gaussian model could be used.</p>	<p>Wording</p>	x			

2	64.	4.29	By whatever means the data have been acquired, the data should be compatible (in terms of their nature, scope and precision) with the methods and atmospheric dispersion models being used, Gaussian or Lagrangian, (see para 4.21 4.20); for example, atmospheric stability can be characterized in different ways with different parameters. The data and models needed also depend on the regulatory objectives requirements for the radiological impact on people on the environment; for example, if the assessment of population risk is an objective, then long range dispersion modelling is needed.	Reference to para 4.21 seems to be more suitable here, please verify. Actually, as para 4.21 states that the atmospheric dispersion computer models commonly used fall into two main types: Gaussian and Lagrangian, it is more informative to incorporate this in text here. Please change “regulatory objectives” to “regulatory requirements”, as last wording is more common.	x			
1	65.	4.30	Generally, the same data collected for normal releases can be used for accidental releases although the latter may also necessitate more long range data if long range dispersion modelling is part of the assessment. Account for evolution over relevant time frames including climate risks is required.				x	Para. 2.40 is addressing this aspect.
2	66.	4.31	The typical meteorological data needed, as an example, for a Gaussian dispersion model include the following: .....	Do you intent to introduce the typical meteorological data needed for a Lagrangian dispersion model as well? If not, we suggest to add wording “as example”.	x			
2	67.	4.32	In addition, other data that may be used in the Gaussian dispersion model include the following:	Clarification	x			



1	68.	4.40	For accidental radioactive releases from a nuclear accident, in addition to a deterministic assessment, a Level 3 probabilistic safety assessment may be needed to be performed in line with SSG-3 [reference ...] and SSG-4 [reference ...]. be performed. For this purpose, typically the results of a Level 2 probabilistic safety assessment <sup>6</sup> (or other accident consequence analysis for accidents not involving core melting) are should be used in the form of source terms and release categories and their corresponding frequencies from a series of accident scenarios <sup>7</sup> . To address the effect of different meteorological conditions on the release, historical meteorological data is are sampled to define a set of meteorological sequences for which radiological consequences are calculated for each meteorological sequence; this is repeated for each source term. This set of results can complement deterministic modelling of the individual risk to representative persons, societal risks, or statistical distributions of other economic consequences.	For “accidental releases” see comment on para 1.2.  DSA should be mentioned as the PSA is complementary.  Release categories are typically used for the interpretation of PSA results (see SSG-4).	x			
1	69.	4.40 Footnote 6	The footnote 6 should be replaced by proper texts from either SSG-3, Rev. 1 or SSG-4, Rev. 1 for consistency reasons and a better explanation	Please replace footnote 6			x	It is reference to IAEA safety glossary. Edition 2022.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page					
Country/Organization: Japan / NRA		Date: 4, Apr., 2024					
No.	Para/Line No.	Proposed new text	Reason				
1.	4.40. Footnote 6	Three levels of probabilistic safety assessment are generally recognized: -Level 1 comprises the assessment of failures leading to determination of	For consistency with SSG-3 (Rev. 1) para. 1.4. (a)), this term is not			x	Definitions from latest IAEA safety glossary edition 2022 are used.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page					
Country/Organization: Japan / NRA		Date: 4, Apr., 2024					
No.	Para/Line No.	Proposed new text	Reason				
	(page 38)	the frequency of <u>core and/or</u> fuel damage.	"fuel damage" but "fuel and/or core damage".				

Reviewer: PAEC			Page 1 of 4				
Country/Organization: PAKISTAN/ Pakistan Atomic Energy Commission (PAEC)			Date: 09-04-24				
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
9	4.2	Text may be changed as under: ...where they <u>minimally</u> expose the public..				x	Exposure isn't necessarily minimal.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer:		Page:					
Country/Organization: Russia / State Atomic Energy Corporation "Rosatom"		Date:					
Rostechndzor / SEC NRS							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
3	Section 4.25	(c) the area of transfer modeling is limited by great uncertainties at large distances from the source	The area of application of the Gaussian dispersion model usually does not exceed 30 - 50 km from the emission source			x	It is covered in (b).
4	Section 4.38	4.38. Since.... (f) uncertainty of the dispersion model used (g) uncertainty of the	The uncertainty of the calculations depends on the uncertainty of input parameters, the assumptions, the model error etc.		x		Text is revised.

		software implementation of the mathematical model (for example, the numerical solution of the dry deposition integral)					
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COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC			Date: 04/26/2024				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
4	4.16	Sources of radioactivity in a <del>nuclear installation such as</del> nuclear power plant might include the following: (a) Corrosion products that remain in coolant during normal operation but that can be released to the environment in loss of coolant accidents (e.g. 58Co, 60Co). (b) Fission products and actinides formed by fission or activation of uranium in fuel (e.g. noble gases (85Kr, 138Xe), 131I, 137Cs, 90Sr, 238Pu, 239Np). These are prevented from release in normal operation by many barriers. (c) Radionuclides from the fuel matrix, fuel cladding, coolant circuit or containment. Volatile	These sources of radioactivity do not apply to most nuclear installations other than a nuclear power plant. If a paragraph is needed for non-power plant nuclear installations this should be added. According to the IAEA glossary nuclear installations are more than just power plants.	x			

	<p>radionuclides can be released into coolant through fuel rod failures or by tramp uranium and therefore can be released when coolant is released or by off-gassing during normal operation. Large releases can also occur in severe accidents, when the fuel matrix and fuel cladding fail, and the coolant circuit and containment might be breached.</p> <p>(d) Activation products formed by the activation of substances present in the coolant water, which can be released when coolant is released or by off-gassing (e.g. radionuclides tritium (<math>^3\text{H}</math>), radiocarbon (<math>^{14}\text{C}</math>), Argon-41 (<math>^{41}\text{Ar}</math>)).</p>					
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## Comments on Section 5

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Canadian Nuclear Safety Commission		Page 1 of 18					
Country/Organization: Canada		Date: April 30, 2024					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
23.	5.6(c)		<b>Comment:</b> Suggest including ice cover, seasonal temperature profile (i.e., spring/fall mixing), and total suspended solids in water.		x		Text is revised.
24.	5.7 (b)	“Box type models treat the entire water body or sections of a water body as <b>interconnected</b> homogeneous compartments. These models often include some sediment–radionuclide interactions.”	Clarification	x			
25.	5.13 (a)	Box model: The advantages of this model are that the calculation time is short, and long term prediction is possible. Its disadvantages are that the model is not suitable for stratified lakes, cannot represent the heterogeneity within a box, and cannot represent the effects of flow changes.	<b>Comment:</b> Box models can account for stratification by layering one box on top of and interconnected with one below. One below is only one connected to sediment. One above is only one connected to air. Each box can have flow between and in different directions.	x			

26.	5.13	<p><b>Comment:</b>  This information might be better represented in a table that outlines the different model advantages / disadvantages, types of applications they are well suited for, and considerations in selecting model (e.g., uncertainties, assumptions) and what level of detail is needed to ensure model is representative (i.e., can end up adding more detail without net benefit to model predictions). Could also consider a diagram, such as two interconnected boxes with water and sediment, and arrows depicting transport to demonstrate a box model</p>			x	<p>We prefer to keep as it is for the consistency of the publication.</p>
27.	5.14	<p><b>Comment:</b>  In estuaries, freshwater can flow outwards over saline water flowing inwards. This can impact circulation and deposition of radionuclides discharged from banks.</p>	x			

28.	5.17	<p><b>Comment:</b>  For exposure pathways in surface water, if source term is known than dilution factor can be applied with distance, location and time factored in to estimate contribution to dose. Enables assessment of potential exposure risk during accident conditions without burdensome computational needs.</p>	x			Noted.
29.	5.21	<p><b>Comment:</b>  To calculate radionuclide concentration in rivers, need information on total suspended solids and sedimentation rate, radionuclide properties (e.g., volatilization rate, Kd), and other parameters mentioned earlier in document... so could refer back to that section or mention them again in this one. Same comment applies for Section 5.22 to 5.24. Include flow rates at surface and depth, as there may be freshwater flowing in opposite direction of saline water</p>	x			Text is added.

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Pages: 50 Country/Organization: <b>Germany</b> Date: 08.04.2024								
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	70.	5.2	The hydrological dispersion and transfer of radionuclides should be estimated using relevant models, considering the defined hydrological conditions. The output of atmospheric dispersion models may also be used as input for transfer in surface water if considered significant. As discussed in Section 7, all exposure pathways should be listed, the relevant exposure pathways and the representative person should then be identified. Finally, the estimated dose (and, in some cases, a measure of the risk of health effects based on the estimated doses), should be derived and compared with the applicable established criteria. Possible exposure pathways for a representative person through surface water include consumption of drinking water, fisheries, aquatic food, irrigation and recreation.	Even the pathways that have been screened out and not found to be relevant need to be listed.	x			
1	71.	5.4 A New issue	For both authorized discharges and accidental releases scenarios should include evolution with time.	Emphasizing the evolution with time is missing			x	This issue is covered in para. 2.40.
3	72.	5.6, bullet (d), item (i)	Distribution coefficient (Kd) (Kd), which determines the removal of radionuclides from surface water to the bottom sediment;	Editorial	x			



2	73.	5.13	<p>Appropriate models should be selected. The typical models for dispersion in lakes along with their advantages and disadvantages for different situations are discussed below:</p> <p>....</p> <p>(e) Three dimensional model: The advantages of this model are that it can describe local hydrology and water quality characteristics, can take into account density flow density and drift current, and can reproduce complex phenomena in the lake. A disadvantage of the model is that a long calculation time is needed, so it is not suitable for long term calculations (over 10 years).</p>	Clarification	x			
2	74.	5.15 (c) New footnote	<p>(c) Isopycnal footnote coordinate model, in which the vertical coordinates of the surfaces are along the isopycnal plane.</p> <p>Footnote: Isopycnals are layers within the ocean that are stratified based on their densities</p>	Please add new footnote to explain "isopycnals", as the term "isopycnal" is rather specific and such an explanation will make the text more reader-friendly.	x			
1	75.	5.16	<p>The release to surface water can not be seen as trivial and should be divided into direct and indirect release.</p> <p>According to para 5.27 of GSG-10 [8], possible exposure pathways for releases of radionuclides to surface water in normal operation of nuclear installations such as nuclear power plants include the following direct release:</p> <p>(a) Ingestion of drinking water;</p> <p>(b) Ingestion of aquatic food (e.g. freshwater or seawater fish, crustaceans, molluscs);</p> <p>(c) External exposure from radionuclides in water and sediments (i.e. from activities on shores, swimming and fishing).</p> <p>Exposure pathways via irrigation and food as well as via the use of sediments as fertilizer over food should be considered as indirect release. Also, flooding from rivers might lead to deposition of radionuclides on land used for agriculture (see para 5.27 of GSG-10 [8])</p>	Please add		x		Exposure pathways defined in para. 5.16 are independent of the mode of the release.

2	76.	5.16 New footnote	<p style="text-align: center;">New footnote</p> <p>Some Member States describe the following pathways (here German AVV):</p> <p style="padding-left: 40px;">External exposure:</p> <p style="padding-left: 80px;">Exposure on sediment (gamma ground radiation on bank sediment or rinsing field or flooding area)</p> <p style="padding-left: 40px;">Internal exposure:</p> <p style="padding-left: 80px;">Exposure due to ingestion of radioactive substances with food (ingestion)</p> <p style="padding-left: 120px;">Drinking water; Water - fish</p> <p style="padding-left: 120px;">Cattle water - cow - milk</p> <p style="padding-left: 120px;">Cattle water - animal - meat</p> <p style="padding-left: 120px;">Irrigation - fodder plant - cow - milk</p> <p style="padding-left: 120px;">Irrigation – fodder plant - animal - meat</p> <p style="padding-left: 120px;">Irrigation - plant</p> <p style="padding-left: 80px;">Breast milk as a result of the ingestion of radioactive substances by the mother via the abovementioned ingestion pathways</p> <p style="padding-left: 40px;">If this is justified by the local characteristics of the site:</p> <p style="padding-left: 80px;">Agricultural use on floodplains</p> <p style="padding-left: 80px;">Agricultural use of river and sewage sludge</p>	<p>The pathways described in the German regulation „Allgemeine Verwaltungsvorschrift zu § 47 der Strahlenschutzverordnung (Ermittlung der Strahlenexposition durch die Ableitung radioaktiver Stoffe aus Anlagen oder Einrichtungen)“ might be useful.</p>			x	This is too detailed to accommodate in this publication.
3	77.	5.17	<p>Most accident conditions involve releases to the atmosphere with only indirect releases to surface water. In these situations, assessing only the radiological consequence of the atmospheric release is usually sufficient as these are dominant and any additional impact from indirect releases to surface water is trivial in comparison. Given that the computational effort needed to assess the impact of indirect inputs to surface water is likely to be large, ...</p>	Wording	x			

1	78.	5.19	Site specific hydrological data must be collected in situ. If data is taken from the The data necessary for the hydrological analysis come from different sources. The existing hydrometeorological network usually provides sufficient data. These data, however, it should be carefully verified before being used, since their reliability varies depending on the location from where they were collected.	The text does not clearly describe the issue. Site specific hydrological data must be collected.		x		Data may come from different sources and can be used in hydrological analysis for some nuclear installations depending on hazard category of the installation. However, site specific data collection is mentioned in para. 5.20.
1	79.	5.20	The data needs presented in this Safety Guide relate to standard calculational methods. For advanced models, the data needs should meet the relevant regulatory requirements. Typical water bodies in the vicinity of a nuclear installation range from rivers, estuaries, open shores of large lakes, seas and oceans to human-made impoundments. The specific parameters necessary for modelling radionuclide transfer in various aquatic environments are provided in paras 5.21– 5.25.	Does this statement apply to the hydrological analysis only? If not, please put on the beginning of the chapter.		x		Text is revised.
2	80.	5.22	.... (d) Radionuclide decay constant and daughter products.	Please add “and daughter products” to (d) to be consistent with para. 5.21.	x			
2	81.	5.23	..... (f) Radionuclide decay constant and daughter products.	Please add “and daughter products” to (f) to be consistent with para. 5.21.	x			
1	82.	5.29 A New issue	Similar to discharges (see para 5.4 A), scenario based simulation of radionuclide transfer in surface water both for authorized and accidental releases scenarios should include evolution with time.	Emphasizing the evolution with time is missing			x	This aspect is addressed in 2.40.
2	83.	Title bevor 5.30	GRADED APPROCH TO ASSESSING THE TRANSFER OF RADIONUCLIDES IN SURFACE WATER	As this Chapter is not targeted at graded approach, please remove this from the title			x	Specific aspects of graded approach are discussed in this section.

1	84.	5.31	<p>When assessing rivers, the size and length of the river should determine the level of modelling. If the length of the river cross-section is much larger than the width or depth, a one dimensional model may be used. If the water flow path is unknown for certain events, or changes significantly during an event, a one dimensional model is not appropriate and a more sophisticated model should be used.</p> <p>When assessing rivers, the local flow conditions at the discharge point should determine the level of modelling. If the width of a river is so great that discharged water flows over long stretches of the watercourse along on one bank and only mixes slowly over the total width, a one-dimensional model is not appropriate and a more sophisticated model should be used. Similar holds if discharged water flows via a tributary into another river. When assessing the lateral mixing in the river, different flow conditions, especially low water, must be taken into account.</p>	<p>In the case of wide rivers (approx. 100 m and more), the discharged water can flow preferentially over longer distances on one side of the river bank in the case of a lateral discharge. Similar holds if discharged water flows via a smaller tributary into another, broader river. The assumption of homogeneous mixing is not correct in such cases, especially if sensitive uses are located on one side of the river downstream of the discharge point. The amended passage is intended to draw attention to this fact of limited cross-mixing in large rivers. Quantitative information on the width or length of the mixing section is not useful in the general form of this guideline. The most critical situation in this regard is not high water (because of high dilution) but low water.</p>	x			
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No.	Para/Line No.	Proposed new text	Reason				
2.	5.15.	<p>Appropriate models should be selected <u>based on careful consideration of purpose of the assessment and the level of detail required for the results. If it is determined to deploy an ocean general circulation model, There are three main types of ocean general circulation models that</u> could be used to model dispersion of radionuclides in the sea, depending on the vertical coordinate system. These models along with their advantages and</p>	<p>Only the general circulation models that include global ocean should not necessarily be recommended, and methods based on simple evaluations should not be excluded. Therefore, it should be specified for the use of conditions of models here.</p>	x			

No.	Para/Line No.	Proposed new text	Reason				
		disadvantages for different situations are discussed below: .....					

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC		Date: 04/26/2024					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
14	5.13	Prior to this section remove "human-made" from the title. Same comment prior to section 5.22.	Unless you add a section for natural lakes this title should be generalized. See comment #12, above.	x			
15	5.21	The following parameters are needed to calculate radionuclide concentrations in a river: (a) Average river width and depth; (b) Annual average river flow rate; (c) Longitudinal distance from the release point to a potential receptor location; (d) Radionuclide decay constant and daughter products.	The risk in a river is not driven by the arithmetic average but the harmonic mean of daily flow rates (inverses). The annual average may be appropriate for a screening calculation but not appropriate for a site-specific risk calculation. (It is also noted that instantaneous flow rates can be higher than the mean).	x			

Remining

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page 36					
Country/Organization: Japan / NRA		Date: 06, Oct., 2023					
No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
49.	5.15.	<p>Appropriate models should be selected. <u>Detailed information shown in the underline is in the Annex.</u> <u>There are three main types of ocean general circulation models that could be used to model dispersion of radionuclides in the sea, depending on the vertical coordinate system. These models along with their advantages and disadvantages for different situations are discussed below:</u></p> <p><u>(a) Z coordinate model, in which the vertical coordinates are perpendicular to gravity. This model is suitable for long term calculations. The z coordinate model utilizes the characteristics of the ocean so that local pressure is expressed as a function of depth by zero-order approximation, which makes implementing the equation of state straightforward. The implementation of bottom topography and drawing of results are also straightforward. This is the most widely used ocean general circulation model because of its versatility. The main disadvantages of this model, however, are that the vertical resolution in shallow seas and near the sea floor tends to be low, and the processes that arise near the coast and the sea floor tend to be poorly reproduced.</u></p> <p><u>(b) Sigma coordinate model, in which the vertical coordinates are the planes along the sea floor. The number of vertical layers to be calculated in shallow water is the same as for deep water. Since the number of vertical grid points is invariable throughout the model domain, sigma models are widely used for coastal ocean simulations. The main disadvantages of this model are that an accurate representation of the horizontal pressure gradient is difficult near steeply sloping bottom topography, and the lateral mixing along the same vertical layer</u></p>	<p>Using a general circulation model that includes marine areas in the site evaluation does not necessarily provide the adequate information needed for the evaluation and seems unpractical.</p> <p>These unpractical methods should be moved to the Annex.</p>		x		<p>Text is modified.</p> <p>The guide does not impose the use of these models, but it states they could be used when appropriate.</p>

COMMENTS BY REVIEWER				RESOLUTION																																				
Reviewer: Japan NUSSC member		Page 36																																						
Country/Organization: Japan / NRA		Date: 06, Oct., 2023																																						
No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection																																	
		<p><u>near the continental slope region might lead to the mixing of the shoreward light water and the seaward dense water.</u></p> <p><u>(c) Isopycnal coordinate model, in which the vertical coordinates of the surfaces are along the isopycnal plane. The development of this class of model is based on the fact that seawater moves along isopycnal surfaces in the interior. Thus, the characteristics of a water mass are well maintained in the ocean interior. Since many theoretical studies of physical oceanography use an isopycnal coordinate framework, the isopycnal models have the great advantage of providing good correspondence between theory and numerical models. The main disadvantage of this model is that a surface mixed layer model cannot be incorporated into an isopycnal model.</u></p>																																						
50.	5.24.	<p>All oceanic phenomena affecting dispersion should be considered. The representative physical factors for <del>developing</del> the oceanic models in terms of their space and time scales are given in Table 2.</p> <p>TABLE 2. THE REPRESENTATIVE PHYSICAL FACTORS FOR DEVELOPING THE OCEANIC MODELS.</p> <table border="1"> <thead> <tr> <th>Representative physical factor</th> <th>Time scale</th> <th>Space scale</th> </tr> </thead> <tbody> <tr> <td>Wind waves</td> <td>1–10 s</td> <td>1–10 m</td> </tr> <tr> <td>Microstructure turbulence</td> <td>1 s to 1 min</td> <td>1 cm to 1 m</td> </tr> <tr> <td>Boundary layer turbulence</td> <td>1 min to 1 day</td> <td>10 cm to 100 m</td> </tr> <tr> <td>Swell</td> <td>1 s to 1 min</td> <td>100 m</td> </tr> <tr> <td>Internal gravity waves</td> <td>1 hour to 1 day</td> <td>100 m to 10 km</td> </tr> <tr> <td>Sub-mesoscale currents</td> <td>1 hour to 1 month</td> <td>100 m to 10 km</td> </tr> <tr> <td>Mesoscale eddies</td> <td>1 day to 1 year</td> <td>1–100 km</td> </tr> <tr> <td>Tides</td> <td>1 hour to 1 day</td> <td>1000–10000 km</td> </tr> <tr> <td>Wind-driven circulation</td> <td>1 month to 100 years</td> <td>100–1000 km</td> </tr> <tr> <td>Thermohaline circulation</td> <td>100–1000 years</td> <td>1000–10000 km</td> </tr> </tbody> </table>	Representative physical factor	Time scale	Space scale	Wind waves	1–10 s	1–10 m	Microstructure turbulence	1 s to 1 min	1 cm to 1 m	Boundary layer turbulence	1 min to 1 day	10 cm to 100 m	Swell	1 s to 1 min	100 m	Internal gravity waves	1 hour to 1 day	100 m to 10 km	Sub-mesoscale currents	1 hour to 1 month	100 m to 10 km	Mesoscale eddies	1 day to 1 year	1–100 km	Tides	1 hour to 1 day	1000–10000 km	Wind-driven circulation	1 month to 100 years	100–1000 km	Thermohaline circulation	100–1000 years	1000–10000 km	<p>Using a general circulation model that includes marine areas in the site evaluation does not necessarily provide the information needed for the evaluation and seems unpractical.</p> <p>Tides are often difficult to model in general. Also, tides do not affect diffusion with a short duration, such as one week.</p> <p>For these reasons, unpractical descriptions should be deleted.</p>		x		Text is modified. The guide does not impose the use of these models, but it states they could be used when appropriate.
Representative physical factor	Time scale	Space scale																																						
Wind waves	1–10 s	1–10 m																																						
Microstructure turbulence	1 s to 1 min	1 cm to 1 m																																						
Boundary layer turbulence	1 min to 1 day	10 cm to 100 m																																						
Swell	1 s to 1 min	100 m																																						
Internal gravity waves	1 hour to 1 day	100 m to 10 km																																						
Sub-mesoscale currents	1 hour to 1 month	100 m to 10 km																																						
Mesoscale eddies	1 day to 1 year	1–100 km																																						
Tides	1 hour to 1 day	1000–10000 km																																						
Wind-driven circulation	1 month to 100 years	100–1000 km																																						
Thermohaline circulation	100–1000 years	1000–10000 km																																						
51.	5.25.	<p><del>The ocean general circulation model should consider wind driven circulation and thermohaline circulation to</del></p>	<p>Since use of a general circulation model that</p>		x		Text is revised.																																	

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page 36					
Country/Organization: Japan / NRA		Date: 06, Oct., 2023					
No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		<del>represent the global scale. Global models are typically used as a boundary condition for the regional model that represents the target ocean.</del> The regional model should represent the relevant physical oceanographic phenomena, such as <del>tides</del> , mesoscale eddies, swells and wind waves, in order to represent the topography and ocean currents specific to the target area. A high resolution model with a grid size of a few kilometres is often used near the coast, and a low resolution model with a grid size of 10–100 kilometres is used in the open ocean.	includes marine areas in the site evaluation does not necessarily provide the information needed for the assessment to be adequate, technically inaccurate descriptions should be removed.				The guide does not impose the use of these models but it states they could be used when appropriate.

Reviewer: USNRC							
Country/Organization: USNRC			Date:10/6/2023				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
54.	5.14	See comments.	There seems to be very little guidance on modeling estuaries which is a very complex topic. Suggest expanding the guidance.	x			
57.	5.26	It is recommended that additional guidance is needed in the draft document with respect to (model) calibration.	For a facility to be built or licensed, there are no (baseline) releases to be compared against for the purposes of decision-making. For an existing facility, there may be no planned/continuous releases only events such as accidents, that once again have no data available.	x			
58.	5.28, 5.29	It is recommended that guidance on event scenarios for surface water releases be	The guidance provided is for continual releases not for discrete events.	x			



		added to the guidance document.				
59.	5.32	The intent of the following (second) sentence is unclear: “These flow phenomena can be simplified according to their complexity.”	Recommend clarification.	x		It is deleted.

## Comments on Section 6

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer:		Page.... of....					
Country/Organization:		FINLAND / STUK					
Date: 4.4.2023							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
15	6.13 g), p. 48	Sorption characteristics of the specific radionuclide onto sediments/rock matrix.	Nuclear installations (e.g. storage facilities) can also be located in crystalline rock. The proposed text is covers wider range of rock environments.	x			
16	6.13, p. 48	i) diffusion properties	Add diffusion as a new point to be consistent with Paragraph 6.5 b). Solute exchange mechanisms between the flowing fractures and surrounding rock matrix are of interest e.g. in crystalline rock environments.	x			When the flow velocity is very low as it may be in crystalline rocks, diffusion can be an important process. “i) diffusion properties” is added.

17	6.23 f), p. 51	produced from the groundwater levels measured in a sufficient number piezometers.	A more general formulation fitting better to heterogeneous environments as well.	x			
18	6.31 a), p. 52	Ignoring the role of the unsaturated zone;	Instead of vazoze, unsaturatezd zone is used otherwise in the guide	x			
19	6.33, p. 53	... more hydraulic and transfer parameters need to be determined, such as dispersivity, diffusion coefficients, distribution coefficients, ...	Add diffusion as a new point to be consistent with Paragraph 6.5 b), see also comment 2	x			

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
3	85.	6.2	The hydrosphere is a major medium by which radioactive material that <del>are</del> <u>is</u> released from a nuclear installation via discharges or accidental releases could be dispersed into the environment and transferred to locations ...	Editorial.	x			
2	86.	6.12	The protection of aquifers from accidents should be considered in the safety analysis for postulated accident conditions, <u>taking into consideration and a geological barriers. to provide protection should be considered. If required according to the results of the analyses, building of a protection barrier should be deemed.</u>	Clarification, as available geological barriers should be considered in the safety analysis as well. Additionally, as a result of safety analysis, building of a protective barrier might be necessary.		x		
2	87.	6.13, bullet (b), item (i)	The following properties and parameters should be estimated for radioactive discharges: .... (b) Chemical properties, including the following: (i) Important anion and cation concentrations, and their oxidation states and complexing states (e.g.- <del>Ca<sup>2+</sup>, K<sup>+</sup>, Mg<sup>2+</sup>, Na<sup>+</sup>, NH<sub>4</sub><sup>+</sup>, HCO<sub>3</sub><sup>-</sup>, Cl<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup>, PO<sub>4</sub><sup>3-</sup>, Ca<sup>2+</sup>, K<sup>+</sup>, Mg<sup>2+</sup>, Na<sup>+</sup>, NH<sub>4</sub><sup>+</sup>, HCO<sub>3</sub><sup>-</sup>, Cl<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup>, PO<sub>4</sub><sup>3-</sup></del> ); .... <u>(vi) E<sub>h</sub> value (redox potential)</u> <u>(vii) CO<sub>2</sub> partial pressures</u>	In addition to the chemical properties mentioned, the E <sub>h</sub> value also plays a decisive role in the chemical speciation and thus the transfer of various radionuclides in the groundwater. It should be added.  Please add also CO <sub>2</sub> partial pressures.  Furthermore, microbial activities can also significantly impact		x		In groundwater environment, microbial activities are not important to include here.

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			..... <u>(x) microbial activities</u>	mobilization/immobilization of radionuclides. This fact also should be addressed.				
2	88.	6.21, Line 2	... The preliminary conceptual model should be tested by an appropriate mathematical model (defined in paras. <u>6.25–6.33</u> <del>6.26–6.34</del> ) using the monitored data ...	Please check references	x			Number of paras has been changed.
2	89.	6.23, bullet (h)	Artificial or environmental tracers such as tritium, the <del>helium:tritium</del> ratio of <u>helium to tritium</u> (where tritium is close to the natural background), or other appropriate tracers ...”	Clarification	x			
2	90.	6.31, last sentence, bullet (a)	“Ignoring the role of the <u>unsaturated</u> ( <u>vadose</u> ) zone;”	Terminological clarification.	x			
1	91.	6.33	In order to use more complicated models (e.g. a combination of all processes), more hydraulic and transfer parameters need to be determined, such as dispersivity, distribution coefficients, kinetic reaction rates and half-lives. See Section 10 and the Appendix for recommendations <del>on the application of a graded approach</del> for different reporting stages.	Term “graded approach” is used for a system of control, such as a regulatory system or a safety system, a process or method in which the stringency of the control measures and conditions to be applied is commensurate, to the extent practicable, with the likelihood and possible consequences of, and the level of risk associated with, a loss of control (GRS-Part 3). Application of term “graded approach” for reporting stages is misleading. Please			x	Please see our response to your comment 7.

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
				change here and all over the text.				
3	92.	6.34	(c) <del>Groundwater</del> Ground water used for agriculture;	Editorial	x			
2	93.	6.40	... The model itself is one source of uncertainty; (see para. <del>6.35-6.36</del> ), and the other is associated with the scenario.	Check the references please	x			Number of paras have been changed due to editing.
1	94.	6.41	Primarily, simulation under <del>normal conditions</del> <u>operational states</u> (discharge) should be run for different scenarios. Scenarios should be based on the expected future changes in natural conditions, and on the design of the installation. Changes in the meteorological and hydrological conditions during the lifetime of the installation and the release of radionuclides during <del>normal</del> operation ( <u>normal operation and anticipated operational occurrences</u> ) should be simulated for a period of time covering at least the lifetime of the installation. Changes in meteorological parameters such as precipitation, temperature (evaporation and evapotranspiration) and land use, which affect surface runoff and evapotranspiration should be taken into account. The exposure pathways defined in para. <del>6.34</del> <u>6.35</u> should also be considered.	This is not limited to normal operation and affects AOOs too.			x	Please see our response to your comment 12.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page					
Country/Organization: Japan / NRA		Date: 4, Apr., 2024					
No.	Para/Line No.	Proposed new text	Reason				
3.	6.10.	Considering their <del>limitations—characteristics</del> , analytical models for groundwater flow and radionuclide transport <del>should—may</del> be applied as an initial prediction because, in <del>most-some</del> cases, they <del>may</del> involve a high level of simplification of the real system. Additionally, the assumptions in these models limit their application to relatively simple systems. Therefore, <del>they careful consideration</del> should be <del>considered as inappropriate for most practical groundwater problems given in selecting analytical models regarding groundwater flow and radionuclide transportation.</del>	Clarification. If a simplified analytical method can produce investigation results that meet the objectives, there could be cases where further detailed investigation might be not necessary. It should be stated here that evaluation methods (including simplified analytical) should be carefully selected corresponding to the purpose of the investigation.		x		Text is revised.
4.	6.17.	Inadequate conceptualization is one of the main sources of uncertainty and may result in models for the transfer of radionuclides that are unreliable. Inadequate consideration of spatial variations of hydrogeological parameters might also adversely affect the results. <u>Consideration should be given in using</u> simple hydrogeological models <del>that</del> might not produce a conservative assessment of the system behaviour.	Clarification. The third sentence should be revised to clarify the intent of recommendations.	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page					
Country/Organization: Japan / NRA		Date: 4, Apr., 2024					
No.	Para/Line No.	Proposed new text	Reason				
5.	6.21.	An iterative approach should be used in the process of construction of a hydrogeological conceptual model. The preliminary conceptual model should be tested by an appropriate mathematical model (defined in paras <del>6.24-6.33-6.26-6.34</del> ) using the monitored data and refined until improvements in the predictive capability of the model are, practically, not necessary.	Missing referred para. numbers.	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC		Date: 04/26/2024					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
16	6.23	Both local and regional information should be collected to identify the hydrogeological system and <b>determine if the preferential flow paths are present.</b>	It shouldn't be assumed that preferential flow paths will be present.	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: ENISS		Page 1 of 7		ENISS			
Country/Organization: ENISS		Date: May 2024					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection

7	6.5	<p>The information necessary to perform dose assessment relating to exposure pathways in the hydrogeological system includes the following (see Section 7 for assessment of doses using the radionuclide concentrations calculated from groundwater transfer analyses discussed in this section):</p> <p>(a) The source term <del>for the discharge</del> of radioactive material to the groundwater system</p>	Proposed modification to be generic. In fact, in most cases it would apply to accidental releases	x			
8	6.34	<p>Possible exposure pathways for <del>releases of</del> radionuclides to groundwater during normal operation such as nuclear power plants are as follows:</p> <p>(a) Boreholes, wells and galleries used to abstract water for drinking;</p> <p>(b) Springs captured for drinking water;</p> <p>(c) Ground water used for agriculture;</p> <p>(d) Discharge (or emergence) as base flow to streams, rivers, lakes or wetlands (ingestion of drinking water and/or aquatic food such as fish,</p>	For enhancing clarity of the text, given that releases is often used in the guide as referring to accident conditions, while here the focus is on normal operation	x			



		<p>crustaceans and molluscs;</p> <p>(e) Discharge to sea (ingestion of aquatic food, external exposure through activities such as swimming and fishing).</p>					
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## Raming

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page 36					
Country/Organization: Japan / NRA		Date: 06, Oct., 2023					
No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
	Before 6.1.	<p>When conducting hydrogeological surveys on the premises of nuclear installations, it is necessary that" the resources devoted to assessment and control, and the scope and rigor of regulation, be consistent with the magnitude of the radiation risk and the extent to which the exposures are amenable to control".</p> <p>For nuclear installations installed on a land basis, the radioactive releases from the surface of the installations are assumed to be more dominant than the groundwater transportation route, both in normal and accident conditions. It is assumed that the transport of radionuclides in groundwater has little impact on the site evaluation for nuclear installations.</p> <p>Therefore, from the perspective of a graded approach, hydrogeological surveys should be</p>	<p>The application of the graded approach in the conduct of hydrogeological study is described in parts of Chapter 6 (Section 6.43 and Appendix).</p> <p>It should be stated at the beginning of Chapter 6 that this basic concept will be consistently applied to the overall hydrogeological study described in Chapter 6.</p>	x			A new para. is added (para. 6.2).

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page 36					
Country/Organization: Japan / NRA		Date: 06, Oct., 2023					
No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
		<p>conducted corresponding to their grade. (e.g., Characteristics of the site in 10.5. (j) )</p> <p>When conducting a hydrological survey, groundwater contamination from nuclear installations should be examined and determined. Then, it is necessary to assess the risk stemming from the groundwater contamination and compare it with other risk. It is important to select appropriate surveys and evaluations for individual sites based on these assessments.</p> <p>This chapter provides examples of investigation evaluation methods when detailed investigation is necessary.</p>					
57.	6.10.	<p>Considering their limitations, analytical models for groundwater flow and radionuclide transport should be applied as an initial prediction because, in most cases, they involve a high level of simplification of the real system. Additionally, the assumptions in these models limit their application to relatively simple systems.</p> <p><del>Therefore, they should be considered as inappropriate for most practical groundwater problems.</del></p>	<p>Given that sometimes a simple model is sufficient to achieve the objective, the descriptions that is not technically rational should be removed.</p>		x		Text is revised.
58.	6.13.	<p>The following properties and parameters should be estimated for radioactive discharges:</p> <p>(a) Radioactivity:</p> <p><u>(i) Rate of discharge of each important nuclide;</u></p> <p><u>(ii) Total activity discharged in a specific period-</u> <del>and its fixation capacity on soils.</del></p>	<p>(1) Assumptions about releases (location, amount, and concentration) are important since the nuclear facilities covered by this guide do not directly discharge radioactive materials into the groundwater system during their normal operation. However, these descriptions are not</p>		x		<p>Comment 2 is accepted..</p> <p>For Comment 1, text is revised.</p>

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page 36					
Country/Organization: Japan / NRA		Date: 06, Oct., 2023					
No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			included in (a) (i) and (ii). Please add the method for these items.  (2) In addition, the items and content of the descriptions do not match. "fixation capacity on soils" should be deleted.				
59.	6.17.	Inadequate conceptualization is one of the main sources of uncertainty and unreliability in the analysis of the transport of radionuclides. A lack of well represented spatial variations of hydrogeological parameters might also adversely affect the results. <del>It should also be considered that simple hydrogeological models might not produce a conservative assessment of the system behaviour.</del>	The inability to evaluate properly is not an issue with the simple hydrogeological models themselves. It would be a problem that occurs when the evaluator does not give sufficient consideration when simplifying the model while ensuring maintainability.			x	What is meant here is not related to the incompetence of the modeler. A competent modeler sometimes may use simple models (not complicated ones) to make a conservative prediction.

Reviewer: USNRC							
Country/Organization: USNRC			Date: 10/6/2023				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
6.	p. 45, Sec. 6.31(a)	Recommend that consideration be given to amending the text in question to better understand what the IAEA's intent is in the	In the case of unconfined aquifer systems, the vadose (unsaturated) zone can potentially have a significant effect on contaminant fate and transport in groundwater	x			The guide suggest to characterize the unsaturated (vadose) zone due to its effect on the

		<p>matter of vadose zone characterization.</p>	<p>modeling owing to the presence of sorption coefficients or <math>K_{ds}</math> (or <math>R_{fs}</math> as described in DS529). It is not clear why DS529 acknowledges the potential for ignoring this key aspect of the groundwater system in connection with the abstraction process of the subsurface geology.</p>				<p>fate and transport of contaminant. The vadose zone is the zone where processes that significantly affects the concentration of the contaminants in general. It, for most of the contaminants reduces the concentration and retards its movements toward the saturated zone. Therefore, ignoring the effect of the vadose zone leads to higher concentration and faster movement of the contaminant in the groundwater (saturated zone) system. In turn this allows to make a conservative prediction (staying at the safe side) at the first stage of site evaluation. A few lines will be added to the text to further clarify.</p>
66.	6.21	See comments.	<p>In reference to the phrase “the predictive capability of the model,” how does one do this if there are no observations, such as for facilities where the only releases will be accidental? It is recommended that additional guidance (text) elaborating on this point be provided.</p>	x			<p>The iterative approach is recommended to test the accuracy (representativeness) of the conceptual model. Prediction refers to mainly the flow (head</p>

							distribution). Monitoring the temporal variation of groundwater levels provide the time-series needed to check the capability of the model by comparing the predicted head with the monitored data. The issue can be elaborated in the text.
67.	6.24	See comments.	In reference to the last sentence " <i>Predictive models, on the other hand, need to be calibrated,</i> " For most facilities, especially new ones, there is no data on radionuclide transport. While the hydrology can be calibrated the transport cannot. We suggest rethinking this point.	x			Calibration mainly refers to flow models, with the assumption that a calibrated flow model will provide a substantial basis for a successful transport model. On the other hand, calibration of transport models can be achieved by tracer tests, considering advective and dispersive transport only. This can be elaborated accordingly.
68.	6.28	See comments.	In reference to the following sentence " <i>Stochastic models are usually used to consider strong heterogeneity and occurrence of preferential flow paths,</i> " it is observed that stochastic models are used when there are significant sources of uncertainty, which may have nothing to do with preferential pathways. Suggest revising to make more general. In addition, the term "probabilistic" is typically	x			"Occurrence of preferential flow paths" is considered as one of the sources of heterogeneity. The recommendation to make it more general is acceptable.

			used in place of “stochastic” which is usually limited to hydrology.				
69.	6.34	Recommend adding a reference to discharges to the sea or estuaries.	It is observed that estuaries are not mentioned/referenced in this section.	x			
70.	Between §§ 6.38 & 6.39	Recommend renaming this section as follows: SCENARIO BASED SIMULATION OF RADIONUCLIDE TRANSPORT IN GROUNDWATER	We recommend that either the term “scenario-based” be described or defined as it is observed that the concept has not been addressed in the text or the title be amended.	x			A definition of the scenario-based is added to the text. It actually means to run the calibrated model to simulate different regular and/or accidental release scenarios (plausible cases) of contaminants.
71.	6.40	See comments.	The draft text here is a mixed and in our view is an incomplete representation and discussion of uncertainty. For example, there are many types of uncertainty commonly encountered in contaminant flow and transport analyses, such as: conceptual model uncertainty, numerical model uncertainty, parameter uncertainty, exposure scenario uncertainty, exposure parameters uncertainty, etc. We recommend that this paragraph be revised and expanded.	x			The guide is normally designated to provide guidelines rather than giving details of the steps, procedures and methodologies. For the sake of integrity of the guide and not to violate the “balance” among chapters, some further explanations have been avoided. A text can be added to make the analyst analyze different sources of uncertainty, however, is not

COMMENTS BY REVIEWER	RESOLUTION
Reviewer: ENISS Country/Organization: ENISS	ENISS
Page 1 of 17 Date: 06/10/2023	

Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
38	6.34	<p>Possible exposure pathways for releases of radionuclides to groundwater during normal operation of nuclear installations such as nuclear power plants are as follows:</p> <ul style="list-style-type: none"> <li>(a) Boreholes, wells and galleries used to abstract water for drinking;</li> <li>(b) Springs captured for drinking water;</li> <li>(c) Ground water used for agriculture;</li> <li>(d) Discharge (or emergence) as base flow to streams, rivers, lakes or wetlands (ingestion of drinking water and/or aquatic food such as fish, crustaceans and molluscs;</li> <li>(e) Discharge to sea (ingestion of aquatic food, external exposure through activities such as swimming and fishing).</li> </ul>	<p>6.34 is not understood. It looks as if there is confusion between exposure pathway and the means for contamination to reach groundwater.</p> <p>Content to be reconsidered</p>	x			Text is revised.

## Comments on Section 7

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dr. A.F.M. Mizanur Rahman Country/Organization: Bangladesh Atomic Energy Commission			Page.... of..... Date:				
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	Page -60 Para -7.24 Line no.23	It was mentioned in the text "7.24. The components of the radiological impact on the public from accidental releases is shown in Fig. 3 of GSG-10 [7]." Fig.3 of GSG-10 could add in this text also.	Similar reason as given for comments 1.			x	Figure cannot be reproduced in this publication due to IAEA style.
7	Page -61 Para- 7.28 Line - 8	It was mentioned in text. “(c) Shall arrange with the affected State the means for the exchange of information and consultations, as appropriate.” It can be written as (c) Shall arrange with the affected State the means for the exchange of information and consultations, as appropriate.”	Typing error.	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Dr. M. Moinul Islam, Director, Physical Science Division Country/Organization: Bangladesh Atomic Energy Commission			Page. 1 of. 2 Date: 15 Feb 2024				
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
10	Para: 7.11 Line I, Page: 50	In new text repetition of word 'considered' may require to be changed	To understand an appropriate meaning of the sentence	x			Text is revised.



COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Canadian Nuclear Safety Commission Country/Organization: Canada			Page 1 of 18 Date: April 30, 2024				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
30.	Fig. 1		<p><b>Comment:</b> There is mention of radiological exposure to biota, but text in sections that follow is very human centric. Consider adding another column to Table 2 to include dose to biota and associated additional text and/or table rows as appropriate. Alternatively, remove reference to biota and consider pointing to other guidance where biota are considered.</p>	x			

31.	7.15	<p>“The representative person may be different for normal operation and accident conditions at the same site or installation. <u>For accidents conditions, the role of the accident management program in power reactors in stopping the accident progression to become a severe accident or delaying its progression need to be considered (see para 2.14 in SSG-54 [xx]). Early halt of accident progression or slower progression rate of severe accident give time to enforce off-site emergency response actions which reduces the diversity in public habits; and hence a more realistic representative person assumption can be made.</u> Possible representative persons for an accidental release from a nuclear installation could be as follows:...”</p>	Suggested addition for clarity.			x	Full spectrum of accidental releases including severe accidents needs to be assessed regardless of any accident management programme.
32.	7.21		<p><b>Comment:</b> In what normal operation situation would one not consider exposure to animals and plants? Please include example if there's a normal operation situation where one doesn't need to take exposure to animals and plants into consideration. For species, protection of individual is needed for species at risk.</p>			x	See GSG-10 paras 5.78 and 5.79. Some Member States have not agreed to a specific requirement to assess exposure to plants or animals.

33.	7.14 to 7.22		<b>Comment:</b> Section 7.14 to 7.20 focuses on humans, whereas Section 7.21 to 7.22 focuses on animals and plants. Consider sub-headings.			x	Noted but not sure it adds any clarity.
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COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	95.	7.1	<p>Recommendations on the characteristics of a nuclear installation site that form the basis for radiological impact assessment are provided in Sections 3–6. These characteristics primarily relate to meteorological and hydrological conditions, topography, population distribution and habits, land and water use, natural background radioactivity, and food production and consumption in the vicinity of the site. These site characteristics and where they are used in the radiological impact assessments for a nuclear installation are shown in Table 2 and Fig. 1.</p>	<p><b>Recommendations on the characteristics</b> of a nuclear installation site that form the basis for radiological impact assessment are provided in Section 3.</p> <p>However, Sections 3–6 provide <b>recommendations for characterizing</b> a nuclear installation site that form the basis for radiological impact assessment.</p> <p>Please clarify, which formulation is more suitable. We made a suggestion.</p>	x			
1	96.	7.2	<p>In addition to the characteristics summarized in Table 2 and Fig. 1, <del>there are</del> other site characteristics, considered in site evaluation for a nuclear installation, <u>which</u> <del>They</del> relate to natural external hazards and include seismicity, slope instability, subsidence, soil liquefaction,</p>	<p>The current statement is very important and should be mentioned at the very beginning of this Safety Guide. Please move essential parts and reformulate accordingly. We made a suggestion.</p>		x		

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<p>volcanism, flooding, and extreme meteorological events (e.g. high winds, tornados, storms, precipitation), as well as to human-induced events such as potential incidents in other nuclear or non-nuclear facilities and in land, water and air transference corridors in the vicinity of the site (<a href="#">see para. 1.12A</a>). - These characteristics are covered in more detail in SSG-18 [15], and IAEA Safety Standards Series Nos SSG-9 (Rev.1), Seismic Hazards in Site Evaluation for Nuclear Installations [18], SSG-21, Volcanic Hazards in Site Evaluation for Nuclear Installations [19], NS-G-3.6, Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants [20] and SSG-79, Hazards Associated with Human-Induced External Events in Site Evaluation for Nuclear Installations [21]. These other characteristics are also considered in the analyses for determining the types of safety features that are incorporated into the design of a nuclear installation, and the frequency of potential accident scenarios during the operation of the installation. Therefore, these design characteristics also affect the radiological impacts of nuclear installations either by altering the source terms (the quantities, physical and chemical form, and timing of</p>					

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			radionuclides released to the environment during an accident) or by changing the frequency of potential accident scenarios. Source terms have a strong influence on the doses from individual accident scenarios and the frequency of accidents has a direct effect on the total radiological risk from a nuclear installation (see paras <del>7.27-7.30</del> 7.26-7.29).					
2	97.	7.5 (b)	The ingestion dose of an individual consumer of a particular food type should be determined by combining the following: .... (b) The ingestion rate for an individual food consumer, usually determined from the habit surveys <u>and considering various age groups</u> ;	Food rates are different for different age groups, please add.	x			
2	98.	7.7	The total dose for any given individual is the sum of all <u>dose</u> contributions listed in paras <del>7.3</del> 7.4-7.6 ( <u>i.e. inhalation, ingestion and external exposure</u> ).	Clarification	x			
2	99.	7.12 Line 5	... dilution in large bodies of water can occur, and the water provides some shielding (see <u>para. 2.28</u> <del>Section 2</del> ) reducing the exposure of any people in the vicinity.	Clarification	x			
2	100.	7.18	For an atmospheric release, the radiological consequences <del>are</del> strongly dependent on the meteorological conditions at the time of the release; for example, the number of people exposed and the level of exposure for	Clarification  See also comment on para 4.4.		x		

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<p>individuals are very different for a coastal site if the wind is blowing out to sea or blowing inland at the time of the release <u>different wind directions and wind speeds. Amongst others,</u> Level 3 probabilistic safety assessment <u>PSA considers</u> takes into account the consequences of each accident scenario under a range of meteorological conditions combined with the likelihood of these conditions occurring <u>and therefore may be applied to supplement deterministic assessments,</u> among other factors. If applying a graded approach to lower risk installations, <del>then</del> it may be acceptable to use a single set of bounding meteorological conditions.</p>					
2	101.	7.32, lines 9 to 10	<p>.... <del>The environmental management plan</del>            Some States may not require such a combined document but instead may require individual plans for specific issues. The environmental monitoring programme, which is discussed in Section 8 of this guide, should be a part of the environmental management plan.</p>	Please delete	x			

Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
7	7.21	Where exposure of animals and plants is considered, this is usually for only normal operation. Care should be taken to protect the more highly exposed population groups of a species rather than <del>individual</del> <b>individual</b> members of species within those groups.	Spelling Mistake	x			
10	7.28,7.293.9,4.8	Para is required to be elaborated further for implementation of arrangements as two or more States will be involved. An arrangement in the form of protocol or bilateral agreement is to be worked out in advance with neighbouring countries	An arrangement in the form of protocol or bilateral agreement is to be worked out in advance with neighbouring countries			x	This is outside scope of this publication.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Country/Organization: Russia / State Atomic Energy Corporation "Rosatom" Rostekhnadzor / SEC NRS			Page: Date:				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
5	Section 7.15	Add a point: "e) pregnant woman (fetus)".	There is no such representative as a pregnant woman (fetus) for emergency situations. This approach removes excessive conservatism, And, in our opinion, is more correct.			x	Representative person is 95th percentile of most exposed people and given fraction of pregnant women in the overall population, the representative person

							is unlikely to be pregnant.
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COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Eamonn Guilfoyle and Graeme Burt Page.1 of 1. Country/Organization: UK/ONR 2024				Date:26 April			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
6	7.7	The total dose for any given individual is the sum of all contributions listed in paras 7.4–7.6	Paragraph 7.3 doesn't feed directly into the calculated dose for an individual.	x			
7	7.11	The individual doses for <del>the</del> all the accident conditions <b>considered</b> should be considered for comparison with dose constraints and dose limits (see Fig. 2 of GSG-10 [8]). The possible different release routes (i.e. atmosphere, surface water or groundwater) and different pathways for the same release route might result in many different groups of people being exposed to differing extents.	Removal of additional 'the' in the text and considered is repeated in the first sentence.	x			
8	7.15b and c 7.16	An <b>infant female</b> high-rate local food consumer living in the nearest population centre (e.g. a village)	Further explanation is required here as to why an infant consuming locally produced food has been excluded from consideration as a representative person while an adult is included.			x	Firstly, these are just possible examples and do not exclude other possibilities. Secondly, in line with ICRP



			There have been several studies demonstrating higher radio-sensitivities in females and younger age groups and ICRP Publication 147 provides age- and sex-specific factors in relation to stochastic health effects.				guidance, as set out in para. 7.14, the selection of representative person should not be overly conservative (Approximately 95th percentile according to ICRP-101).
9	7.19	Level 3 probabilistic safety assessment usually samples from an hourly data set of <del>recent</del> historic data measured or calculated for the site as described in Section 4.	In Section 4 historical meteorological data is used for a Level 3 PSA. For consistency with Section 4 I would remove the reference to recent historic here.	x			
10	7.25	<b>Framework</b> and its application for radiation protection of members of the public and protection of the environment in planned exposure situations, emergency exposure situations and existing exposure situations. are provided in IAEA Safety Standards Series No. GSG-8, Radiation Protection of the Public and the Environment [26]. The principles of justification, optimization of protection and dose limits, where appropriate are also covered in GSG-8 [26].	I am not sure what Framework is being referred to in this paragraph?	x			Text is revised.
11	7.32	As part of the application for a licence for a new	There was a stray full stop at the end of the paragraph.	x			

		nuclear installation project, the applicant prepares, and the regulatory body reviews, an environmental management plan which is a comprehensive document that identifies, among others, the actions to be taken (including any mitigation measures that are included in the environmental impact assessment report and licensing conditions imposed by the regulator), responsibilities, reporting, and processes for implementing 62 corrective actions if needed.					
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COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC			Date: 04/26/2024				
Comment No.	Para/ Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
15	Page 57, Figure 1	It is not easy in this form process to submit a revision to your figure.	The figure is confusing because of the organization of the boxes and design of the figure. Suggest revising the figure to make the flow of information through the stages more clear. It is also likely to be advantageous to make one figure for normal continuous releases and one for accidents as they can be substantially different.			x	Left-hand part of the figure is taken from IAEA GSG-10. Given that the data required (boxes on the right) is largely the same, it is convenient to have one figure to present normal and potential exposure scenarios.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: ENISS		Page 1 of 7		ENISS			
Country/Organization: ENISS		Date: May 2024					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
9	7.11	<del>The individual doses for the all the accident conditions considered should be considered for comparison with dose constraints and dose limits (see Fig. 2 of GSG 10 [8]). The possible different release routes (i.e. atmosphere, surface water or groundwater) and different pathways for the same release route might result in many different groups of people being exposed to differing extents.</del>	The paragraph is not clear, hence we propose to delete it unless an improved version could be proposed.	x			Para. 7.11 is slightly improved.

### Comments on Section 8

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Canadian Nuclear Safety Commission		Page 1 of 18		RESOLUTION			
Country/Organization: Canada		Date: April 30, 2024					
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection

34.	8.2		<b>Comment:</b> Consider mention of chemical and physical parameters to include in baseline monitoring program (e.g., chemical contaminants, noise). Only radionuclides are discussed, but nuclear installations need to include chemical and physical parameters in monitoring program. It is noted in Section 8.26, so maybe consider referencing this section.			x	Non-radiological impacts are beyond the scope of this publication.
35.	8.6/8.10		<b>Comment:</b> Sampling locations and monitored parameters should also be selected considering the results of the site environmental risk assessment, which should be used to inform monitoring program design.			x	We cannot say sampling locations and monitored parameters should also be selected considering the results of the site environmental risk assessment if there is no specific IAEA requirement to that effect.

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	102.	8.3	The environmental monitoring programme should commence well before the start of construction of the	In addition to temporal trends, the natural variability of environmental			x	There is no IAEA requirement

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			<p>installation and sufficiently before operation to be able to identify the natural variation as well as any trends in the background levels of radioactivity. <u>The monitoring must include man-made radionuclides at a level that is required for estimations of doses at a de-minimis-level.</u></p> <p>For example, if the levels of a particular nuclide are falling prior to the start of operation, then they would be expected to continue to fall in the absence of any new releases from the installation.</p>	<p>radioactivity should be specifically taken into account. It is not sufficient to determine a level of activity concentrations of certain radionuclides. The variability of these values should be specifically taken into account and reported. In order to obtain this information repeated sampling at specific sites is necessary. Therefore, this aspect should be mentioned here.</p> <p>The requirement that every trend must be recognised is linguistically problematic. This can lead to disproportionate requirements for monitoring radionuclides that do not normally occur in nature or only in traces that are insignificant in terms of radiation protection (e.g. plutonium). For this reason, the monitoring requirements should be specified in such a way that disproportionate requirements are not imposed.</p>				to reference to this aspect.
	103.	8.12 Line 10	... The control locations (see para. <del>3.26</del> <u>3.35</u> ) that are outside the region of influence of the nuclear installations	Clarification	x			

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			should continue to be sampled regardless of their distance from the installation.					
2	104.	8.13	As recommended in para. 5.14 of RS-G-1.8 [28], arrangements for emergency preparedness should be considered carefully for any conceivable emergency when implementing the monitoring programmes during the pre-operational stage.	RS-G-1.8 is currently under revision as DS505. Such a reference might be wrong with a new review of RS-G-1.8.	x			It is noted. It will be implemented during publication.
3	105.	8.16 Line 3	... Samples from the environmental media should be taken and analysed on a schedule that depends on the half-lives of the radionuclides that could potentially be discharged from the installation, <del>its</del> <u>their</u> way of discharge, and also in correspondence to the objective of the analysis to be made. However, the frequency and the number of samples ...”	Editorial	x			
3	106.	8.23 Line 7	“... and RS-G-1.8 [28] <u>recommends</u> <del>indicates that</del> , during an emergency, individual monitoring should be conducted, together with source and environmental monitoring, to determine whether decontamination or medical follow-up of people in the emergency zones is warranted.	Editorial	x			
2	107.	8.24	For a nuclear installation, the ‘other parameters’ <del>should</del> <u>might</u> include the following: (a) Population distribution (permanent and temporary) and characteristics (e.g. age, gender);	We suggest to change “should” to “might”, as such level of detail (and burden to the operator) should be applied to the cases where it is really relevant, for			x	This basic data is necessary.

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>								
					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			(b) Population habits (e.g. food consumption rates, proportion of time people spend indoors and outdoors); .....	instance for complex fuel cycle installations with a wide range of potential releases.				
1	108.	subheading after 8.26	Monitoring following cessation of operations <u>(permanent shutdown)</u>	<p>It is recommended amending the subheading to clarify that the subsection with paras 8.27–8.29 does not cover temporary suspension of operations, for example for modification and/or refurbishment of a nuclear installation for the purpose of extending its design lifetime, which could necessitate major design modifications and re-evaluation of safety of the installation.</p> <p>For the subject matter dealt with in this subsection, the term ‘permanent shutdown’ is found in the IAEA Glossary as “the cessation of operation of a facility with no intention to recommence operation in the future.”</p>	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Country/Organization: Russia / State Atomic Energy Corporation “Rosatom” Rostechnadzor / SEC NRS				Page: Date:			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
2	Section 8.2	... In the case of discharges, the activity concentrations detected in environmental monitoring are usually very low under the detection limits, and consequently in most cases the dose calculations are based on source monitoring data and appropriate modelling	When activity concentrations in environmental monitoring could be detected they could be used for the dose calculations. on the other side, measurements of source could be under the detection limits (RS-G-1.8,p.8).		x		Text is revised.

## Comments on Section 9

COMMENTS BY REVIEWER				RESOLUTION				
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>				Pages: 50 Date: 08.04.2024				
Relevance	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification /rejection
2	109.	9.2	Any adverse conditions surrounding the site that could hinder off-site	Clarification	x			



COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification /rejection
			emergency response actions ... should be identified and evaluated (e.g. in a <del>transfer</del> <u>transport</u> analysis, see para. <del>9.9</del> <u>9.8</u> ) and ...					
3	110.	9.3 Line 2	... IAEA Safety Standards <u>Series</u> No. GS-G-2.1, Arrangements for Preparedness for a Nuclear or Radiological Emergency [36]. <u>provides recommendations on</u> <del>suggests</del> emergency planning zone and area sizes.	Editorial	x			
1	111.	9.11 (h)	Many site related <del>factors</del> <u>aspects</u> should be <del>taken into account in evaluating the feasibility of planning</del> <u>considered in assessing the planning of</u> effective emergency response actions. The most important ones are: .... (h) <del>Possible concurrent external events (e.g. earthquake with flooding).</del> <u>In line with SSG-3, SSG-4 and TECDOC ... [reference of TECDOC on Combinations of External Hazards actually under preparation which will be published in 2024], combinations of all three types (consequential, correlated or coincidental) of external hazards identified to be possible to occur at the site being investigated.</u>	Please put in line with SSG-3, SSG-4 and upcoming TECDOC.		x		Text revised.
2	112.	9.15	<del>It is possible that</del> <u>The</u> conditions assessed for the <del>purposes of</del> approval of the site and design <del>will</del> <u>may</u> change over time. The site characteristics considered in the off-site emergency plan, such as infrastructural	Clarification	x			

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>								
					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification /rejection
			developments, should <b>therefore</b> be reviewed periodically during the operational phase of the nuclear installation. Level 3 probabilistic safety assessment may be used in performing such reassessments <b>in addition to other types of assessments.</b>					

Reviewer: PAEC Country/Organization: PAKISTAN/ Pakistan Atomic Energy Commission (PAEC)			Page 1 of 4 Date: 09-04-24					
Comment No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection	
8	9.9	A transport analysis (e.g. road and/or <b>railand /or through ship/boat</b> ) should be performed to demonstrate that the transport infrastructure for multiple evacuation routes	Most of nuclear installation are located near some water body. So evacuation through ships may also be considered along with road and rail if appropriate.			x	Example of road and rail are given only.	
11	Chapter 9	Text, legends insides Figure 2,3 and 4 may be enhanced in size and quality. Sizes of the objects, animals, plants may be increased	Space is available			x	This will be taken care during publication.	

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Eamonn Guilfoyle and Graeme Burt Page.1 of 1. Country/Organization: UK/ONR 2024				Date:26 April			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	9.4	<p>Geographical features of the landscape that might make off-site emergency response actions difficult to implement include physical barriers that would impede evacuation, such as rivers or mountains.</p> <p>Administrative restrictions associated with national parks or other protected environments might also present the same difficulties. <b>If evacuation is likely to be required, then as a high level principle, there should be at least two evacuation routes in different directions to offer various itinerary options for the implementation of precautionary urgent or urgent protective actions that involve road transportation during a nuclear or radiological emergency. If this is not possible owing to geographical features, administrative</b></p>	<p>This requirement is not in NS-G-3.2. Furthermore, This paragraph presumes that evacuation would be required for all in-scope facilities, and further sets prescriptive requirements about the road transport infrastructure required to facilitate an evacuation. Existing and future reactor designs (e.g. SMRs/ANTs) may make evacuation inappropriate and, additionally, member states should be free to be infrastructure agnostic as to how they deliver any evacuation requirement.</p> <p>The text in blue (and the associated figures) would be better suited for inclusion in an appropriate IAEA-TEC DOC or EP&amp;R Series guidance.</p> <p>If the blue text must be retained, then the text proposed (in red) introduces the required flexibility. (Additionally the reference to</p>	x			

		<p>restrictions or other reasons, the site should be considered unsuitable for a nuclear installation. Examples for an unsuitable site are provided in Fig. 2 and 3. Example for a suitable site are provided in Fig. 4.</p>	<p>“emergency response actions” in the first sentence would need amending to ‘protective actions’.)</p>				
2	Figure 2	<p>Example of a <b>potentially</b> unsuitable site — a physical barrier (river) preventing construction of an alternative evacuation route in another direction – site <b>potentially</b> unsuitable if a bridge is not constructed or alternative evacuation route.</p>	<p>Linked to comment 1. The additional text proposed provides the required flexibility for member states.</p> <p>The proposed amendments (in red) mean that this does not presume that evacuation would be required in all circumstances.</p>	x			
3	Figure 3	<p>Example of a <b>potentially</b> unsuitable site — an administrative barrier (national park or special area) preventing construction of an alternative evacuation route in another direction – site <b>potentially</b> unsuitable</p>	<p>Linked to comment 1. The additional text proposed provides the required flexibility for member states.</p> <p>The proposed amendments (in red) mean that this does not presume that evacuation would be required in all circumstances.</p>	x			
4	9.9.	<p><b>If evacuation is likely to be required</b>, a transport analysis (e.g. road and/or rail) should be performed to demonstrate that the transport infrastructure for multiple evacuation routes is sufficient to evacuate the necessary</p>	<p>This requirement is not in NS-G-3.2 and, furthermore, this paragraph presumes that evacuation would be required for all in-scope facilities, when existing and future reactor designs (e.g. SMRs/ANT) may make evacuation inappropriate.</p>	x			

		<p>number of people – taking special population groups into account – in the necessary amount of time (i.e. within a few hours) to avoid significant exposure. The factors that should be taken into account for the transport analysis of each alternative route include the following:</p> <ul style="list-style-type: none"> <li>(a) Number of people to evacuate;</li> <li>(b) Available vehicles;</li> <li>(c) Transport needs and arrangements for any special population groups;</li> <li>(d) Time to alert people and to prepare to evacuate, taking into consideration any special population groups;</li> <li>(e) Time from declaration of the appropriate emergency class to the start of a radioactive release;</li> <li>(f) Typical traffic volumes;</li> <li>(g) Traffic bottlenecks such as bridges.</li> </ul>	<p>This paragraph gives undue focus to transport analysis and the minutiae of transport analysis factors. Transport analysis should not be privileged above other forms of feasibility analysis.</p> <p>This entire text would be better suited for inclusion in an IAEA-TEC DOC or EP&amp;R Series guidance.</p> <p>If the text must be retained, then the text proposed (in red) introduces the required flexibility.</p>				
5	9.10	<p>If evacuation is likely required, the transport infrastructure required for this does not need to be present at time of site evaluation, but it should be practicable to improve the infrastructure so that the off-site emergency plan</p>	<p>This paragraph presumes that evacuation would be required for all in-scope facilities, and further sets prescriptive requirements about the road transport infrastructure required to facilitate a evacuation. Existing and future reactor</p>	x			

		can be made feasible before operation.	designs (e.g. SMRs/ANTs) may make evacuation inappropriate  The proposed text (in red) makes this agnostic on whether evacuation would be required.				
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COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC			Date: 04/26/2024				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
19	Section 9/Paragraph 9.4	Geographical features of the landscape that might make off-site emergency response actions difficult to implement include physical barriers, such as rivers or mountains that lack infrastructure for facilitating a response. Feeder roads (e.g., frontage roads, spurs, secondary roads) which offer single points of access are not barriers to response as they lead to major evacuation routes. There should be at least two major evacuation routes in different directions to offer various itinerary options for the implementation of precautionary urgent or urgent protective actions	Physical barriers are themselves not impediments to evacuation if there is no intended evacuation route. In addition, a site may be suitable if there are plans to mitigate or eliminate barriers to evacuation. Site suitability decisions should be based on the existing and proposed infrastructure that would facilitate an evacuation response. We believe that consideration should be given to the hierarchy of roads as it is common to have single points of access for lower-level roadways. We recommend replacing the paragraph in question with the revision proposed.	x			

		that involve road transportation during a nuclear or radiological emergency. If this is not possible owing to geographical features, administrative restrictions or other reasons, the site should be considered unsuitable for a nuclear installation unless measures are identified that would, when implemented, mitigate or eliminate the barriers to response. Examples for an unsuitable site are provided in Fig. 2 and 3. Example for a suitable site are provided in Fig. 4.					
20	Section 9/Paragraph 9.6	Delete paragraph 9.6	If the site is suitable for evacuation, it can be assumed the infrastructure supports distribution of KI. We recommend deleting this paragraph.		x		Text is revised. We prefer to keep it for completeness.
21	Section 9/Paragraph 9.7	Delete paragraph 9.7	There is no guidance to assess for site suitability. We believe that paragraph 9.7 is redundant considering the current content of paragraph 9.8.		x		Text is revised. We prefer to keep it for completeness.
22	Section 9/Figure 2 Caption	<i>FIG. 2. Example of a physical barrier (river) without an alternative evacuation route in another direction – site unsuitable if a bridge is not constructed or alternative major evacuation routes exist</i>	We believe that it is highly unlikely a town or city would be within the EPZ and have only one road leading out in one direction. In our view, this figure is not a useful example without additional clarification. We recommend revising the figure text to clarify in the manner proposed.	x			

23	Section 9/Figure 3 Caption	<i>FIG. 3. Example of a site with an administrative barrier (national park or special area) preventing construction of an alternative evacuation route in another direction.</i>	We believe that this figure does not reflect an example of an unsuitable site. There are, in fact, some sites with administrative barriers that have been found to be suitable. We recommend revising the figure text to clarify in the manner proposed.	x			
24	Section 9/Figure 4 Caption	<i>FIG. 4. Example of a suitable site—Two major evacuation routes (with sufficient capacity) in different directions exist or can be constructed.</i>	We believe that the example figure lacks sufficient detail to differentiate between local and major routes. Recommend clarifying that the alternative routes are major evacuation routes in the manner proposed.	x			
25	Section 9/ Paragraph 9.9	A transport analysis (e.g. road and/or rail) should be performed to demonstrate that the transport infrastructure for multiple evacuation routes is sufficient to evacuate the necessary number of people – taking special population groups into account – in the necessary amount of time <del>(i.e. within a few hours)</del> to void significant exposures.	Recommend deleting the parenthetical phrase “... (i.e. within a few hours) ...”. A few hours for evacuation of special population groups are possible, but not reflective of the range of adequate times available. EP provides dose savings, and many countries do not require set evacuation times be achieved.	x			
26	Section 9/ Paragraph 9.9	<b>The factors that should be taken into account for the transport analysis of each alternative route include the following:</b>  (a) <b>Number of people to evacuate;</b> (b) <b>Available vehicles;</b> (c) <b>Transport needs and arrangements</b>	Recommend revising as indicated as the guidance for factors to consider in the transport analysis. The time from emergency declaration to start of release may not be known for the purposes of siting and is not typically information that is used or needed in ETEs. Traffic volumes should not be	x			



		<p>for any special population groups;</p> <p>(d) Time to alert people and to prepare to evacuate, taking into consideration any special population groups;</p> <p>(e) Typical traffic volumes;</p> <p>(f) Typical road capacity;</p> <p>(g) Traffic bottlenecks such as bridges.</p>	<p>considered without understanding road volume capacity as traffic analysis is all about supply and demand.</p>				
27	Section 9/Paragraph 9.12	<p>The presence of large populations in the region or the proximity of a city to the nuclear installation should be carefully taken into account in the hazard assessment to develop effective off-site emergency arrangements. The specific circumstances of any special population groups should be recognized and taken into account. <del>The presence of residents whose evacuation route would pass near the nuclear installation might lead to the rejection of a site if no other emergency measure can overcome this difficulty.</del></p>	<p>The intent of the last sentence of paragraph 9.12 is unclear why traveling a route near the site makes a site unsuitable. Short term exposures may be necessary to effect an evacuation and provide dose savings. The statement lacks any quantitative guidance for evaluation. Recommend deleting the last sentence.</p>	x			
28	Section 9/Paragraph 9.14	<p>If it is determined that no effective <b>response actions</b> can be established, then the proposed site should be considered</p>	<p>We believe that the emphasis should be on evaluating site suitability for facilitating a response. We recommend replacing the phrase, "offsite</p>	x			

		unacceptable.	emergency plan” with “response actions”.				
29	Section 9/Paragraph 9.15	Delete paragraph 9.15	In our view, the recommendations in this paragraph are not useful for initial siting decisions. Recommend relocating the paragraph to a different safety guide or delete.			x	It is guidance for fulfillment of SSR-1 requirement on periodic review on this subject.

### Comments on Section 10

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Canadian Nuclear Safety Commission Country/Organization: Canada			Page 1 of 18 Date: April 30, 2024				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
36.	10.5 Line 8	“Three or more categories of nuclear installation may be defined on the basis of national practice.”	It is not clear what are these 3 nuclear installation categories. The previous sentence states 3 radiological consequence categories but not 3 installations?	x			Text added for clarification
37.	10.5	<u>(1) the changing nature of the population of the site and its surrounding based on local government or municipality the future plans for the region</u>	The future plans for the region need to be considered as they may impact the future population and their habits			x	This paragraph is discussing the graded approach and suggested text does not seem relevant here.

COMMENTS BY REVIEWER

RESOLUTION

Reviewer:  
Country/Organization: Russia /  
State Atomic Energy Corporation "Rosatom"  
Rostechndzor / SEC NRS

Page:  
Date:

Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
8	10.5	<p>The analysis process may be performed iteratively where complexity is sequentially added until no more complexity in the analysis is necessary. The hazard categorization of nuclear installation for the application of a graded approach can be based on the same characteristics as listed in para 9.5 of SSG-9 (Rev 1) and para 10.5 SSG-18 [x].</p> <p>as follows:</p> <p>e) The distribution of radioactive sources in the installation (for research reactors, most of the radioactive inventory is in the reactor core and the fuel storage pool, whereas fuel processing and storage facilities it might be distributed throughout the installation);</p> <p>lxI INTERNATIONAL ATOMIC ENERGY AGENCY, Meteorological and hydrological Hazards in Site Evaluation Nuclear</p>	<p>Item e) of para 10 5 ofDS529 is corresponds to para 10.5 SSG-18 which states: The likelihood that a meteorological or hydrological event would give rise to radiological consequences will depend on the characteristic of the nuclear installation (c its use, design. construction. operation and layout) and on the event itself. Such characteristics include the following factors: - The concentration of radiation sources the installation (e.g. for research most of the radioactive inventory will be in the reactor core and fuel storage pool, while in fuel processing and storage plants radioactive inventory may be distributed throughout the plant);</p>			x	It is not quoted. One reference is enough.

		Installations. IAEA Safety Standards Series No. SSG-18. IAEA. Vienna (2011).					
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COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: USNRC							
Country/Organization: USNRC			Date: 04/26/2024				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
18	10.5	The bullets should be general to apply to all nuclear installations and not focused on reactors. Or if the guidance is only intended to apply to nuclear reactors it should lead in with something like "For a nuclear power plant, ..."	Avoid ambiguity as to the type of facility the guidance applies to.		x		Text amended slightly. Para. Is for nuclear installations.

## Comments on Appendix

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer:		Page.... of....					
Country/Organization:		FINLAND / STUK					
Date: 4.4.2023							
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
20	A11, p. 82	...advection, diffusion, sorption and radioactive decay, but processes such as dispersion should also be included.	Mention also diffusion see also comment 2, 5	x			

COMMENTS BY REVIEWER				RESOLUTION				
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II)				Pages: 50				
Country/Organization: <b>Germany</b>				Date: 08.04.2024				
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	113.	Before A.1	<del>APPLICATION OF A GRADED-APPROACH TO DETERMINING THE MOST APPROPRIATE LEVEL OF COMPLEXITY FOR MODELLING RADIONUCLIDE TRANSFER IN GROUNDWATER</del>	1)The categorization of sites, presented here, is not an official IAEA categorisation, this should be communicated clear enough			x	Please see our response to your comments 7.

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: <b>Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)</b> (with comments of RSK, SSK, ESK, GRS and Technical University Munich FRM II) Country/Organization: <b>Germany</b>					Pages: 50 Date: 08.04.2024			
Relevanz	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
			A.1. This <u>Annex gives example Appendix presents guidelines</u> for determining the most appropriate level of complexity for modelling radionuclide transfer in groundwater. Since different nuclear installations pose different levels of hazards, the suggested method uses a graded approach based on the level of hazard and the stage of reporting.	2) please change to "Annex", as this is example, an example should not be an official part of Safety Guide, an Appendix is an official one. 3) Application of term "graded approach" to modelling is misleading. Please change here and all over the text. See out comment to para. 1.15.				
2	114.	A.7 Line 3	... The <del>pros and cons</del> <u>advantages and disadvantages</u> of the different techniques are discussed in detail in paras <del>6.24-6.33-6.23</del> and 6.34.	Clarification	x			
2	115.	Fig. A.2	<del>The report button needs to be shifted to the right and should be replaced with the diamond-shape "Significant?"</del> from figures Fig A.1 and A.3		x			
2	116.	Table A.1, heading	<del>Symbols and abbreviations used in flowcharts.</del> <u>SYMBOLS AND ABBREVIATIONS USED IN THE FLOW CHARTS OF FIGURES A.1-A.4.</u>	The phrase "used in flowcharts" is too general. The table heading should be amended to refer to the Figures containing the flow charts. Please write title in capital letters.	x			

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page					
Country/Organization: Japan / NRA		Date: 4, Apr., 2024					
No.	Para/Line No.	Proposed new text	Reason				
6.	Appendix A.8.	The objective and the level of hazard category may necessitate groundwater modelling in one, two or three dimensions. One dimensional model simulate flow and transfer in the mean flow direction and should be used only for the low hazard category or for the screening stage <u>for the higher hazard category</u> . Dimensionality should be selected on the basis of the objective, expected impact and level of hazard. The higher <u>the level of the accuracy for the investigation and</u> the hazard category, the more dimensions the model should have.	Clarification. It should be carefully stated that the use of a model with multiple dimensions is determined by consideration of not only hazard category, but also by the level of accuracy required for the investigation as mentioned in the draft.		x		Text is revised
7.	Appendix A.14.  FIG. A.1.- A.4. TBALE A.1.	The detail of the graded approach to groundwater modelling is illustrated <u>in the flow charts presented in Figs A.1–A.4. The symbols and abbreviations used in these flowcharts are explained in Table A.1.</u>	The description of flow charts in FIG. A.1. through A.4. seems to be less informative and not member states practices. Messages or recommendations on how to deal with the contents for each box are not shown, so it is difficult for users to understand these flow charts.  (1) Please clarify the method for using these flow charts with references.		x		Section 6 presents details of the process. Explanations is provided in A.1- A.9. Text and flowchart boxes are linked.

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page					
Country/Organization: Japan / NRA		Date: 4, Apr., 2024					
No	Para/Line No.	Proposed new text	Reason				
			(2) Otherwise, these flow charts should be deleted. (3) Alternatively, should be moved to Annex.				
8.	FIG. A.1.-A.4.	<p>FIG. A.1. Flow chart <del>showing a graded approach to</del> modelling radionuclide transfer in groundwater in Stage 1 reporting of site evaluation for low hazard category nuclear installations.</p> <p>FIG. A.2. Flow chart <del>showing a graded approach to</del> modelling radionuclide transfer in groundwater in Stage 1 reporting of site evaluation for intermediate hazard category nuclear installations</p> <p>FIG. A.3. Flow chart <del>showing a graded approach to</del> modelling radionuclide transfer in groundwater in Stage 1 reporting of site evaluation for high hazard category nuclear installations.</p> <p>FIG. A.4. Flow chart <del>showing a graded approach to</del> modelling radionuclide transfer in groundwater in Stage 2 and 3 reporting of site evaluation for low, intermediate and high hazard category nuclear installations</p>	<p>FIG. A.1. through FIG. A.3 just show the pass to “run for scenarios”, and any box for determining suitable grade for evaluation is not shown, and then suggested to be deleted.</p> <p>Concerning FIG. A.4. modelling process shown in Fig. A.4 is common for all hazard category and does not show any elements of graded approach.</p> <p>Should be deleted ”graded approach to” in the titles.</p>			x	In each hazard category, the level of investigations for selection of proper model needs grading.



**Remaining**

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Japan NUSSC member		Page 36					
Country/Organization: Japan / NRA		Date: 06, Oct., 2023					
No	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
75.	Appendix x FIG A.1.- A.3.	Difficult to understand these figures. More detailed information should be added in the Annex.		x			Appendix has been elaborated.

Reviewer: USNRC							
Country/Organization: USNRC			Date: 10/6/2023				
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
85.	Appendix	See comments	We observe that this appendix is an excellent complement to the guidance document. We recommend that the body of the guidance document be better aligned with the appendix. For instance, the body of the guidance document mentions stages in the nuclear facility lifecycle without defining or elaborating on their			x	Detail elaboration are given for only hydrogeological aspects due to its complexity.

			functions. In the appendix those functions are clearly defined.				
86.	A.4	See comments.	In reference to the last sentences, it is observed that it is very rare that radionuclide transport (models) will be validated. Alternatively, it is observed that the hydrologic model may very well be validated. It is recommended that the sentence in question be revised.	x			Text is revised
87.	A.6	See comments.	In reference to the second sentence, in many geologic (hydraulic) systems in the United States, the unsaturated system is thick and consequently provides significant delay in the transport for many radionuclides. It is recommended that the sentence in question be revised.	x			Correct. The vadose zone provides significant delays and therefore it has a reductive effect on the contaminant transport. To be on the safe side (for a conservative prediction) we recommend to ignore this reductive effect by ignoring it at the first stages. Thus, the prediction is a conservative one. If the result is acceptable in terms of contaminant concentration then it means that the results in the real case the concentration will be even lower concentration. Text can be elaborated
88.	A.9	See comments.	The term 'verification' is used here in a broad sense to mean checking the model against an independent set of data. Verification is simply confirming that the equations in question are correctly solved whereas validation is solving the correct equations.	x			Text is modified.
89.	Appendix Figures	See comments	There are only marginal differences in these flowcharts for low,	x			This suggestion is considered.

			<p>intermediate, and high hazard categories. Therefore, it is our view that they could be combined with the same block used but with a distinction made. For example, the block on dimensionality (D) could be as follows:</p> <p>LOW - 1D INTERMEDIATE - 2D HIGH - 2D/3D</p> <p>At a minimum those steps that are different for each hazard level should be made a different color from the rest in the charts so the user can clearly see what would be different.</p>				<p>Flowcharts are changed. It worth to work on it if it will make the diagram more easily readable and straightforward understandable.</p>
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