Resolutions of the Member States comments to the
DS523 – Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants

Country / Organisation	Comment No.	Para	Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
Canada	1	1.04	Footnote 1	"Sections 5 to 9 focus~~es~~ only on…"	Editorial change	X			
ENISS	1	1.04	-1	Level 1 PSA provides insights into the strengths and weaknesses of SSCs (Systems, Structures and Components) important to safety and procedures in place or envisaged as preventing core and/or fuel damage.	Acronyms should be defined, at least at first use.	X			
Germany	1	1.04	Item (3)	In Level 3 PSA, public health and other societal consequences are estimated, such as the contamination of land or food from the accident sequences that lead to a release of radioactivity to the environment [Reference]. [Reference] Procedures for Conducting Probabilistic Safety Assessments of Nuclear Power Plants (Level 3), IAEA Safety Series No. 50-P-12, 1996	For consistency, a reference regarding Level 3 PSA should be added		X 50-P-12 document is considered to be obsolete and therefore is not references here. Currently there is a TECDOC under development aimed to elaborate on Level 3 PSA methodology (in an early stage of development). In addition, there are plans to propose initiation of a Safety Guide on Level 3 PSA. It is planned to update the reference list Depending on the further developments in this area		

Hungary Attila	1	1.04	Footnote 1 linked to Para 1.4	Sections 5 to 9 focus only on the reactor core, therefore in these sections the term “core damage” is used (**except for cases when fuel damage is mentioned** specifically, e.g. core or fuel damage). **Spent fuel pool specific** considerations **of the** analysis are provided in Sections 10 and 12**.**	Some typos were identified in this footnote (i.e. “sections 5 to 9 focuses”, “)” without “(“, a full stop was missing from the end of the footnote). Moreover, the word “sometimes” does not seem appropriate to reflect contrast with the preceding part of the sentence, “except for” may be more sufficient. Besides, the first sentence relates to reactor core, hence the second one should address the spent fuel pool, instead of fuel damage. Accordingly, a proposal was made to modify the second sentence in footnote 1.	X				
Hungary Erzsébet GYURICZA	1	1.04	(2)/ 3	In Level 2 PSA, the chronological progression of core and/or fuel damage sequences identified in Level 1 PSA are evaluated, including a quantitative assessment of phenomena arising from severe damage to fuel.	Please consider to correct the text to "fuel" from "reactor fuel", because the severe damage could occur in the reactor as well as in the spent fuel pool.	X				
Turkey	1	1.04	(2)/3	“………evaluated, including a quantitative assessment of phenomena arising from severe damage to reactor and/or spent fuel”	As a term, “reactor fuel” is not clear whether covers both source of fuel or not. It is better to either define what is reactor fuel or writing as it is proposed.	X				

Turkey	2	1.05	8	"…….Level 2 PSA provides additional insights into the relative importance of accident sequences leading to core and/or fuel damage in terms of the severity of the releases of radioactive material they might cause, and insights into weaknesses in confinement function & measures for the mitigation and management of severe accidents and ways of improving them [4]."	One of the very important outcomes with Level 2 PSA is putting forth the effectiveness and performance of the design in confinement. So It would be good to emphasize this here at the very beginning of the guide.	X			
Turkey	24	1.08	/2 2.02/1&2 2.05/23 2.05/14 2.07/2 2.10/2 2.16/2 3/1/2 3.3/2	"…… GSR Part 4 (Rev.1) [3]……."	It was corrected in some places but missed other places.	X			
Turkey	3	1.08	2	"The objective of this Safety Guide is to provide recommendations for meeting the requirements of GSR Part 4 (Rev.1) [3]……."	It was corrected in several places but missed here.	X			

Germany	2	1.11		This Safety Guide addresses the necessary technical features of a Level 1 PSA and applications for nuclear power plants (both operating and new plants), on the basis of internationally recognized good practices. Level 1 PSAs have ~~now~~ been carried out for most nuclear power plants worldwide. The scope of a Level 1 PSA addressed in this Safety Guide includes all operating states of the plant (i.e. at power and shutdown) and all potential initiating events and potential hazards, namely: (a) internal initiating events caused by random component failures and human error, (b) internal hazards (e.g. internal fires, ~~and~~ floods, explosions, turbine missiles) and (c) external hazards, both natural (e.g. earthquake, external flooding, high winds and other meteorological hazards ~~external flooding~~) and ~~of~~ human-induced ones (e.g. aircraft~~plane~~ crash, explosion pressure waves, accidents at nearby industrial facilities).	Terminology and consistent order of different types of natural hazards as typically grouped	X			

Hungary Attila	2	1.11	lines 8-10.	… explosions, turbine missiles) and (c) external hazards, both natural (e.g. earthquake, high winds, external flooding) and of human-induced (e.g. airplane crash, explosion pressure waves, accidents at nearby industrial facilities) **as well as combinations of external hazards**.	Since this Safety Guide puts special emphasis on combinations of external hazards, we suggest highlighting it in the scope of SSG-3 too.	X			
Pakistan	1	1.11	Line 2	Reference Para 1.11, line 2, the term "operating and new plants" may be changed to "**existing and new plants**" as per Para 1.8 and Para 2.14 to remove the ambiguity.	Based on objectives of the safety guide in Para 1.8 and safety goals in Para 2.14, the term "existing and new plants" should be used in the scope of safety guide in Para 1.11 instead of the term "operating and new plants" to remove the ambiguity.	X			
Turkey	4	1.11	2	"This Safety Guide addresses the necessary technical features of a Level 1 PSA and applications for nuclear power plants ~~(both operating and new plants)~~ (both existing and new nuclear power plants), on the basis of internationally recognized good practices."	Consistency between terminology in different paragraphs.In paragraph 1.8 & 1.11 define type of NPPs with different wordings. Unless there is not any specific reason, better to use same terminology.	X			
Turkey	5	1.11	5	"The scope of a Level 1 PSA addressed in this Safety Guide includes all operating states of the plant (i.e. at power operation and shutdown) and….."	To have consistency in using same terminology in same level. In the draft guide "operating states" is defined by the term of *(at power)* OR *(power operation as in Paragraph 1.14).* It is better if one of them will be fixed throughout the document.	X			

Canada	2	1.12		"An assessment of other sources of radioactive material on the site, e.g. the interim fuel storage facilities, is not in the scope of the Safety Guide".Please provide a reference to the relevant IAEA document, where the assessment of interim fuel storage is covered.	To ensure that all parts of the NPP are covered, this reference is needed.		X The reference to SSG on spent fuel pool was added		
Canada	3	1.12		Related to the 1st sentence about spent fuel pool, please insert a footnote as follows:"It should be documented that there are no other non-reactor sources of radioactivity that have the potential to impact risk-based large release frequency safety goal of 1E14 Bq of Cs-137, or do not contain Cs-137 or contain significantly less than the large release threshold of 1E14 Bq of Cs-137"	The footnote will support the selection of spent fuel pool as the only pertinent non-reactor source of radioactivity that is relevant to the PSA safety goal of 1E14 Bq of Cs-137.			X	Actually some sites have dry spent fuel storages which can also contribute significantly to the release and thus, it is suggested not to include the footnote.
Canada	4	1.12	2.14 and 11.5	"The scope of this Safety Guide covers also Level 1 Multi-Unit PSA which is aimed to quantify the multi-unit risk metrics."Some guidance on the site quantitative definition of the site safety goals is necessary.	Need for a quantitative definition of the site safety goals.		X It is added to 11.5 that the principles mentioned in Section 2 are in general applicable for setting up the probabilistic safety goals on a site level.		
Egypt	4	1.12		This Safety Guide focusses on the assessment of nuclear power plant reactor core and respective spent fuel pools.	The scope of this safety guide includes both reactor core and spent fuel pool. This should be reflected in the scope of this safety guide.	X			

ENISS	2	1.12		1.12. This Safety Guide also focusses on the assessment of nuclear power plant respective spent fuel pools. An assessment of other sources of radioactive material on the site, e.g. the interim fuel storage facilities, is not in the scope of the Safety Guide. ~~The scope of this Safety Guide covers also Level 1 Multi-Unit PSA which is aimed to quantify the multi-unit risk metrics.~~ 1.13 This Safety Guide also considers multi-unit aspects. These aspects may be considered when developing Level 1 Multi-Unit PSA to quantify multi-unit risk metrics.	Otherwise, the text would mean that only spent fuel pools are addressed.In addition, it is suggested to split the recommendation in two parts, the first one addressing SFP, the second one addressing multi-unit aspects, and consequently multi-unit PSA.		X The reactor core was added specifically. The entire discussion on the scope related to the sources of radioactivitiy is proposed to be covered by para 1.12		
Germany	3	1.12	Line 4	… However, considering in the assessment any adverse effects of such facilities to the reactor(s) and spent fuel pool(s), e.g. in case of hazards impairing the whole site, are addressed in this Safety Guide.	Addition of a sentence needed for a consistent approach	X			
Pakistan	2	1.12		Reference IAEA Safety Glossary 2018, the Spent Fuel Pool PSA is not covered under the definition of PSA. However; the same have been discussed in draft standard as a part of Level-1 PSA. Rationale for covering Spent Fuel Pool PSA under Level-1 PSA may be addressed and definition in the	Spent Fuel Pool PSA is considered in the draft guide, which, however, seems to be out of scope of Level-1 PSA as per IAEA Safety Glossary definition.		X The Safety Glossary is developed for the current version of the Safety Guide. The revised SSG-3 is expected to expand the scope.		

				Glossary may be updated accordingly.					
Russia	1	1.12		1.12. This Safety Guide focuses on the assessment of nuclear power plant respective fuel in the reactor core and in the spent fuel pool-	The original statement gives wrong impression that only spent fuel pool is in the scope.	X			
Turkey	6	1.12	4	"….The scope of this Safety Guide also covers ~~also~~ Level 1 Multi-Unit PSA which is aimed to quantify the multi-unit risk metrics."	Editorial (grammar)	X			
UK	1	1.12	1	Power plant and respective spent fuel pool.	Grammar.	X			
Libya	1	1.13	No. SSG-3	Include the spent fuel pool because have source of radioactive material	Improved clarity.			X	No need to double clarify the fact of presentce of radioactive materials
Russia	2	1.14		1.14. In carrying out Level 1 PSA, the most common practice is to perform the analysis for the various hazards and operating states in *the integrated model* ~~separate modules~~, having a Level 1 PSA for power operation for internal initiating events as a basis. This Safety Guide *presents information on various PSA types in separated models for convenience.*	The original statement did not fully reflect the reality.	X	Changes are implemented, just the last sentence is revised as follows: *This Safety Guide presents information on various PSA types included in the integrated model.*		

Turkey	7	1.14	3	"This Safety Guide follows this approach as well."	Editorial (make a connection between consecutive sentences)		X reformulated considering also the the previous comment from Russia		
Hungary Attila	3	1.16	lines 12-13	… PSA for low power states are included in the previous sections. Section 10 addresses **the specifics of** the development of PSA for spent fuel pools. Section 11 provides recommendations on Level 1 …	Section 10 cannot be considered as a stand-alone Section on spent fuel pool PSA, it just highlights the specifics important to note regarding spent fuel pool PSA. Therefore, some short addition to the text is proposed.	X			
Turkey	8	1.16	9	"………and Sections 7 and 8 address the specific aspects of Level 1 PSA for internal hazards and external hazards"	Editorial (to be consistent in wording)	X			
Libya	2	2	Line 14	[...]the recent developments of the relevant practices in the Member States.	Improved clarity.			X	DPP has been already finalized and approved at this stage the comments are addressed towards the Guide itself.
Libya	3	2	Line 19	Margins for avoiding cliff-edge effects;	It seems that **cliff edge** is missing a hyphen.			X	DPP has been already finalized and approved at this stage the comments are addressed towards the Guide itself.
Libya	4	2	Line 23	[...]NS-R-2 publications that were revised twice (in 2012 and 2016), meanwhile, the superseded versions of these documents [...]	Improved clarity/grammar.			X	DPP has been already finalized and approved at this stage the comments are addressed towards the Guide itself.
Libya	5	2	Line 28	[...] there is a need to revise the Guide by an amendment or the amendment[...]	Improved clarity/grammar.			X	DPP has been already finalized and approved at this stage the comments are addressed towards the Guide itself.

Hungary Andras	1	2.02	14	It should be demonstrated that the risk from those initiating events and hazards and operating states that are not in the model does not threaten compliance with the probabilistic safety goals or criteria.	It is practically not feasible to perform a comprehensive list of initiating events and hazards and all plant operating states, without supplementing it with a description of the set of those items that are screened out from the list. Therefore please consider replacing the last part of the sentence starting with "or alternative approaches are used...". The correct relation between the beginning and the end of the sentence may not be "or" but rather "and".			X	X This edition of the safety standard is being developed to address as much as possible all possible combinations between initiating events, plant conditions and sources of radioactivity (including multi-unit) considered in the PSA. We believe that replacing "or" with "and" does not affect the interpretation of the paragraph
Germany	4	2.03		The scope of Level 1 PSA should include consideration of the fuel in the reactor core ~~for~~ of a single unit. The recommendations on development of Level 1 PSA for the reactor core of a single unit are specified in the Sections 5-9. The scope of the Level 1 PSA should also include consideration of the fuel in the spent fuel pool, for which recommendations are provided in Section 10. …	Wording and grammar	X			
Hungary Attila	4	2.03	lines 3-5	… unit are specified in the Sections 5-9. The scope of the Level 1 PSA should also include consideration of the fuel in spent fuel pool, for which **specific** recommendations are provided in Section 10. In addition, the scope of Level 1 PSA might	Section 10 cannot be considered as a stand-alone Section on spent fuel pool PSA, it just highlights the specifics important to note regarding spent fuel pool PSA. Therefore, the word “specific” should be added to the text.			X	paragraph has been revised. in the new edition, the word "specific" has no semantic meaning

				include consideration of multi-unit risk metrics, …					
Turkey	9	2.03		The scope of Level 1 PSA should include consideration of the fuel in reactor core for a single unit and fuel in the spent fuel pool. The recommendations on development of Level 1 PSA for reactor core of single unit are specified in the Sections 5-9 and the recommendations on development of Level 1 PSA for spent fuel pool ~~The scope of the Level 1 PSA might should also include consideration of the fuel in spent fuel pool, for which recommendations~~ are provided in Section 10. In addition, the scope of Level 1 PSA might include consideration of multi-unit risk metrics, for which recommendations are provided in Section 11.	Language in the draft version may cause confusion about the importance of spent fuel consideration. Scope should include it where it is applicable			X	Since both of the sentences contain should statement we belive it does not affect the importance of SFP consideration Thus, we would suggest to keep the current version.

Hungary Andras	2	2.04		Importance measures for basic events, groups of basic events, credited systems and groups of initiating events, should be calculated and used to interpret the results of the PSA.	As being weightful parts of the assessment results besides the frequency criteria, it may be considered to highlight it under the "SCOPE OF THE PSA" also, that importance analyses are also inevitable parts of the PSA. Maybe a separate paragraph should be dedicated to this purpose.			X	it is elaborated later in Section 5
Hungary Andras	3	2.04		Studies should be carried out to determine the sensitivity of the results of the Level 1 PSA to the assumptions made and the data used.	As being weightful parts of the assessment results besides the frequency criteria, it may be considered to highlight it under the "SCOPE OF THE PSA" also, that sensitivity analyses are also inevitable parts of the PSA. Maybe a separate paragraph should be dedicated to this purpose.			X	this is mentioned later in Section 5
Canada	5	2.05		"…and the controlling physical and logical equations are required to be correctly programmed…."	Editorial change	X			
FRANCE - CEA	1	2.05		These include the analysis of accident sequences and the associated systems, typically through the development of event tree and fault tree logic models, the methods for solution of the logic models, the models of phenomena that could occur, ~~for instance, within the containment of a nuclear power plant following core damage, and the models for the transport of radionuclides in the environment to determine their effects on health and the economy,~~	Not in the scope of the guide.			X	Section 2 describes the overall framework touching upon L2 and even L3 PSA aspects.

				~~depending on the scope of the analysis (Level 1, 2 or 3)~~					
Indonesia	1	2.05	7	These include the analysis of accident sequences and the associated systems, typically through the development of event tree and fault tree logic models, the methods for solution of the logic models, the models of phenomena that could occur, for instance, within the containment of a nuclear power plant following core damage and/or fuel damage, and the models for the transport of radionuclides in the environment to determine their effects on health and the environment, depending on the scope of the analysis (Level 1, 2 or 3). Prior to their application, it should be demonstrated that these analytical methods provide an adequate representation of the processes taking place. The computer codes that support these analytical methods are required to be	Based on para 1.4: (1), Level 1 PSA, the design and operation of the plant are analysed in order to identify the sequences of events that can lead to core and/or fuel damage and the corresponding core and/or fuel damage frequencies are estimated.	X			

				adequate for the purpose and scope of the analysis, and the controlling physical and logical equations are required be correctly programmed in the computer codes: see para. 4.60 of GSR Part 4 [3].				
FRANCE - CEA	2	2.06			It will be useful to indicate other possibilities to validate to review of PSA; independent peer review of the PSA from an outside body, sometimes from a different State, is not always possible or practical. If practicable, the review can also be done by PSA experts from the same organization not involved in the development.			X	yes, it might be helpful, but this review could not be considered as independent, even if the experts were not involved in the development. The idea of the paragraph is to highlight the independency.
Hungary István NEUBAUE R	1	2.06	2.07, 2.08, 3.02 and more	There are trivial references, that could be omitted	Use of too much references in the text. Readability of the guide seems to be damaged. Guide has to be easy readable and understandable more or less independently. Use of too much references is more typical for other type of documents (e.g. Safety Series)			X	References were used to avoid making text too complex and redirect users for more detailed documents on specific topics.
Turkey	10	2.06	4	"……. recognized good practices in PSA. Scope of the independent peer review should be consistent with scope of the submitted document to regulatory body. The experts involved ……"	One of the experience from regulatory reviews is inconsistency between scope of this independent verification (ex. *only for internal events*) & submitted documents (*full scope*). It would be better to think if there may be emphasize for that here.		X Revised as follows: 2.6. It is a widely accepted practice for the organization conducting a PSA to commission an independent peer review of the PSA from an outside body, sometimes from a different State, to provide a degree of assurance that the scope, modelling and data are adequate (e.g. consistent with the scope of the submitted document to		

							regulatory body), and to ensure that they conform to current, internationally recognized good practices in PSA.		
FRANCE - CEA	3	2.07		Likewise, new information, update knowledge, new operating experience and more sophisticated methods and tools may become available, which may change some of the assumptions made in the analysis and hence the estimates of the risk given by the PSA.	Complete with other current reasons to update the PSA.	X			
Indonesia	2	2.07	3	In the operating lifetime of a nuclear power plant, optimization of plantoperation is often made to the SSC design or to the way the plant is operated.	In general, modifications are often made to SSCs important to safety			X	The current text implies various types of modifications including the optimization of plant operation (e.g. procedures)
Hungary Andras	4	2.08	5	Emerging data sets from other NPPs of the same type or of similar configuration should also be used similarly for the improvement of the living PSA, depending on the availability of such data.	It should be considered to add a recommendation to parallelly use emerging data from other NPPs of the same type for the same purpose. Such data usage may also improve the quality of the living PSA in a similar extent.	X			
Hungary Andras	5	2.10	10	In some States, current practice for reference values is that they are to be formulated as probabilistic safety goals, with the implication that they represent orientation values whose achievement is to be aimed for.	Grammatical modification is necessary to help understanding.	X			

Pakistan	3	2.10	2.15	Safety goals or criteria/ targets for spent fuel pool PSA may be defined. Moreover, a description regarding goals or objectives of MUPSA may be provided in the guide.	As per international practice, probabilistic safety goals or criteria or targets are defined for a single unit and does not include risk due to spent fuel pool. The paragraphs 2.10-2.15 of this draft safety guide also provides guidance related to probabilistic safety goals or criteria or targets of single unit only.			X	This idea is already highlightes in para 2.11 (a)
Germany	5	2.11	Item (d)	… <u>[Reference].</u>	For consistency, please add the same reference as in 1.4, item (3) (our comment Nr 1)		X 50-P-12 document is considered to be obsolete and therefore is not references here. Currently there is a TECDOC under development aimed to elaborate on Level 3 PSA methodology (in an early stage of development). In addition, there are plans to propose initiation of a Safety Guide on Level 3 PSA. It is planned to update the reference list Depending on the further developments in this area		

India	2	2.11	(b)	Broad guidance on typical definition of core damage (for different types of NPPs) may be included in the safety standardProposed definitions:Core damage (channel type reactors):The extensive physical damage due to overheating of reactor core or its components leading to loss of core structural integrity[1]. Core Damage may include core/fuel melt. Core damage (vessel type reactors):Uncovery and heat up of the reactor core, due to loss of core cooling leading to loss of coolable geometry involving large fraction of core/fuel meltCore damage (fast reactors):The severe overstressing/overheating of reactor core or its components to the extent that loss of structural integrity of clad[2], large fraction of fuel melt or their combination occurs.	The definition of core damage is not included in DS-523 and not found in IAEA safety glossary 2018.The interpretation of core damage could be different for different NPP technology, PSA results may vary significantly if different interpretations are used.Suggested definitions are given for consideration.Guidance on definition of core damage will be useful.			X	During the decision was made not to provide specific definitions for CDF or LERF, but to outline the boundaries of these terms. Since each country then uses its own term also depending on the reactor type.
Russia/ SEC NRS	1	2.12		In Member States probabilistic goals or safety criteria meet a threshold of acceptability, and design goals differ from State to State.	It is not clear for what purpose three words are used in paragraph 2.12, which are similar in meaning, but different in sound (goals, objectives, indicators): *"In the Member States the probabilistic safety criteria are typically identified as targets, goals, objectives, guidelines or reference values for orientation"*.This introduces some ambiguity in understanding in which context these different words	X	Revised in line with the next comment (Turkey 11)		

					should be used. A reformulation of the paragraph is required.Paragraph 2.10 says: *"In some States, current practice is for reference values to be formulated as probabilistic safety goals, with the implication that they represent orientation values whose achievement is to be aimed for. In other States, the reference values are criteria that specify strict limits for which compliance is required".*In this regard, paragraphs 2.12 - 2.14 propose to use the terminology used in paragraph 2.10.				
Turkey	11	2.12	1	"In the Member States the probabilistic ~~safety criteria~~ reference values are typically identified as criteria, targets, goals, objectives, guidelines or ~~reference~~ only values for orientation."	There is a misleading in the explanations between paragraph 2.10 & 2.12. Paragraph 2.10 stated that goals are preferable but criteria are strict. On the other hand, 2.12 stated that safety criteria are identified as target, goals etc. In this way, SSG3 cause confusion whether the criteria are strict or not OR whether goal is preferable or not. There is similar ambiguity between safety criteria & reference values. Please look at these as well.Para. 2.10: "In other States, the reference values are criteria…."Para. 2.12: "probabilistic safety criteria are typically identified as reference values"		X Reformulated as "In the Member States the probabilistic ~~safety criteria~~ reference values are typically identified either as criteria, targets, goals, objectives, guidelines or ~~reference~~ values for orientation."		

Canada	6	2.13		"If they have not, the design may still be acceptable provided that the higher level criteria have been met. This may be demonstrated by margin assessment against the two Quantitative Health Objectives established by the US NRC in 1986, achieving a satisfactory rating of the IAEA safety factors by the regulatory body, etc."	The new sentence provides specific guidance to demonstrate an acceptable design in case the safety goal is not met.			X	The details regarding how to demontarte that is out of scope of this document.
Egypt	5	2.16		.... the results and insights of deterministic safety analysis	Editorial	X			
Russia	3	2.16		2.16 … The PSA should be used during the lifetime of the plant to provide an input into decision making in combination with the results and insights of deterministic safety analyses and considerations of defense in depth *(see Annex IV with brief description of DiD concept and its application in the development of PSA)*.	DiD in relation to PSA has certain specifics which should be discussed in SSG-3. Suggestion for the content of Annex IV is provided below the table. Annex IV could be better elaborated if found necessary.			X	Annex IV is not foreseen by revision by Ammendment which is the case with this revision of the Safety Guide
Canada	7	2.17		PSA can provide useful insights and inputs for various interested parties, such as operating organizations (management and engineering, operations and maintenance personnel), regulatory bodies, technical support orgnisations, designers and vendors, for making decisions, for example on:	These are just examples. Indeed, PSA can be used in other areas too.	X			

FRANCE - CEA	4	2.17		PSA can provide useful insights and inputs for various interested parties, such as plant staff (management and engineering, operations and maintenance personnel), regulatory bodies, designers and vendors, for making decisions, as for example, on:	Thera are many other PSA uses which are not mentioned here	X			
Turkey	12	2.19	all	-	Placement of this paragraph in the guide may be consider one more time. It seems that it would be better if it is placed under "Scope of The PSA" OR "Living PSA" titles.			X	We belive that para 2.19 is in line with the overall flow of paras 2.16-2.24, so we propose to leave it as is.
Canada	8	2.2		"~~In this case, t~~The insights gained from PSA should be considered in combination with the insights gained from deterministic analysis to make decisions about the safety of the plant."	This is a general statement. PSA has been always used in combination with deterministic analyses for decision-making.	X			
FRANCE - CEA	5	2.20		For a plant in the design stage, the results of PSA should be used as part of the design process to assess the level of safety. ~~In this case~~, Similar with other PSA uses for decision making, the insights gained from PSA should be considered in combination with the insights gained from deterministic analysis to make decisions about the safety of the plant. Decisions on the safety of the plant should be the result of an iterative process aimed at ensuring	The sentence is not specific to design PSA		X"In this case" is removed.		

				that national requirements and criteria are met, the design is balanced, and the risk is as low as reasonably achievable.					
FRANCE - CEA	6	2.21			The § is similar to 2.11, but with different criteria. To check.			X	Different messages are foreseen for these paras
Turkey	13	2.21	1 and 3	"In addition, the results of the PSA should be compared with the reference values such as probabilistic safety goals or criteria if these have been specified in national regulations or guidelines. This should be done for all probabilistic goals or criteria defined for the plant, including those that address system ……"	It seems there may another misleading wording here, it can be understood that no need to make any comparison for safety goals".	X			
Turkey	14	2.21	4	"reliability, core damage ~~frequency~~, and/or fuel damage frequency, frequencies of releases of		X			
Turkey	14.5	2.21	all	-	It should re-consider the relation between Para. 2.18 & Para 2.21 one more time. They touched same important point as complementary for each other but their link is interrupted by two different paragraphs related with other issues. So It is suggested to merge both paragraphs into one OR reorganize the structure without any repetition and place both them one after another.			X	Indicated paras are related to the same topic, however there are complimentary to each other and it is suggested to keep them separate. Also to keep the reliability.

Canada	10	2.22		"The PSA should set out to identify all accident sequences that not negligibly contribute to risk to the extent that supported by the state-of-the-art of the PSA and the data. If the analysis does not address all significant contributions to risk (for example, if it omits external hazards or shutdown states), then conclusions drawn from the PSA about the level of risk from the plant, the balance of the safety features provided and the need for changes to be made to the design or operation to reduce the risk may be biased. Due to the limitation of PSA and the current state-of-the-art, PSA cannot identify all accident sequences that not negligibly contribute to risk. Some examples include malevolent acts and some other security-related issues.	It is not possible to identify all accident sequences as well as to address all significant contributions to risk.		X It is acceptable that the security related treats are not considered, the following footnote was added to the first sentence to address that: *Footnote: the desciption is related to the scenarious that are not triggered by security events such as malicious actions.* Current state of the practice of PSA implies analysis of non-negligivle scenarios related to the hazards triggered by random events (not security events). If these are missed, then the final risk profile is considered to be underestimated.		
Canada	9	2.22		With respect to the 1st sentence of the para, please include a footnote to justify what constitutes a negligible risk.	Some justification is needed regarding the measure of risk defined by terms like 'negligible'	X	The following footnote was added: *Footnote: Contribution to the risk could be deemed as negligible based on the evaluated potential impact on the final results and the decision making process based on the PSA results.*		

ENISS	3	2.22		The PSA should be set out to identify all accident sequences that not negligibly contribute to risk. If the analysis does not address all significant contributions to risk (for example, if it omits external hazards or shutdown states), then conclusions drawn from the PSA about the level of risk from the plant, the balance of the safety features provided and the need for changes to be made to the design or operation to reduce the risk may be biased. Such limitations should be acknowledged when using PSA to support decision making. Therefore, the utilization of full scope PSA models is recommended.	Use of PSA limited in scope should be kept possible, provided limitations are acknowledged and considered in the decision process. Conducting a full scope PSA is one option but it is not the only one.	X			
Turkey	15	2.22	1	"The PSA should be set out to identify all accident sequences…."	Editorial (grammar)	X			
Turkey	16	2.22	6	"….Therefore, the utilization of full scope PSA model ~~models~~ is recommended."	Editorial (grammar)	X			
UK	2	2.22	1	…accident sequences that do not negligibly…	Grammar.	X			
Canada	11	2.23		With respect to the last sentence of this para, please provide a reference to guidance/methodology for Benefit Cost Analysis.	For a consistent application of the benefit cost analysis for decision making by the member states, a reference is needed.			X	There is no specific guidance in the IAEA on Cost Benefit Risk Analysis. Perhaps this is the action for the further developments.

FRANCE - CEA	7	2.23		The results of the PSA should be used to identify weaknesses in the design or operation of the plant. These can be identified by considering the contributions to the risk from groups of initiating events, the importance measures of the safety systems and the contributions of human error to the overall risk. Where the results of the PSA indicate that changes could be made to the design or operation of the plant to reduce risk, the changes should be incorporated where reasonably achievable, taking the relative costs and benefits of any modifications into account. This should be integrated in a more global RIDM methodology (see INSAG25 for example).	The first sentence s identical with 2.22. The rest of the paragraph summarizes a RIDM processes, but which in fact is more complex à better to make a reference to a IAEA RIDM document..	X	Reference to TECDOC-1909 was added [37]		
FRANCE - CEA	8	2.24		Section 12 provides detailed recommendations on specific applications of PSA for the regulatory body and for operating or design organizations	Design organizations are also mentioned in section 12.	X			
Canada	12	3.01	Footnote 6	"PSA for low power and shutdown states is sometimes performed as part of the same study~~,~~; however, it ~~is~~ may be more practical to perform low power PSA as part of PSA for power operation."	Less restrictive text. Depending on the details of a particular low power state (and details of reactor design, etc.) it might not always be more practical to perform low power PSA as part of the full power PSA; rather, some low power states could be better grouped as part of the outage PSA.	X			

FRANCE - CEA	9	3.01		The scope of the PSA should be compatible with both the objectives of the study and the available ~~resources and~~ information,	In contradiction with the second part of 3.1: *Adequate resources should be provided for the analysis.*	X			
Germany	6	3.01	Last Sentence	In addition, other sources of radiation, particularly (~~e.g.~~ the fuel in the spent fuel pool~~)~~, should be analy~~s~~zed, depending on the formulation of the probabilistic safety goals.	Wording and grammar		XThe word “particularly” has been removed, spent fuel pool kept as an example.		
Turkey	17	3.01	6	“….. (i.e. at power operation and shutdown) and…..”	To have consistency in using same terminology in same level. In the draft guide “operating states” is defined by the term of *(at power)* OR *(power operation as in Paragraph 1.14).* It is better if one of them will be fixed throughout the document.	X			
FRANCE - CEA	10	3.02		~~For instance, if it is planned to use the PSA for the development of a severe accident management programme, a Level 2 PSA should be performed. An extension of Level 2 or even Level 3 PSA should be also required if it is to be used to support definition of emergency planning zones.~~	Not in the scope of the document		The para 3.2 was shortened considering also the discussion regarding the France CEA comment 50		
FRANCE - CEA	11	3.02		As another example, if it is planned to use the PSA model as a basis for a risk monitor, the PSA model should be ‘symmetrical’ in terms of the modelling ~~of initiating events~~.	Symmetrical modelling is more complex that initiating events. A better description is provided at 5.84.		The para 3.2 was shortened as follows considering also the discussion regarding the France CEA comment 50		

FRANCE - CEA	12	3.02	Note 5	PSA for low power and shutdown states is sometimes performed as ~~part of the same~~ a stand-alone study, however, it is more practical to perform low power PSA as part of PSA for power operation.		X			
Germany	7	3.02		Add a footnote explaining the term "symmetrical", or extend footnote 7. *Suggestion, for example:* "A PSA model is called symmetrical if it explicitly models initiating events in all locations in which they can occur, including all primary circuit loops, all trains of the credited systems, and all running and standby trains of normally operating systems." (cf. para. 5.84)	Clarification.	X			
Russia	4	3.02		3.2 … The common simplification of modelling an initiating event as always occurring in one particular train should not be used. For example, loss of coolant accidents should be modelled for each loop with an appropriate probability that a specific loop is affected (i.e. 1/2 for a *two loop* ~~train~~ plant, 1/3 for a *three loop* ~~train~~ plant) rather than a single event in one of the loops.	In the example not safety system trains, but primary circuit loops are considered.	X			
Canada	13	3.04		"The PSA can be performed by these groups or by consultants, research institutes, universities or a combination of these. ~~In any case,~~ ~~t~~The operating organization…"	Brevity.	X			

Indonesia	3	3.04	7	The PSA can be performed by these groups or by consultants, research institutes, universities, The technical support organizations, or a combination of these. In any case, the operating organization should always participate as a source of operational knowledge, as well as being a beneficiary from the insights obtained8	Adding technical support organization, since Some Member States have external technical support organizations	X			
Indonesia	4	3.06	1	The PSA study should consider a particular 'hold point' for modelling the as built and as operated plant conditions	Consider using the phrase 'hold point' instead of 'freeze' date, since 'hold point' is a more familiar phrase.			X	Current term "freeze date" is commonly used amond many PSA practicioners. It is suggested to keep it to make it clearer for readers.
Indonesia	9	3.06	1	The PSA study should consider a particular 'hold point' for modelling the as built and as operated plant conditions	Consider using the phrase 'hold point' instead of 'freeze' date, since hod point is a more familiar phrase			X	Current term "freeze date" is commonly used amond many PSA practicioners. It is suggested to keep it to make it clearer for readers.
FRANCE - CEA	13	3.10		The members of the team that perform the PSA can be characterized by the organization they represent (if different organizations are involved) and the technical expertise they provide.		X			
FRANCE - CEA	14	3.11		The expertise necessary to conduct a PSA should provide two essential elements: knowledge of PSA techniques and knowledge of the plant.	Knowledge of PSA techniques is essential; knowledge of the plant can be improved during the project	X			
FRANCE - CEA	15	3.11		This expertise can vary in depth, depending on the scope of the PSA, but the participation of the plant designer and/or the operating organization of	A degree of participation of plant designer and/or the operating organization is always necessary.	X			

				the plant should be foreseen~~, if possible.~~					
Indonesia	5	3.12	2	A team that will perform a PSA for the first time should be provided with training to acquire the expertise necessary to complete the study successfully and they should be able to show they are capable to perform a PSA for a specific NPP	Different types of NPP have specific case of PSA development and application			X	This type of demonstration is not a common practice.
Russia	5	3.12		3.12. A team that will perform a PSA for the first time should be provided with training to acquire the expertise necessary to complete the study successfully.	Training idea is repeated through the whole section 3. Logically para 3.12 should be in the beginning, but all repetitions related to training should be removed. Training is not needed to make clear experienced team.			X	The idea of training is considered to be key for the new team which will be working on PSA for the first time. That is explicitely specified in 3.12
Turkey	18	3.13		"For a PSA, appropriate quality means an end product that is correct and usable and one which meets the objectives and fulfils the scope of the PSA"		X			
Canada	14	3.14		Quality assurance procedures should include control of the documentation of the PSA as well as the versions of the PSA models.	The quality assurance should also include the PSA models versions.	X			
FRANCE - CEA	16	3.14		Quality assurance procedures should include control of the documentation of the PSA and of the PSA models versions.	Control of PSA model versions is essential.	X			

Turkey	19	3.15	5		There is different explanation for the same term. In Para. 2.17, operating organizations is defined as "*management and engineering, operations and maintenance personnel* " In Para 3.15, it is "management and operating personnel" .It is better if we can use same terminology for both Para. and all.	X			
Indonesia	6	3.16	2	PSA documentation includes work files, computer inputs and outputs with explanation, correspondence, interim reports and the final report of the PSA	Explanation is needed to understand the input and output.	X			
Russia	6	3.16		3.16. …. ~~In addition, means should be provided for possible extensions of the analysis, including integration of new topics, use of improved models, broadening of the scope of the PSA in question and its use for alternative applications~~. Explicit presentation of the assumptions, exclusions and limitations for extending and interpreting the PSA is also of critical importance to users.	This statement is ambiguous and contradicts the objectives of PSA (see Para 3.1)	X			

Russia	7	3.20		3.20. The summary report of a PSA should ~~include a subsection on the structure of the report, which should~~ present concise descriptions of the contents of the sections of the main report and of the individual appendices. The relation between various parts of the PSA should also be included in this subsection of the summary report.	It is written as inside summary report should be a section of a summary report		X Reformulated as follows: 3.20. The summary report of a PSA should include a subsection with the structure of the main report, with very brief indication of the contents of the sections of the main report and oappendices. The relation between various parts of the PSA should also be included in this subsection of the summary report.		
Indonesia	7	3.21	3	The main report should give a clear and traceable presentation of the complete PSA study, including a description of the plant, the objectives of the study, the methods and data used, the initiating events considered, the plant modelling results and the conclusions, as well as the recommendation	The recommendation is important to get the feedback from the results	X			
Indonesia	8	3.21	6	The main report, together with its appendices, should be designed: (a) To support technical review of the PSA and its verification and validation;	Verification and validation are very important to check the results			X	"Review" is more general and encompassing term
Hungary István NEUBAUER	2	3.37		„graded”, „radioactive”, „depending”	Typographical mistakes			X	there is no para with number 3.37

Libya	7	4		The objective of this Safety Guide is to provide recommendations for meeting the requirements of GSR Part 4 (Rev. 1) in the development and application of Level 1 Probabilistic Safety Assessment for NPPs.	Improved clarity/grammar.			X	DPP has been already finalized and approved at this stage the comments are addressed towards the Guide itself.
Indonesia	10	4.01	4	Information sources that may be used forfamiliarization with the plant include thefollowing:(c) (c) System descriptions; including fuel and core information(o) Multi unit layout, such as: control room for modular reactor type.	Adding fuel and core information, since Fuel and core data are very important information in order to see the potential of the internal hazards in NPP for Level 1 PSA.Inserting a new (o) to evaluateinteraction between the units from risk point of view			X	The list has very generic nature,adding detailed explanatory notes for one of the items would require to elaborate the rest, which is not considered necessary.
Indonesia	11	4.01	19	(j) Operator's logs, including operation and core management data	operation and core management data are very important to see the potential of the internal hazards in NPP for Level 1 PSA.			X	The list has very generic nature,adding detailed explanatory notes for one of the items would require to elaborate the rest, which is not considered necessary.
Canada	15	4.03		Either add the following at the end of the para, or include this as a footnote:"Since safety report contains conservative deterministic analysis,procedures/methods should include the guidelines for use of safety analysis information to support PSA that is a best estimate analysis"	A best estimate approach should be used to prepare a PSA. The goal of a best estimate approach is to determine a realistic assessment of the safety for a NPP. A best estimate approach is intended to exclude unjustifiable conservatism and optimism.			X	Need to use best-estimate approach for PSA is specifically mentioned in Section 5 (see paras 5.6, 5.56, 5.58)
Czech Republic, UJV Rez Stanislav Hustak	1	5.02	Fig 1	Add **Duration of plant operating states** as the additional label to the link from DATA AND CCF ANALYSIS to INITIATING EVENT ANALYSIS.	Duration of plant operating states is an important input for IE frequency determination in shutdown states, see also paras 9.20 and 9.51(c).			X	Could be added but "Duration of plant operating states" can be also considered parameters. It's better to not fill too many details in the figure.

Czech Republic, UJV Rez Stanislav Hustak	2	5.02	Fig 1	Add **Key plant parameters** as the additional label to the link from DETERMINISTIC SUPPORT to HUMAN RELIABILITY ANALYSIS.	Unambiguity and availability of key plant parameters displayed in control room, which would be used by control room staff to identify the actual accident course and plant status, are important inputs to HRA. Those key parameters and their applicability for accident scenarios can be determined from support analyses.	X			
Czech Republic, UJV Rez Stanislav Hustak	3	5.02	Fig 1	Safety **f**unctions and **s**uccess **c**riteria(appears in two places)	Editorial corrections, see the other labels in FIG. 1.	X			
Egypt	6	5.02	After 5.2 Figure 1	The sentence "AS charactristics and sucsess criteria" which written on the arrow between "DETERMINISTIC SUPPORT" and "ACCIDENT SEQUENCE ANALYS" Boxes is not clear and need clarification.The two arrows indicating "reliability and CCF parameters" and "human error probabilities" entering the "ACCIDENT SEQUENCE ANALYSIS" box are not convenient because in accident sequence analysis no reliability data, CCF data, or human error probabilities are needed.	1st bullet: Clarification is needed. 2nd bullet: Modification is needed.		X 1st bullet: “Deterministic support” replaced by “supporting analyses” 2nd bullet: The integrated PSA model is developed jointly through steps IE analysis, AS analysis and system analysis. Reliability data, etc., are needed in all places, not only in systems analysis.		
FRANCE - CEA	17	5.02	Fig 1	FIG. 1 – Consider replacing “deterministic support” by “Supporting studies for PSA”	“Deterministic” is rather a precise term use in the frame of deterministic demonstration	X	"Supporting analyses"		

Russia	65	5.02	After 5.02 Figure 1	Remove duplication on the figure “Human failure events to be considered”	Duplicated text on the figure			X	The same text is providing description for different arrows (one for arrow from HRA to accident sequence analysis, another one from HRA to system analysis). Thus, removing one of them will not allow to describe all the inputs from HRA to other PSA tasks.
Russia	8	5.03		5.3. Several techniques can be used in performing a PSA. However, the usual approach is to use a combination of event trees[1] and fault trees[2]. ..*1- The event tree is a logical diagram in the form of an opened binary graph, which defines a set of accident sequences, each of which is a combination of the following: 1) the Initiating event; 2) the specific state of the modeling function that includes SSCs and or operator actions,3) end state (transfer to another ET, state without core damage (OK), state with core damage (CD) or other state of interest)2 – The fault tree is logical diagram providing a model of the interactions between the components of a system, operator actions and other conditions leading to failure of the specified system function*	Definitions for the basic terms used in SSG-3 should be provided. Note that Safety Glossary does not provide these definitions.Note that the proposed definitions might be revised.			X	Definitions are given only in special cases in this guide. ET and FT are well-known concepts and no definitions need to be provided therefore.

Russia/ SEC NRS	2	5.03		Fault tree is a graphical model of various parallel and sequential combinations of failures that will lead to the implementation of a predetermined undesirable event.Event tree - a graph displaying the logic of the paths of occurrence of accidents, used to simulate accident sequences.	It is recommended that Fault Trees and Event Trees are defined in SSG-3.			X	See above
Canada	16	5.04	Footnote 10	“Credited systems - Systems credited in PSA, which include operating and stand-by safety and non-safetysystems for which operation…”	Editorial change	X			
Egypt	7	5.04		Footnote no. 10 Credited systems – Systems credited in PSA, which include operating and stand-by safety and support systems which operation during the accident can support prevention of the undesired end state (e.g. core damage, fuel damage).	In defining credited systems modelled in fault tree, it includes both safety and non-safety systems. This definition need to be reconsidered because the non-safety systems has no safety function and do not need to be modelled in the fault tree analysis. It is proposed to change the "non-safety systems" with "support systems".			X	“Non-safety” refers to safety classification of systems. A system classified as “non-safety” may support prevention of the undesired end state and therefore can be credited in PSA.No need to address “support systems” in this footnote.
FRANCE - CEA	18	5.04		The fault trees are used to model the failure of the mitigating systems to carry out their safety functions. The dependencies (between the different mitigating systems or with initiating event) are modelled in the fault trees and in the event trees.	Treatment of dependencies is the most important point.	X			
Germany	8	5.04	Line 5	… lead to a successful outcome or to ~~the~~ core damage (see paras 5.42 and 5.43), or to one of the	Editorial	X			

				plant damage states (used in the Level 2 PSA). …					
Indonesia	12	5.04	4	The event trees outline the broad characteristics of the accident sequences that start from the initiating event and, depending on the success or failure of the credited systems to mitigate in PSA (hereinafter referred to as 'credited systems'10).	to clarify the task of the credited systems.			X	Meaning of "credited systems" is explained in footnote 10.
FRANCE - CEA	19	5.05		Another approach that is ~~widely~~ used is to carry out the analysis using large event trees and small fault trees. In this approach, failures of safety functions, mitigating systems and support systems are modelled in the event trees. The dependencies (between the different mitigations or with initiating event) are modeled in the ET. This approach is variously referred to as the large event tree approach, the linked event tree approach, or the event tree with boundary conditions approach.	Not a very common approach for NPP PSA	X			

Canada	17	5.06		At the end of this para, add the following:The use of conservative approach should be justified. Where a best estimate of the NPP’s response to an initiator is not available, one or more of the following sources might be used:a) bounding deterministic analysis;b) design analysis;c) commissioning tests;d) operational tests; ande) expert judgment.	This additional information will provide further details for use of the conservative analysis for PSA if needed.	X			
Japan	1	5.06	3	The status of the front line credited systems (success or failure) for the initiating event group usually forms the headings for a particular event tree; this is sometimes ~~referred to as the 'event tree top event'~~ linked to ‘the top event of the fault tree’.	Correction.The “event tree top event” is an initiating event. The original term should be corrected. To keep a consistency with para. 5.71, 5.74. and others.	X	“; this is sometimes referred to as the 'event tree top event'” deleted		
ENISS	4	5.07		For plants with multiple units, the interactions between the units (both positive and negative from risk point of view) should be considered in Level 1 PSA from the perspective of the unit under consideration. Should a multi-unit PSA be developed to quantify multi-unit risk metrics, associated ~~The~~ recommendations ~~on multi-unit PSA aimed to quantify multi-unit risk metrics~~ are provided in Section 11.	Change is proposed to insist on the need to consider multi-unit aspects even when not developing a multi-unit PSA. Then, developing a multi-unit PSA is one option to deal with multi-unit aspects.	X			

FRANCE - CEA	20	5.09		(a) It should be capable of handling the very large and complex logic model of the nuclear power plant. (b) It should be capable to determine the minimal cutsets (see below) by Boolean logic reduction (~~b~~c) It should be capable of quantifying the PSA model in a reasonably short timescale. It should be capable of quantifying the PSA model in a reasonably short timescale. (~~c~~d) It should be capable of providing the information necessary to interpret the Level 1 PSA, such as the core damage frequency, frequencies of minimal cutsets (combinations of initiating events and SSC failures, unavailability .. and/or human errors leading to core damage), importance measures and results of uncertainty and sensitivity analyses.	MCS determination is crucial	X	"It should be capable to determine the minimal cutsets by Boolean logic reduction."		
Germany	10	5.90	(d)	Component failure dependencies due to ~~errors~~ similarities in design, manufacturing or installation or errors made by plant personnel during plant operation. These are addressed by a common cause failure analysis (see paras 5.95–5.98).	A component failure is not necessarily the result of a design or manufacturing error.	X	X Accepted with some revisions		
Turkey	20	5.10	1	“The development of a Level 1 PSA model”	Editorial (wording) It is better to use “development of a model” or “conducting a analysis”	X			

Egypt	13	5.1		The recommendations provided in paras 5.101–5.124 relate to the most common methods used for human reliability analysis in a Level 1 PSA [14].	The description of methods used for human reliability analysis start from: 5.101 to 5.124. Also this sentence is missing the name of the process being analyzed.	X			
FRANCE - CEA	62	5.1		1) Identification and definition of HFEs to be considered in the PSA;		X			
Hungary Attila	7	5.102		The aim of **quantitative assessment in** human reliability analysis should be to generate probabilities of human errors that are both consistent with one another and consistent with the analysis carried out in other parts of the Level 1 PSA.	The overall aim of HRA is a lot more than just generating consistent HEPs.			X	Agree. But in this para the text specifically refers to the quantitative part of HRA
FRANCE - CEA	63	5.102		The aim of human reliability analysis should be to generate probabilities of human errors that are ~~both~~ consistent with one another ~~and consistent with the analysis carried out~~ in all the parts of the Level 1 PSA.	Not clear.Does it refers to HRA for LPSD states?For HRA, it's not worth to separate full power states and LPSD states.	X			
Hungary Attila	8	5.104	Line 1	A structured and systematic procedure should be applied for the identification **and definition** of…	Although the title of this section is "Identification and definition of human failure events", definition of HFEs is not discussed explicitly. As a minimum, the word "definition" should be added to this paragraph.	X			
Hungary Attila	9	5.104	Line 3	… types of HFE**s**, as indicated in paras 5.105–5.108, where failures can make a contribution to the …	Typo. Use HFEs instead of HFE.	X			

FRANCE - CEA	64	5.104		A structured and systematic procedure should be applied for the identification of the human failure events that need to be included in the Level 1 PSA. This should include all types of HFE, as indicated in paras 5.105–5.108~~, where failures can make a contribution to the core damage frequency.~~	It is implicit	X			
Hungary Attila	10	5.105	line 4	…during repair, maintenance, testing, **inspection** or calibration tasks. If such errors remain undetected, the …	The word "inspection" is added for the sake of completeness.	X			
Canada	40	5.106		"…The review should determine the potential for HFEs to occur and the effect of these potential HFEs on the unavailability or failure of ~~safety~~ <u>mitigating</u> system equipment.	Not only limited to "safety systems". To be consistency of the discussion throughout the section.	X	"credited"		
Hungary Attila	11	5.106	line 2	…maintenance, testing, **inspection** and calibration tasks carried out by operating personnel for the systems …	The word "inspection" is added for the sake of completeness.	X			
Hungary Attila	12	5.108	lines 4-5	… HFEs to occur and the effect of these potential errors on the unavailability or failure of a component**,** ~~or~~ system **or safety function**. Type C HFEs usually provide a significant contribution to the core …	See comment no. 6.	X			

FRANCE - CEA	65	5.108		The review should determine the potential for HFEs to occur and the effect of these potential errors on accident sequences development and on the unavailability or failure of a component or system. Type C HFEs usually provide a significant contribution to the core damage frequency. ~~and hence are often the most important HFEs identified in the Level 1 PSA.~~	Difficult to say which error type is the most important		X Agreed with some revisionsShould be checked		
Egypt	14	5.109		This paragraph discusses considering errors of commission in human reliability analysis. It is suggested to add a paragraph considering errors of omission in human reliability analysis.	Errors of omission are not discussed in this Safety Guide.			X	The guide mainly discusses errors of omission, though without explicitly using that term.

ENISS	7	5.109		Significant errors of commission, i.e. incorrectly performing a required task or action, or performing an extraneous task that is not required and might lead to worsening the accident progression or cause an initiating event should be considered as a good practice. This consideration can lead to the creation of additional accident sequences. ~~While~~ However, it is not yet general practice to include errors of commission in the base case PSA.~~, it is considered to be a good practice to use information on the general causes of errors of commission to reduce their potential (see for example, Ref. [14]).~~	To our knowledge, the identifications and modeling of errors of commission should still be considered as a R&D topic and there is no consensus method to identify and model the commission errors.The CESA method proposed by PSI has only been applied through a plant-specific pilot study. Even if this exercise demonstrated the method to be feasible, it concluded on many open issues. To our knowledge, this method has not been implemented in any industrial PSA and can not therefore be considered as a recognized industrial practice.Therefore, we suggest to recommend the consideration of EOCs as a good practice.Finally, the last part of para. 5.109 rather applies to optimization of plant operation with respect to human interaction than PSA area. We suggest to suppress.			X	Note that according to 1.10, the recommendations presented in this Safety Guide are based on internationally recognized good practices. To add "a good practice" would not change the meaning of the sentence. The last sentence of the paragraph provides a motivation to analyse errors of commission.
FRANCE - CEA	21	5.11		An initiating event is an event that ~~could lead directly to core damage (e.g. reactor vessel rupture) or that~~ challenges normal operation, and which necessitates successful mitigation ~~using safety or non-safety systems~~ to prevent core damage.	Proposal to have a more general definition (reactor vessel rupture is a very particular IE which is not of great interest for PSA; it is for the deterministic demonstration of its exclusion)Moreover, consistency of this definition of "initiating event" with the definition of the glossary should be checked	X			

Canada	41	5.11		It might be possible to credit repair actions if the specific failure mode of the equipment is known for the specific sequence and (i) it is possible to quickly ~~diagnosed~~ diagnose the failure, […]	Editorial change.	X			
Germany	11	5.11		Repair actions (e.g. the replacement of a motor on a valve so that it can be operated) should be credited in PSA only if there is strong justification for their feasibility. Human Reliability Analysis (HRA) techniques cannot ~~be~~ always be used for repair actions since the method of repair is case dependent. It might be possible to credit repair actions if the specific failure mode of the equipment is known for the specific sequence and (i) it is possible to quickly diagnose~~d~~ the failure, (ii) the spare parts and repairing personnel are in place, and (iii) the time window is sufficiently long to credibly assume the possibility for repair, including the time needed to bring spare parts and repairing ~~personal~~ personnel to the plant. Recovery is defined in the PSA context as a restoration of a function lost as a result of a failed SSC by overcoming or compensating for its failure. Recovery can be handled by the operating	Clarification	X			

				personnel, ~~as distinction from~~ <u>in contrast to</u> repair. The appropriateness of the recovery and repair actions should be documented.					
Hungary Attila	13	5.11	line 6	… diagnose~~d~~ the failure, (ii) the spare parts and repairing personnel are in place, and (iii) the time…	Typo: diagnose instead of diagnosed.	X			
Hungary Attila	14	5.11	lines 6-7	… (ii) the spare parts and repairing personnel are in place, (iii) **the environmental and work conditions needed for performing repair are given or they can be ensured,** and (**iv**) the time window is sufficiently long to credibly assume possibility for repair,	Environmental and work conditions (e.g. accessibility, temperature, radiation, etc.) are also an important factor that should be considered when giving credit to repair, even though para no. 5.111 also addresses this issue from a given perspective.	X			

				including the time needed …					
FRANCE - CEA	66	5.110		It might be possible to credit repair actions if the specific failure mode of the equipment is known for the specific sequence and (i) it is possible to quickly diagnosed the failure, (ii) the spare parts and repairing personnel are in place, ~~and~~ or (iii) the time window is sufficiently long to credibly assume possibility for repair, including the time needed to bring spare part and repairing personal to the plant.	(iii) is a complement to (ii)	X			
Pakistan	6	5.111		The statement “Exceptions may be justified, but this should not be normal practice.” may be expunged.	Actions that are performed without any procedure guidance or are not trained on, should not be included or credited in the analysis in any case. The statement “Exceptions may be justified, but this should not be normal practice.” seems to encourage the deviation from approved procedures. Therefore, this statement may need to be expunged in order to discourage such behavior.			X	This paragraph does not encourage to the deviation from approved procedures.
FRANCE - CEA	67	5.111		Crisis team may be also considers in the PSA. To complete the text.				X	The proposed text is not related to the discussion of paragraph 5.111

Hungary Attila	15	5.112	lines 1-2	Assessment of human reliability in the context of deploying portable equipment should follow the same **general** principles as ~~generally in~~ **the overall** human reliability analysis **process**.	Use of language.	X			
Hungary Attila	16	5.114	line 6	(d) Interviews, talk-throughs, and walk-throughs with operating personnel **and trainers**	Information from training staff is considered important too. For type C actions it is often more relevant than the feedback from operating personnel.	X			
Libya	8	5.114	No. SSG-3	Passive systems must be more than one system working independent and also include natural convection	Improved clarity.			X	Unclear which paragraph is meant and what the change is proposed
Hungary Attila	17	5.115	lines 5, 10 and 13	Use HFEs instead of HFE.	Typo.	X			
Hungary Attila	18	5.116	lines 3-5	If this is not possible, then ~~the~~ expert judgement should be used for **the** items listed above. In any case, later the correspondence of qualitative information to **the actual** plant ~~actual~~ status should be verified and PSA should be updated, as needed.	Use of language.	X			
Hungary Attila	19	5.117	lines 2-4	… including the level of stress, the time available to carry out the task, the availability of operating procedures, the level of training provided~~,~~ and the environmental conditions**. Other relevant factors**	It is considered important to point out that the list of PSFs is not exhaustive.	X			

				should also be considered, as appropriate.					
Libya	9	5.117	No. SSG-3	Electrical power supply with emergency power system connected to computer-based systems in case of main power system cutoff	Improved clarity			X	Unclear which paragraph is meant and what the change is proposed
FRANCE - CEA	68	5.117	Before 5.117	**Quantitative assessment of human failure events**	Very little on this important subject – most important aspects are described? To make reference to others IAEA guides?			X	Comment is not clear. 5.113 discusses qualitative assessment, not quantitative assessment. Reference is made to [14]
Hungary Attila	20	5.119	lines 1-6	While the application of different quantification methods for different types of HFE**s**, e.g. between types A, B and C, may be considered, the use of **the** same human reliability analysis approach (human reliability analysis method or combination of methods) for the assessment of similar types of HFE**s** is preferable to **ensure** ~~achieve a~~ consistency in the analysis. If different approaches are used for the same type of HFEs**,** the reasons for their selection should be documented.	Use of language.	X			

Hungary Attila	21	5.120	lines 1-2	The risk importance of HFEs should be evaluated to identify the ~~need~~ **HFEs that should be subject** to ~~perform~~ a more detailed analysis ~~of HFEs~~.	The main objective of importance analysis in this step is to select the HFEs for detailed analysis, as opposed to identifying the need for detailed analysis. It is seen unlikely that no detailed HRA is needed for any of the HFEs in a plant PSA.	X			
Hungary Attila	22	5.120	line 4	…more factors **are taken into account** and ~~a~~ **the context is characterised in** more detail~~ed context characterisation is taken into account~~…	Use of language.	X			
Hungary Attila	5	5.12	line 6	… in Section 10 and for Multi-unit PSA are provided in Section 11.	There is an unnecessary ")" sign at the end of the sentence that needs to be deleted.	X			
Canada	42	5.121		(b) HFEs that are relevant only for a specific hazard (e.g. firefighting using portable fire extinguishing ~~devises~~ devices).	Editorial change.	X			
Egypt	15	5.121		(b) HFEs that are relevant only for a specific hazard (e.g. firefighting using portable fire extinguishing devices).	Editorial	X			
Hungary Attila	23	5.121	line 4	…relevant ~~for~~ to the **scenarios induced by** internal or external hazards ~~scenario~~.	The subject is not a specific scenario but the scenarios that can be induced by internal or external hazards in general.	X			
Hungary Attila	24	5.121	lines 10-11	The methods to assess hazard specific HFEs ~~may~~ **can** usually **rely** ~~follow~~ **on the** same principles as the **ones used for analysing** other types of HFEs.	To ensure clarity.	X			

Hungary Attila	25	5.122	lines 1-3	**Analysis** ~~Identification~~ of dependent HFEs should **be embedded into the overall** ~~take place in all phases of the~~ human reliability analysis process (identification, qualitative assessment~~s~~, quantitative assessment~~s~~, and integration of HFEs in**to** the **PSA** model).	To ensure unambiguity, the sentence should not start with the word "identification" as the main message is to stress that the analysis of dependent HFEs should follow each major HRA step. Another reason is the use of language.	X			
Hungary Attila	26	5.122	lines 5-6	…**cognitive coupling due to the structure or content of plant** ~~incorrect~~ procedures, ~~an incorrect~~ **drivers of** diagnosis ~~or an incorrect plan of action in carrying out response actions~~ **and response planning, and similarities in conditions for taking responses.**	The terms "incorrect procedures", "incorrect diagnosis" and "incorrect plan of action" appear much too strong and simplifying. The proposed text is considered more appropriate as a refined description of contextual conditions that are important to the occurrence of dependent HFEs.	X			
FRANCE - CEA	69	5.122		Dependencies between pre-accident human errors should also be considered. To complete.			-	X	The recommendation in the 5.122 regarding the dependencies is more general, no need to specify for Type A errors. Considered to be misleading regarding other HFE dependencies.
FRANCE - CEA	70	5.122		Dependencies between human errors and automatic actions should also be considered. To complete.				X	This is a different issue. Dependencies between HFEs and automatic actions are part of the analysis of the context for HFE
Egypt	16	5.123		Footnote 17Such minimal cutsets can be identified by setting the human error probabilities to the maximum value (i.e. 1.) and recalculating the core damage frequency; ….	Often in screening, the dependency between human interactions is set to the maximum value (i.e. 1.) to ensure that the related human action dependency is not eliminated in the process.			X	.9 is an example

Hungary Attila	27	5.124	lines 1-2	~~The impact of risk significant HFEs should be either incorporated as basic events in fault trees or used as event tree headings.~~ **HFEs should be incorporated as basic events into the logic model. Depending on the definition and effect of an HFE, the corresponding basic event can appear at an appropriate level in the system fault trees or it can represent an event tree heading too.**	Not the impact but the HFEs themselves should be incorporated into the PSA model.Whatever HFEs are considered in PSA after screening (if applied), they are modelled and quantified; therefore, it is not necessary to note at this stage that risk significant HFEs should be incorporated. The final results may show that some HFEs are not risk significant, even though they are represented in the PSA model.Finally, all the HFEs should be identifiable as basic events in the PSA results (minimal cut sets) and this aspect is also addressed in the proposed text.	X			
Hungary Attila	28	5.124	line 2	Recovery type ~~of~~ HFEs may be also implemented	Use of language.	X			
FRANCE - CEA	71	5.124		The impact ~~of critical~~ HFEs should be either incorporated as basic events in fault trees or used as event tree headings.		X			
Hungary Attila	29	5.125	lines 6-7	… in Ref. [16]). **The demonstration of the functionality (including reliability and availability) of passive systems** generally involve**s** the use of one or more techniques such as **thermal-hydraulic calculations, validation, expert judgement**, testing, and performance monitoring.	It is suggested fractioning the long sentence into two as proposed. The techniques listed in the sentence are used to demonstrate not only the reliability, but the functionality of the system that includes, amongst others, the reliability and the availability of the system. Moreover, thermal-hydraulic calculations and validation are the techniques that should come first in the listing.	X			

UK	4	5.125	1,2 and 3	Edit 5.125 to:Functional reliability assessment of passive systems to satisfactorily perform their safety functions (i.e., assessment of their failure probability) should be considered in PSA. Paragraphs 5.125–5.131 deal with passive systems incorporating moving fluids or expanding solid structures, direct action devices, or stored energy sources (i.e. passive systems of categories B, C, and D defined in Ref. [16]), that generally involve the use of one or more techniques such as expert judgement, validation, testing, and performance monitoring to demonstrate their reliability.	Highlighted text simplified to improve clarity.	X			

Russia	16	5.126		5.126. ... The absence of such reliance in passive safety means that the reliance is instead placed on natural laws, properties of materials, ~~and~~ internally stored energy or *capacity and environmental conditions.* Some potential causes of failure of active systems, such as lack of human action or power failure, do ~~not~~ *also* exist when passive safety is provided. ~~While~~ Individual processes *that might impact passive system operation* should be ~~are well~~ understood, ~~as well as the~~ combinations of these processes, which define actual performance of such systems. *These processes and their combinations* may vary depending on changes in the ~~conditions of state,~~ boundary conditions and failure or malfunctioning of components within the system~~, the circuit or the plant~~.	These features of passive systems are important (tanks, external temperature for heat sink, etc). Statement was wrong. Human error can cause failure. Also for system initiation power supply and IC might be needed. Statement was wrong. Firstly, you have to understand individual processes. Last part (~~the circuit or the plant~~) is unclear. It is still within some system.	X	First proposal accepted as proposed.Second changed as "… may be eliminated…"Third changed as"It is necessary to understand not only but also the combinations of these processes. These processes and their combinations, which define actual performance of such systems, may vary depending on changes in the conditions of state, boundary conditions and failure or malfunctioning of components within the system."		

Hungary Attila	30	5.127		**The operation of passive systems (especially thermal-hydraulic systems) generally rely on smaller driving forces than active safety systems; therefore, they are more sensitive to environmental and boundary conditions.** Assessment of reliability of passive systems should carefully consider failure mechanisms and events potentially affecting the environmental and other boundary conditions for system operation, such as the conditions that influence natural laws to effectively mitigate accident conditions, mechanical or structural degradation, including ageing effects, unique to passive system. For example, natural circulation may be impaired or prevented by non-condensable gases, blockage, wrong valve positions, impurities, corrosion, algae in tanks, maintenance errors or foreign objects in the system **and the potential imperfections of the passive system components (e.g. undesired inclination of pipes due to improper construction) may also degrade the performance of certain passive systems due to the low magnitude of driving forces.**	Adding a short explanation to the beginning of the paragraph is proposed to describe why passive systems are more sensitive to environmental and boundary conditions than active systems. The importance of the effect of proper construction on the performance should also be emphasized at the end of the paragraph.	X			

FRANCE - CEA	72	5.127		Assessment of reliability of passive systems should carefully consider failure mechanisms such as the conditions that influence natural ~~laws~~ phenomena	Natural laws can not be influenced	X			
Russia	17	5.128		5.128. ... For instance, if it exists, the feedback from the periodic testing and maintenance may reveal any age-related material degradations or may demonstrate need to modify testing *or maintenance* strategies.	Maintenance is more important	X			
FRANCE - CEA	22	5.13		(e) Review of the deterministic design basis accident analysis and beyond design basis accident analysis and the safety analysis report. (f) During the PSA development, some IE can be added when the plant design details are better understood	Somme IE may be identified during the PSA model development			X	Self-evident - PSA process is iterative
Canada	18	5.13		"A systematic process should be used to identify the set of initiating events to be addressed in the Level 1 PSA. This should involve a ~~number~~ sufficiently comprehensive combination of different approaches including:"	To improve the clarityThe approach of c), d) or e) is not systematic by itself.Revised to be consistent with 5.21 and 5.24	X			

Turkey	21	5.13	All	"……….(e)(d)(b)(c)(a)….. "	It is suggested to organize the bullets in accordance with their potential for having them at the very beginning. So it would be better to start with the ones which we already have in the design stage. For example starting with (e), (d), (b), (c) and (a). Generally we don't have the hazard analysis during generic design stage.	X	Changed to (e)(d)(c)(b)(a)		
Russia	18	5.13		5.130. The reliability analysis of a passive system should include the following stages: (a) System characterization to define the mission of the system, associated accident scenarios, failure modes and success/failure criteria; *(b) Identification of system failure mechanisms* (b) System modelling to enable ~~an evaluation~~ *a consideration* of system performance in various conditions ~~(system modelling is needed due to limited possibilities to evaluate the system performance experimentally)~~; ~~c) Validation of the system model to the extent practical;~~	Missing step is added.Unnecessary text is removed c) has no practical value	X			

Russia	66	5.13		5.130. The reliability analysis of a passive system should include the following stages: (a) System characterisation to define the mission of the system, associated accident scenarios, failure modes and success/failure criteria; *(b) Identification of system failure mechanisms* (b) System modelling to enable an evaluation of system performance in various conditions ~~(system modelling is needed due to limited possibilities to evaluate the system performance experimentally)~~;	Missing step is added and unneeded text is removed	X	note that 5.130 is based on [17]		
FRANCE - CEA	73	5.13		c) Validation of the system model to the extent practical;	Agree but how to do it? Please explain.		X Bullet is removed		
Hungary Attila	31	5.131	Lines 6-7	… system and failure of initiation (if external initiation is required). **Over and above these failure events, phenomenological events that are unique to passive systems due to their high sensitivity to environmental and boundary conditions and the uncertainties in the supporting analyses should also be considered in the PSA.**	The necessity of modelling the phenomenological reliability of passive systems besides the conventional mechanical and human failures was missing from the paragraph. As currently there is no consensus methodology or recommendation on accurate modelling techniques (e.g. whether it should be handled in fault tree or event tree level), no detailed guidance should be proposed in this document.			X	5.131 is deleted. The proposed modification does not provide added value

Russia	19	5.131		5.131. ~~… The uncertainties in the supporting analysis should also be taken into account.~~ The approach for accessing failure probabilities vary depending on the type of passive systems. *For passive systems of Type B, where only moving fluid is needed to perform its function, the following major cause for system failure should be considered:Operation beyond the design conditions of the system (e.g. system is not designed to operate at a high environmental temperature) Aging effects, leading to loss of system boundaries Improper maintenance of the system or operator errors during maintenance that leads to reduction of system efficiency (deposition on the surfaces, loss of system boundaries, use of fluid of unacceptable quality) Improper design of the system, that leads to changes in the properties of the fluid (e.g. intrusion of gases in the fluid from connected systems)Insufficient energy and/capacity stored in the system to maintain system function for the required mission timeFor such systems in each specific scenario the dominant impact of each cause (in*	Uncertainty is already discussed in 5.130.Details are needed. Otherwise para is empty and almost useless. Important. I.e. in VVER-1200-M design passive heat removal system cannot provide sufficient heat removal if outside temperature is above 53 C Important: In VVER-1200-E design passive heat removal system has not enough water for operation beyond 24 hs,		X 5.131 is deleted. The proposed modification is considered to be too detailed for this guide purposes.		

				terms of its likelihood) for the system failure should be assessed and converted in failure probability using the most appropriate technique (e.g. type B HFEs assessment for cause c), assessment of probability of environmental condition for cause a). For passive systems of Type C (systems with moving mechanical parts, not requiring external to the passive system signal or action, the major cause for system failure is a failure of moving mechanical part. Failure probability for moving mechanical part should be assessed using standard data assessment technique. However, other causes listed above should also be investigated and might be accounted in overall failure probability for the system.For passive system of Type D (which requires an external signal or action to initiate change of the status of mechanical part to trigger the passive process), the major cause for system failure is a failure of external signal or action and a failure of moving mechanical part. Failure probability for external signal or human failure events should be assessed using either the standard fault tree modelling techniques or HRA methods. Even though					

				other causes listed above are typically negligible for failure probability of the system, they should also be considered.					

Russia	20	5.131	New para 5.131a needs to be added	*5.131a Common cause failure is one of the most important failure modes of passive systems that should also be considered. Typically for type C-D passive systems CCF of moving parts or IC part is assessed using standard technique for similar components in redundant trains. However, for type B passive systems causes for system failures might be the same for all system trains. This should be reflected in the passive system models when dependent failure of redundant trains might have the same or close to the same probability as for any single train.*	CCF aspects of passive system should be discussed	X			
China	1	5.132		"Reliability assessment of computer based systems being part of the SSCs credited to ensure safety functions should be considered in PSA" is recommended to be modified as" Reliability assessment of computer based systems being part of the SSCs credited to ensure safety functions or cause initiating events should be considered in PSA""	The computer based system that caused initiating events should also be considered in PSA.	X			

Germany	12	5.132	to 5.145	*Consider replacing "computer based systems" by "programmable systems" or "software based systems".*	The proposed terms are all-encompassing in that they also include embedded programmable field devices as well as devices that rely on HDL-programmable circuits like FPGAs. (In many places the text already talks about 'programmable systems', and the terminology should be unified.)	X			
Russia	21	5.132	New Para 5.132	*5.132 The reliability of passive systems for which statistical data cannot be collected (i.e. containment, reactor, core catcher spend fuel pool) should be assessed using special models. These models should be capable to capture effects that might lead to system degradation and failure in specific accident conditions.*	Statement on large passive systems should be added.			X	Covered by 5.127

ENISS	8	5.133		The scope and the approach for the reliability assessment of digital ~~computer based~~ systems should follow the risk importance of the systems from the PSA point of view. For instance, it could be expected that if the reactor protection system and the reactor control systems or other high-risk importance systems are controlled by a digital ~~computer based~~ system, they might ~~may~~ need ~~a detailed~~ an analysis more detailed than ~~while~~ the one associated to the assessment of digital ~~programmable~~ components in other lower risk importance I&C systems ~~may only require analysis in a more simplified manner~~. ~~Other~~ In any case, acceptable simplified approaches for assessing the reliability of digital ~~computer based~~ systems could be adopted for PSA modeling considering their architecture and their safety classification.	As there is no consensus on what is a ‘detailed’ analysis and what is a ‘simplified’ analysis, it is proposed instead to use a relative formulation.In addition, we propose to mention that, even in case a more detailed analysis is conducted, this one may still adopt simplifications.Both terms “computer-based” and “programmable” are used here. We think the term “digital” should be used consistently with SSG-39.			X	SSG-39 uses both “digital” and “computer based”. L32 Paragraph has be revised according to another comment (NUBIKI-30)

Hungary Attila	32	5.133		**A graded approach should be used to specify the scope and the method used** for the reliability assessment of computer based systems, **relying on the risk significance** of the systems from the PSA point of view. For instance, it could be expected that if the reactor protection system and the reactor control systems or other **risk significant** systems are controlled by a computer based system, they may need a detailed analysis while the assessment of programmable components **of** other lower risk **significant** I&C systems may only require analysis in a more simplified manner. Other acceptable simplified approaches for assessing the reliability of computer based systems could be adopted for **modelling** considering their architecture and their safety classification.	The original version of the first sentence was not clear and it was slightly misleading. Hence it was proposed to directly address the graded approach and refine wording. Moreover, "risk importance" is proposed to be replaced by "risk significant", as it is more widely used in such context.	X			

ENISS	9	5.134		Reliability assessments of operator interface systems usually consider other I&C system failure dependencies through normal PSA fault trees and event trees modelling, which cascade failures of systems credited earlier in an accident sequence routinely. The operator and correlated operator interface system interdependencies between different I&C systems should be considered. For those programmable operator interface systems that are modelled in a simplified manner, justification should be provided for the limitations in the analysis.	Editorial correction			X	"s" is not needed
FRANCE - CEA	74	5.134		The need to assess the reliability of the operator interface systems should consider the dependencies with other I&C systems whose failures are relevant for the considered actions by operating personnel. In any case, for those programmable operator interface systems that treated in a simplified manner, a justification should be provided for the chosen limitation in the analysis.	Not clear. Please revise.		X		

ENISS	10	5.135		Reliability assessment of digital computer based systems should cover both hardware and software components of those systems. Modelling Assessing the reliability of digital computer based systems is still a challenge, due to the fact that for the software modules the standard statistical approaches have limited applicability. Recognized industrial practice is still to be established.	Assessing the reliability of digital I&C systems is still a R&D topic. As an example, it is still a part of future work program in the frame of DIGMAP task of WGRISK. Therefore, we propose to mention this limitation and current work in progress.			X	Proposed revisions do not change the content of the paragraph
Germany	13	5.135		Reliability assessment of computer based systems should cover both hardware and software components as well as configuration data of programmable logic devices of those systems.	Include programmable logic devices (e.g. FPGAs, CPLDs) that are configured by hardware description languages (HDL).	X			
ENISS	11	5.136		As for any systems analysis, the first task for the reliability assessment of a digital programmable system should be to define the scope of the system and its PSA related tasks. Here, attention should also be paid to system tasks which, if spuriously actuated, can have adverse effects on some safety function. In addition, the The interactions between the I&C systems should be analysed to define system dependencies for the considered system tasks. Here, aAttention should also be paid to system tasks which, if spuriously actuated, can have adverse effects on some safety	We propose to distinguish the failure of I&C systems to accomplish required function, which may drive the failure of required systems or operator actions to perform their function and the spurious actuation of systems which may constitute an initiating event. In addition, the modelling of spurious actuation of systems in PSA is, to our knowledge, still a R&D topic. As an example, it is still a part of future work program in the frame of DIGMAP task of WGRISK. Therefore, we propose to mention this limitation and current work in progress.			X	Proposed revisions do not change the content of the paragraph

				function and cause initiating events to consider. Recognized industrial practice is still to be established.						

ENISS	12	5.137		The analysis of digital ~~computer based~~ systems should be sufficiently detailed to capture the functionally relevant failure modes of the systems and to capture the dependencies between systems. Both the failure mode “failure to actuate certain I&C function” and “spurious actuation” should be considered. The required level of details ~~is dependent~~ depends on the I&C architecture and the implemented fault tolerant features in the systems. ~~Therefore, it may be necessary to perform a detailed functional analysis of failures, including common cause failures, to come to a conclusion what the sufficient level of details is. When more simplified models are used, they~~ The modeling should ~~include~~ rely, at a minimum, on the major failure modes identified by the hazard analysis used in the development of the system [18].	We propose to simplify 5.137 suppressing text that is not a requirement.In addition, we suggest that the modelling should rely on, instead of include, the main failure modes to keep possible the grouping of functionally similar failure modes.			X	If simplified modelling approach is used, it should be justified.
FRANCE - CEA	75	5.137		The required level of details is dependent on the I&C architecture and the implemented fault tolerant features in the systems.	The link with PSA model is not obvious. Please explain.		-	X	It might affect the overall reliability of the software based I&C system
FRANCE - CEA	76	5.137		When more simplified models are used, they should include at a minimum, the principle failure modes identified by the hazard analysis used in	Hazard analysis is not common to I&C. Please explain.		X change to Failure Analysis		

				the development of the system [18].					
ENISS	13	5.138		In the analysis of digital ~~programmable~~ components (processors, communication modules, sensors, actuators, other devices), the starting point should be to consider both hardware and software parts of the components (modules, sub-components), and to further decompose hardware and software into smaller details if so needed and feasible, and if applicable data are available. ~~For some components a decomposition into hardware and software is not necessary if relevant failure modes and dependencies can be covered jointly. However, such a simplified approach is not necessarily feasible when hardware and software modules have different failure modes, failure detection means, functional failure impacts or common cause failure groups.~~ The reliability analysis of digital ~~programmable~~ components should include an assessment that provides a justification for selected level of details of components' analysis. Reference [18] provides an	We propose to add that the software/hardware decomposition should be needed, feasible, and supported with applicable data.Then, we propose to suppress the following sentences which appears too detailed for a Specific Safety Guide.	X			

				example failure modes taxonomy for digital I&C systems.					

ENISS	14	5.139		The analysis should confirm that dynamic interactions between a plant system and the plant's physical processes, (i.e. the value of process variable), and interactions within a digital ~~computer-based~~ system (e.g. communication between different systems, multi-tasking, multiplexing) including interaction between hardware and software have been addressed in the digital components reliability assessment ~~PSA model for the programmable components~~. If the dynamic interactions have not been addressed a rationale for not modelling them should be provided.	Such analysis of dynamic interactions needs specific methods and tools and is not a common practice for PSA. It should rather be included into the reliability analysis.			X	The paragraph has been fully revised - the comment is not applicable anymore
Russia	22	5.139	Para 5.139	~~5.139. The analysis should confirm that dynamic interactions between a plant system and the plant's physical processes, (i.e. the value of process variable), and interactions within a computer-based system (e.g. communication between different systems, multi-tasking, multiplexing) including interaction between hardware and software have been addressed in PSA model for the programmable components. If the dynamic interactions have not been addressed a rationale for not modelling them should be provided.~~	This para is unclear. Examples or explanation on what dynamic intercations mean should be provided, otherwise, the para should be removed.	X			

Canada	19	5.14	2nd line	"It is recognized that ~~it is not possible to demonstrate that all possible initiating events have been identified. However,~~ by using a sufficiently comprehensive combination of the different approaches listed in para. 5.13…"	Editorial change	X			
ENISS	15	5.14		The reliability of the hardware modules should be assessed using standard techniques, if these techniques can model system behavio~~u~~r, failure modes and dependencies identified.	Editorial correction			X	UK English spelling

ENISS	16	5.141		The reliability assessment of software modules should include an assessment of existing operating experience (also from other NPPs or from other industrial applications) and an assessment of the development process (including validation and verification process) to gain as reasonable confidence as possible for the provided reliability estimates. ~~For the reliability assessment of software modules, several approaches have been developed and tried out in the literature, research and development projects and PSA projects, e.g. statistical testing, reliability growth model, fault injection method, expert judgements based on the assessment of the quality of validation and verification process and software complexity, assessment of operating experience[18] [19].~~ The reliability assessment of software modules is still a challenge. Recognized industrial practice is still to be established.~~[18] Depending on the type of the software module (e.g. operating system, application software) and considered failure mode, the applicability of the method varies but in practice all methods have limitations to produce a~~	Editorial correctionsWe propose to suppress the sentences that describes in too many details the possible modelling approaches and suggest a generic formulation to state that R&D activities are still conducted in this domain.	X	Reference [19] and footnote kept		

				well-justifiable number as ideally expected in PSA. Significant uncertainty in identification of failure modes, modelling dynamic interactions and data have been noted [19]. This needs to be taken into account in the use of PSA in risk-informed applications.						

ENISS	17	5.142		The treatment of the recovery actions taken for loss of digital ~~programmable~~ system functions, should be coordinated with HFE models of the main control room design, minimum alarms and controls inventory. If recovery actions are credited to back-up the loss of digital ~~programmable~~ system functions, possible dependencies with the loss of instrumentation should be taken into account.	Editorial correction	X			
ENISS	18	5.143		The reliability analysis of digital ~~programmable~~ systems, including communications networks, should ~~include an assessment of~~ consider the possibility of intersystem common cause failures~~, including communications networks~~. Such consideration should be paid to digital systems carrying out similar or same functions. ~~This is relevant, for instance, when a control and protection system or two diverse systems carrying out the same safety function are both computer based systems, consideration should be given to whether there are any d~~ Should credible dependencies in the hardware and software of the two computer systems ~~should~~ be identified, ~~and, if so~~, ~~this~~ they should be	We propose to require an analysis of the need to consider intersystem CCF rather than requiring to assess intersystem CCF. If valid evidence are provided to demonstrate that the possibility for intersystem CCF is extremely rare, then, this should be sufficient so that CCF are not included in the reliability analysis.	X	The reliability analysis of programmable systems, including communications networks, should include an assessment of intersystem common cause failures. Such consideration should be paid to computer systems carrying out similar or same functions. Should credible dependencies in the hardware and software of the two computer systems be identified, they should be taken into account in the Level 1 PSA.		

				taken into account in the Level 1 PSA.					
ENISS	19	5.144		Uncertainties in the modelling of digital ~~programmable~~ systems and data should be addressed. ~~It is expected that the modelling uncertainties will be significantly higher for the analysis of computer based systems than other systems, because of the lack of knowledge of detailed failure modes, system interactions and/or hardware software interactions.~~ These modelling uncertainties should be identified and at least qualitatively addressed. Data uncertainty should also be addressed.	We propose to suppress personal opinions from the recommendation, unless it is proven to result from a widely recognized consensus.	X			

USA	4	5.144		5.144 . Uncertainties in the modelling of programmable systems and data should be addressed. Even minor changes in software can significantly change system behavior, and aggregation of data from similar, but not identical software should be carefully considered. It is expected that the modelling uncertainties will be significantly higher for theanalysis of computer based systems than other systems, because of the lack of knowledge of detailed failure modes, system interactions and/or hardware software interactions. Thesemodelling uncertainties should be identified and at least qualitatively addressed. Data uncertainty should also be addressed.	Based on experience, it is very important to highlight this nuance with aggregating data on operating experience in software since it is different from other components modeled in PRAs.	X			
Canada	44	5.145		Please add the following footnote related to this para:“In system reliability analysis, it is sometimes assumed that certain passivecomponents can be omitted, based on the argument that active components dominate. In applying this screening criteria to common cause analysis, it is important to not exclude events such as debris blockage of redundant or even diverse pump strainers”.	To provide more details on modelling of passive components.			X	Addressed by 5.78

Canada	44	5.145		At the end of the 2nd last sentence, add the following:“In addition, it is expected that any software errors that would manifest are adequately covered/bounded by the common cause methodology”.	The addition provides some support for excluding modelling of the software errors			X	Addressed by 5.78
ENISS	20	5.145		As stated in Ref. [20], insights gained from PSA should be considered in the design of I&C systems. Derivation of I&C systems reliability should be substantiated and ~~use internationally recognised approaches~~ comply with national requirements and practices (see IAEA Safety Guide SSG-39).~~ Assumptions should be documented and justified. In this respect, IAEA Safety Guide SSG-39 on Design of Instrumentation and Control Systems for Nuclear Power Plants [20] points out that practices differ in Member States. Some Member States expect quantitative estimates of probability of I&C systems due to hardware and software failures. For other Member States, design errors (including software errors) and their consequences are adequately treated only by qualitative analyses of the architecture and of the design. Some Member States, that apply numerical reliability to software, have established~~	First, as there is no international recognized consensus, we propose to indicate that I&C systems reliability analysis should comply with national requirements and practices.Second, we propose to simply refer to SSG-39 rather than duplicate words from this guide. Then, the interested reader will find more details in SSG-39.			X	This paragraph has been added to make reference to SSG-39. Therefore, it is a kind of summary of SSG-39 from PSA point of view, but it is not a requirement otherwise. Generally, the treatment of programmable systems should not be different from other systems. In any case, national requirements and practices should be complied with.

				~~numerical limits to software reliability claims.~~					
Egypt	17	5.146		Paragraphs 5.147–5.163 provide recommendations on the data for initiating event frequencies, ...	Paragraphs discuss the data for initiating event frequencies start from: 5.147 to 5.163.	X			
Russia	23	5.146	New Para 5.146	5.*146 Reliability parameters for software should be estimated with account for the information presented in para 3.17of the IAEA publication NT-1.13.*	For current situation it is useful to have at least some refrences to data sources.			X	IAEA NP-T-1.13 does not provide additional information compared to 5.141 (could be added as a reference besides IAEA NP-T-3.27 ref. [19]. [19] is much newer than IAEA NP-T-1.13.
Russia	67	5.146	New Para	5.*146 Reliability parameters for software should be estimated with account for information presented in para 3.17of*	For current situation it is useful to have at least some references to data sources.			X	See above

				the IAEA publication NT-1.13.					
Canada	45	5.152		"A frequency should be assigned to each initiating event group modelled in the Level 1 PSA. The frequency for the initiating event group should be the sum of the frequencies for all the individual initiating events assigned to that group. The frequency should be in occurrences per reactor calendar year (such that the frequencies account for the fraction of time the plant is operating at power)."	Clarify that IE frequencies for the at power PSA should be in occurrences per reactor-year (i.e., weighted by the plant availability factor) rather than in occurrences per full power year (i.e., which assumes the reactor is operating at power 100% of the time).	X	The frequency should be in occurrences per reactor calendar year such that the frequencies account for the fraction of time the plant is in the applicable plant operating state.		
FRANCE - CEA	77	5.154		A frequency should be assigned to each initiating event or initiating event group modelled in the Level 1 PSA. In determining this frequency, account should be taken of all the causes identified for the initiating event.		X			
Canada	46	5.157		"Justification should be provided for the numerical values for the component failure probabilities used in the quantification of the Level 1 PSA. Justification should also be provided for any component failure modes that are excluded from the PSA (e.g., on the basis of negligible contribution to total failure probability of the component)."	Clarification. Earlier paragraphs (e.g., 5.77) identify that the fault tree analysis should include the "important" component failure modes. The analyst should justify why "unimportant" failure modes can be excluded, e.g., because they have very small probabilities compared to the failure modes that have been included.			X	This addition suits better in the fault tree analysis subsection (FMEA issue).

FRANCE - CEA	78	5.157		Similar but different of 5.154. Please check.		X			
Russia	24	5.158		5.158. For components such as pumps that are needed to operate for some time ~~post-trip~~, the mission time should be specified. Determination of component mission times should be ~~defined on the~~ based on~~f~~ the system mission time defined through accident sequence analysis (see ~~as defined in~~ para. 5.52).	Editorial	X			
FRANCE - CEA	79	5.158		The Level 1 PSA report should give a description of each initiating event identified for the plant along with the mean value and associated uncertainty for the initiating event frequency, the justification for the numerical value assigned to it and an indication of the level of uncertainty			X Accepted with some revisions		
FRANCE - CEA	80	5.159		Determination of failure probabilities should be consistent with the type of component, its operating regime, its surveillance (periodical tests…), the boundaries defined for the component in the Level 1 PSA model and its failure modes.		X			
FRANCE - CEA	81	5.163		This is valid for all other PSA parameters not only for components failure. To move the paragraph in a general section.		X	Moved to 5.151		

Canada	47	5.165		After the 2nd sentence in this paragraph, add the following sentence:“Logic loops can be generated during fault tree integration due to mutual system dependencies, often among the support systems such as service water, instrument air, and electric power”.	To provide details on logic loops.	X			
Egypt	18	5.165		For the approach using a combination of small event trees and large fault trees (the fault tree linking approach, see para. 5.4 and 5.5)	The fault tree linking approach uses a combination of small event trees and large fault trees.	X	“Relatively small event trees and large fault trees”		
Egypt	19	5.166		Paragraphs 5.166 and 5.167 provide recommendations on meeting Requirement 18 of GSR Part 4 on use of computer codes for a Level 1 PSA.	Paragraphs discuss the use of computer codes for a Level 1 PSA start from: 5.166 to 5.167.	X			
Brazil	1	5.168		fuel damage frequency (point estimates and uncertanty bounds or probability distributions) if the assessment of the contribution of the damage to fuel in the spent fuel pool was defined in the scope	Presenting a risk metric for quantifying fuel damage encourages member states to carry out these fuel damage assessments, in addition to qualitative assessments. These quantitative assessments are becoming increasingly important due to the large number of plants in the life cycle phases such as decommissioning and the long term operation, phases where there is greater movement of fuel			X	Section 5 covers the reactor, as explained in paragraph 2.3

Canada	48	5.168		"(e) Importance measures (such as the risk achievement worth, ~~and~~ the risk reduction worth, Fussel-Vesely and the birnbaum importance for basic events) that are used for the interpretation of the Level 1 PSA;	To include the importance measure of Fussell-Vesely and birnbaum	X			
ENISS	21	5.168		For the approach using a combination of event trees and fault trees	Editorial correction	X			
FRANCE - CEA	83	5.171		The Level 1 PSA documentation should present the results of the quantification of the Level 1 PSA and should describe the most significant sequences and minimal cutsets ~~(for the fault tree linking approach)~~ and any post-processing that has been carried out		X			
FRANCE - CEA	82	5.173	5.176 5.183…	The analyst should provide a definition of the term 'a significant contribution to the risk'	Not the analyst. To be defined at the more general level(similar in other paragraphs)			X	There is a difference between meanings of "significance": significant from PSA model and significance for decision making. Here is meant "significance from PSA model (cusets)"

Canada	49	5.174		Related to this para, add the following two footnotes as examples of how to demonstrate convergence of results:1st foot note:The cutoff/ truncation limit can be established by an iterative process of demonstrating that the overall model results converge and that no significant accident sequences are inadvertently eliminated. For example, convergence can be considered sufficient when successive reductions in truncation value of one decade result in decreasing changes in CDF, and the final change is less than 5%.2nd foot note:Typically in the multi-unit CANDU PSA ,the solution of the integrated fault tree for the core damage state is truncated at 4 orders of magnitude below the most likely minimal cutset, or at 1E-12 occ/yr, whichever is the highest.	To provide details on convergence of results with change in the truncation limit.			X	Too technical and detailed for this guide

Egypt	20	5.175		Footnote 19For a specific basic event, the Fussell–Vesely importance measure is the fractional contribution to the total frequency of core damage for all accident sequences containing the basic event to be evaluated. Footnote 20 The risk reduction worth is the relative decrease in the frequency of core damage if the probability of the particular basic event is considered to be zero. The risk reduction worth is a direct function of the reliability of the basic event and can be used to assess the contribution of the basic event to the core damage frequency. Footnote 21 The risk achievement worth is the relative increase in the frequency of core damage if the failure of the particular basic event is considered to be certain. The risk achievement worth is a measure of the importance of the function performed by the basic event. It identifies the basic event playing a major role with regard to safety, even if the failure rate of such basic event is very low. Footnote 22 The Birnbaum importance measure is a measure of the increase in risk when a basic event is failed compared with when the basic event is operating.	The definition of importance measures are incompatible to each other.The basic event in some definitions called "component", "failure mode", or "item of equipment". It is suggested to use the same word "basic event" for all the definitions.	X	Footnote 20"The risk reduction worth is the relative decrease in the frequency of core damage if the probability of the particular basic event is considered to be zero. The risk reduction worth is a direct function of the basic event probability and can be used to assess the contribution of the basic event to the core damage frequency." Footnote 21 "The risk achievement worth is the relative increase in the frequency of core damage if the probability of the particular basic event is considered to be one. The risk achievement worth is a measure of the importance of the function represented by the basic event. It identifies the basic event playing a major role with regard to safety, even if the failure rate of such basic event is very low."Footnote 22 "The Birnbaum importance measure is a measure of the increase in risk when the probability of the basic event basic event is one compared with when it is zero."		

Egypt	21	5.176		Paragraphs 5.176 –5.185 provide recommendations on meeting Requirement 17 of GSR Part 4 on uncertainty and sensitivity analysis for a Level 1 PSA.	Paragraphs discuss the uncertainty and sensitivity analysis for a Level 1 PSA start from: 5.176 to 5.185.	X			
FRANCE - CEA	84	5.178	5.180 5.184 5.185 5.187	The various importance measures provide a perspective on which basic events, contribute most to the current estimate of risk (Fussell–Vesely importance, risk reduction worth), which contribute most to maintaining the level of safety (risk achievement worth) and for which basic events the results are most sensitive (Birnbaum importance). For example, The importance values should be used to identify the components and systems that significantly contribute to risk and should be considered carefully at the design level or during the operation of the plant. The importance values should be used to identify areas of the design or operation of the plant where improvements need to be considered. This should be integrated in a more global RIDM methodology (see INSAG25 for example).	These paragraphs summarizes a RIDM processes, but which in fact is more complex à better to make a reference to a IAEA RIDM document..	X			

Canada	20	5.18		"The set of initiating events identified should include those that can occur during all the permissible plant operating states, for example, ~~operation with one of the coolant loops removed from service~~ power operation, start up, hot standby, etc."	Operation with one of the coolant loops removed from service" is a deviation from normal operation conditions, which subject to Operating Technical Specifications requirements.			X	This paragraph addresses "permissible" operating states, not "normal" operating states. The paragraph points out that one may need to consider IEs that are specific for such states that are permissible (a limited time).
Russia	25	5.18		5.180. The analyst should provide a definition of the term 'significant impact on the results of the Level 1 PSA' as used in para. 5.179. This could take the form of a numerical criterion in an absolute or a relative form (see para. 5.170), a qualitative criterion ~~(e.g. introduction of a new accident sequence)~~, or a combination of both quantitative and qualitative criteria ~~(e.g. introduction of a new significant accident sequence~~).	Removed words do not exactly have connection to the qualitative measures of significance.	X			
ENISS	22	5.184		Uncertainty distributions should be specified for the parameters used in the quantification of the Level 1 PSA. This should be done as part of the data analysis. These uncertainty distributions should be propagated through the analysis to determine the uncertainties in the core damage frequency. These uncertainties should be used to provide an indication of the level of confidence that can be associated to any insight	Meeting risk criterion or target is not the sole use of PSA. Uncertainties have to be considered for each PSA applications and insights derived. For risk informed decision making in particular it is extremely important to avoid bias in the risk evaluation.	X			

				or result derived from Level 1 PSA ~~the risk criterion or target has been met~~.					
Russia	9	5.23		5.23. The causes of such initiating events should be identified and should be taken into account in the analysis. ~~For initiating events that have a number of causes or where more than one failure would be necessary for the initiating event to occur, a common approach is to use a fault tree to model the initiating event.~~	The final sentence is not exactly correct, because such events should be analyzed based on operational experience. It is almost impossible to identify all causes. Anyway, it has no connection to IEs identification process.	X	First sentence is kept and connected to 5.22		
Russia	10	5.24		5.24. …(f) Any event causing a reactor trip or immediate shutdown of the reactor *without LOCAs*.	Otherwise LOCAs are also here	X	"(except LOCAs)" added		
Canada	21	5.24		"The Level 1 PSA should be based on a comprehensive set of transients that ~~can~~ could occur. ~~Examples of the types of transient that can occur include the following:~~ In terms of principal effects on potential degradation of fundamental safety functions, transients are categorized into the following categories:"	Certain transients occur with low probabilities, such as main steam or feedwater line breaks.To improve clarity.	X			

Canada	22	5.24	(f)	Any event not causing ~~a~~ an automatic ~~reactor trip~~ or immediate demand for shutdown of the reactorAdd the additional following categories.Radioactive release from or due to failure of a subsystem or componentRadioactivity release due to failure of a support system or componentLoss of heat sink while reactor shutdown	IEs causing a reactor trip or immediate administrative demand for shutdown of the reactor have been covered by the listed categories.IEs not causing an automatic or immediate administrative demand for shutdown of the reactor, may not need to be modelled later in PSA explicitly, e.g., loss of HVAC, waste treatment system failure, etc. However, these IEs need to be identified in the IE identification stage.Items g), h), and i) added to make the listed categories comprehensive and be consistent with 5.25, 5.26 and 5.27.			X	The first can be modified to "Any other event causing a reactor trip or immediate shutdown of the reactor (except LOCAs)" This section discusses power operation level 1 PSA for reactor. - Radioactive release from or due to failure of a subsystem or component and Radioactivity release due to failure of a support system or component are level 2 PSA or fuel pool related IEs - Loss of heat sink while reactor shutdown is shutdown PSA IE.
Egypt	8	5.25		The set of transients should include loss of off-site power as an internal initiating event. The initiating event involving loss of off-site power should be specified in terms of the frequency of occurrence and the duration of the loss of off-site power, which should take into account the likelihood of recovery of off-site power. The different durations of loss may be treated in the PSA as different initiating events (analogous to different LOCA sizes) or, alternatively, the restoration of loss of off-site power at the different times may be treated as headings in the event tree.	For loss of off-site power initiating event, the different durations of loss may be treated in the PSA as different initiating events. This clarification suggested to be added.			X	The proposal does not essentially improve the clarity of the paragraph.

				This should be based on details of the design and operating experience in relation to the grid connections to the plant.					
Egypt	10	5.26		A new para. suggested to be added after para. 5.26"particular attention should be paid to loss of off-site power event when it is followed by loss of all on-site AC power in the event sequence, since PSA studies have shown that this situation (known as station blackout) has made a significant contribution to risk for a number of plants. The combined event (loss of all external and on-site AC power) is sometimes treated in PSA as an initiating event in itself. This is acceptable provided that it is quite clear from the documentation that the logic is correct in that there is no double counting (for example, the frequency of loss of grid	The loss of off-site power and loss of all on-site AC power intiating events are closely related, and sometimes treated as one intiating event (station blackout intiating event). This para. is suggested to be added.	X	First sentence added as a new paragraph.		

				should exclude the frequency of blackout) and no omission".					
Egypt	9	5.26		When loss of off-site power that could occur	Editorial	X			
FRANCE - CEA	23	5.27		This is particularly important where the failure of a support system could lead to ~~a reactor trip~~ initiating event and the support system also provides a safety function after ~~a reactor trip~~ the initiating event.	Reactor trip is a particular case of IE	X			
Canada	23	5.27		"This is particularly important where the failure of a support system could lead to ~~a reactor trip~~ an initiating event and the support system also provides a safety function after ~~a reactor trip~~ the initiating event."	This applicable to any initiating event.	X			

Indonesia	13	5.31	3	For pressurized water reactors, loss of coolant accidents is usually categorized as large, medium or small, mainly on the basis of the performance required from the coolant injection systems to mitigate the loss of coolant accident. For some small modular reactors, due to integrated design, initiating event of loss of coolant accident is eliminated or reduced	the probability of the occurrence of initiating event of loss of coolant accident can be eliminated or reduced			X	There is no need to point out design features of SMRs in this context.
Indonesia	14	5.31	5	5.31. The set of loss of coolant accidents identified should be categorized and grouped in accordance with the success criteria of the SSCs that needs to be operated to prevent core damage.For pressurized water reactors, loss of coolant accidents is usually categorized as large, medium or small, mainly on the basis of the performance required from the coolant injection systems to mitigate the loss of coolant accident.For High Temperature Gas Reactor, loss of coolant accidents gives other consequences such as air ingress and water ingress	to provide an example to explain that different type of reactor have different requirements to protect from the loss of coolant accident			X	There is no need to point out design features of HTGRs in this context.

FRANCE - CEA	24	5.34		(b) The success criteria for the mitigating and support systems8; (c) The effect of the initiating event on the availability and operation of mitigating and support systems, including the presence of conditions for signals that will actuate protection actions or block actuation of systems; (d) The response expected from operating personnel (application of emergency operating procedures…).				X	Credited systems have been defined in 5.4 No need to add "(application of emergency operating procedures…)" here
Canada	24	5.34		"Initiating events categorized in 5.24 and 5.28 should be ~~arranged in groups in which all of the following properties of the initiating events are the same (or very similar):~~ grouped based on the similarity of the following:~~The accident progression following the initiating event~~ Initial conditions;~~The success criteria for the mitigating systems12~~ major effects on mitigating systems;~~The effect of the initiating event on the availability and operation of safety systems and support mitigating systems, including the presence of conditions for signals that will actuate protection actions or block actuation of systems~~ plant response;The response expected from plant operating personnel."	To improve the clarity			X	The proposal is another way of defining principles to group IEs, but it is not necessarily more clear than the original one.

Canada	25	5.34		Related to this para, please add the following footnote:"An example of initiating events that can be grouped together is the turbine trip initiating event. This initiating event can include various causes of turbine trip, including loss of condenser vacuum and failures of the turbine governor, as all these failures cause the same plant response".	To provide an example of a grouped event			X	Examples are nice but they expand the guide which already quite detailed
FRANCE - CEA	25	5.35	5.36		Similar paragraphs, but different wording. Please check			X	Yes, the paras are similar, but 5.36 is seen as clarification for the should statement in para 5.35 and reinforcement with additional should statement.
FRANCE - CEA	26	5.38		Initiating events that could cause a containment bypass (e.g. steam generator tube rupture or loss of coolant accidents in interfacing systems) should not be grouped with other loss of coolant accidents where the containment would remain effective. This aspect may be important especially for RIDM when L2 PSA is not available (higher consequences)	Proposal to explain why it is important.	X	This aspect may be important especially for applications when Level 2 PSA is not available (higher consequences).		
FRANCE - CEA	27	5.41		The events that are identified in the accident sequences will relate to the success or failure of the safety systems, ~~and~~ human actions taken in carrying out the safety functions required for the groups of initiating events, other events..	Similar text with 5.60 (but 5.60 is more complete)	X	The events that are identified in the accident sequences will relate to the success or failure of the SSCs and human actions taken in carrying out the safety functions required for the groups of initiating events. ...		

Canada	26	5.41		"The events that are identified in the accident sequences will relate to the success or failure of the ~~safety~~ mitigating systems and human actions"	Not only limited to "safety systems". To be consistency of the discussion throughout the section.	X	The events that are identified in the accident sequences will relate to the success or failure of the SSCs and human actions taken in carrying out the safety functions required for the groups of initiating events. ...		
FRANCE - CEA	28	5.42		A criterion (or criteria, if appropriate) should be developed for what constitutes core damage or a particular degree of core damage. Criteria for some other undesirable consequence can be defined (reactor vessel cold overpressure, reactivity transient, boiling in spent fuel pool…)	other undesirable consequence may be also assigned (example: reactor vessel cold overpressure, reactivity transient, boiling in SFP…)	X	In addition, criteria for other undesired consequences may also be assigned, e.g., reactor vessel cold overpressure, reactivity transient, and boiling in spent fuel pool.		
Canada	27	5.42	footnote 13	"Several core damage states can be specified, depending on the degree of the damage.~~, f~~For example, in channel type reactors, damage to different numbers of channels is usually considered depending on the severity of the consequences. ~~(i.e. f~~For CANDU and RBMK type reactors, ~~the criterion is~~ severe core damage ~~and~~ is defined as a condition where there is extensive physical damage of multiple fuel channels due to overheating leading to loss of the core structural integrity~~)~~."	Editorial change.	X			

FRANCE - CEA	29	5.45		For sequences ending in a safe stable state, the accident sequence analysis should be pursued over a time period, ended with the sequence ~~mission~~ observation time, that will allow for considering the effect of long term measures to be put in place to ensure that the risk estimate beyond the sequence ~~mission~~ observation time is negligible ((loss of supply of water reserves or of long term reactivity control) and possible cliff-edge effects are appropriately captured.	Systems mission time is not identical with sequences observation time. Proposal to avoid the confusion.One objective is to capture the mitigations needed at long term to reach the success state			X	Term "observation time" is not used in the guide
Canada	28	5.45		"… that will allow for considering the effect of long term measures to be put in place to ensure that the risk estimate beyond the sequence mission time is negligible (when compared to the risk during the mission) and that possible cliff-edge effects are appropriately captured."	Clarify that the risk beyond the mission time is negligible when compared to the risk during the mission, as opposed to being negligible overall (e.g., negligible when compared to other background risks that the public is typically exposed to).	X			
FRANCE - CEA	30	5.46		(d) Maintaining the integrity of the primary circuit ~~and the containment~~.	Not in the scope of the document.	X			
FRANCE - CEA	43	5.46		5.64. The accident sequence analysis will identify accident sequences where all the required safety functions have been fulfilled in a satisfactory manner so that core damage (or other undesired consequence) will not occur,		X			

Russia	11	5.46		5.46. …: ~~(a) Detection of the initiating event and reactor trip;~~	These are not safety functions. Reactor trip is already included in b)	X			
Indonesia	15	5.46		The safety functions that need to be performed to prevent core damage should be identified for each initiating event group. The safety functions required will depend on the reactor type and the nature of the initiating event and will typically include: (e) keep the fission product in the fuel matrix or in the reactor core	Inserting (e) because keeping the fission product in the fuel matrix or in the reactor core is one of the safety functions			X	The three main safety functions given in 5.46 cover the safety functions considered in PSA.
Russia/ SEC NRS	3	5.46		The required safety functions will depend on the type of reactor and the nature of the initiating event and will generally include:(a) shutting down the reactor and maintaining its subcritical state;(b) removing residual heat from the core of the nuclear reactor;	It is suggested to remove the bullet (a) *"Detection of the initiating event and reactor trip"*, as it is contained in the bullet (b) *"Shutdown of the reactor and maintaining subcriticality"* detecting the initiating event is not a safety feature.	X			
FRANCE - CEA	31	5.47		The mitigating and support systems and actions by operating personnel that will need to be available to perform each of these safety functions should be identified, along with the success criteria for the mitigating systems used in performing these safety functions.				X	credited systems
Indonesia	16	5.49	4	Where redundant and independent trains of the credited system are involved, the success criteria should be defined as the number of trains	To define the minimum level of performance for credited systems			X	Dependences are considered later in the PSA process.

				that are needed to remain operable.					
Indonesia	17	5.49	7	Where multiple credited systems are involved, the success criteria should take into account the performance needed from each of the different systems. Where dependent of the credited system are involved, the success criteria should account for the performance required from each of the dependent systems.	To define the minimum level of performance for credited systems			X	See above
FRANCE - CEA	32	5.50			In some cases, the success criteria may be also to avoid operator inopportune actions (for example not to stop safety injection, like TMI). To complete?			X	This case is addressed in HRA (error of commission)
Russia	12	5.5		5.50. The success criterion for each action by operating personnel should consider the time between the moment when based on available information the action can be initiated and the first ~~last~~ moment the action even correctly performed is *not* able to lead to the success~~ful~~ of the required system function (considering the time required for diagnosis and for action performance).	Original statement was misleading	X			

Turkey	22	5.51	9	"…….if the break occurs in any leg connecting to reactor directly, the flow	Clarification. There are some new designs which include connection of HP-ECCS directly to reactor chamber. In this format, sentence may be interpreted as that designs will not have loss of ECCS in case of break in that connections.	X			
FRANCE - CEA	33	5.52		The systems success criteria should specify the system mission time according with the accident sequences modeling (see 5.45) ~~so that the reactor reaches a safe, stable state and that will allow for long term measures to be put in place to maintain this state.~~ In many cases, this has been taken, by simplification, to be 24 or 48 h for most initiating events	Proposal to avoid duplication and different wording for the same item. It is simplification.	X			
FRANCE - CEA	34	5.52		For new designs that provide the features to delay core damage, consideration of a longer sequences observation time and systems mission time may be necessary. ~~The mission time should be defined adequately for capturing possible cliff edge effects and assuring that the residual risk accrued after the mission time is negligible.~~	Second part duplicate 5.45			X	It's a duplicate but it is good to repeat here so that 24/48 h is not categorically used for all sequences

Russia	13	5.52		5.52. The success criteria should specify the system mission time so that the reactor reaches a safe, stable state and that will allow for long term measures to be put in place to maintain this state, based on the sequence mission time defined in para. 5.45. In many cases, this has been taken to be 24 or 48 h for most initiating events. *The mission time should be defined adequately for capturing possible cliff-edge effects and assuring that the residual risk accrued after the mission time is negligible.* ~~For designs that provide the features to delay core damage (e.g. passive systems), consideration of a longer mission time may be necessary.~~	The addition is suggested to highlight the need to capture cliff-edge effects in PSA model (e.g. depleting of tanks or batteries). This is not the feature of passive systems only.Availability of passive systems does not mean that systems should have longer mission time in the model.	X			
Canada	29	5.52		At the end of the para, please add:“The choice of the mission time should be justified”.Also add the following footnote related to mission time:“As an example, for multi-unit CANDU PSAs, the longest credited mission time for any system has been set at 72 hours. This is a conservative value since this allows enough time to take suitable beneficial action to alter the course of an accident sequence”	To provide justification of the choice of the mission time, and to provide an example of PSA mission time.			X	All choices made in PSA should be justified. (examples are nice but they expand the guide which already quite detailed)

UK	3	5.52	4	Edit the second and third sentence to:In many PSAs this has typically been assumed to be 24 or 48 hours, however this should be justified and extended if required depending on the system, initiating event and accident sequence. For designs that provide features to delay core damage (e.g. passive systems) or initiating events which prevent or delay long term measures being put in place, consideration of a longer mission time may be necessary.	Whilst it is not considered necessary to include specific durations longer than 48 hours, it is useful to reflect that consideration of longer durations may be appropriate.	X	Comment is taken care by the modification proposed above.		
FRANCE - CEA	35	5.53		Identical with 5.48. Please check		X	5.53 can be deleted		
Canada	30	5.53		It is a good practice to specify these actions in a cooperative effort between ~~by~~ operating personnel, ...	Editorial change			X	5.53 is deleted
Germany	9	5.53		The success criteria should define the actions by operating personnel that are needed to bring the plant to a safe, stable shutdown state as defined by the plant procedures. It is a good practice to specify these actions in a cooperative effort ~~between~~ by operating personnel, systems analysts and human reliability analysts.	Editorial		The sentence “It is a good practice to specify these actions…” is deleted since it is a repetition of 5.48.		

Indonesia	18	5.53	1	The success criteria should define the actions by operating personnel that are needed to bring the plant to a safe, stable shutdown state as defined by the plant procedures. ~~It is a good practice to specify these actions in a cooperative effort between by operating personnel, systems analysts and human reliability analysts~~	Similar with para 5.48: The actions by operating personnel that are necessary to bring the plant to a safe, stable state should be identified on the basis of plant procedures analysis. It is a good practice to specify operator actions in a cooperative effort between plant operators, systems analysts and human reliability analysts	X			
FRANCE - CEA	36	5.54		The Level 1 PSA documentation should include a list of the safety functions, mitigating systems, support systems and actions by operating personnel that are necessary and associated success criteria for each initiating event to bring the reactor to a safe~~, stable shutdown~~ state.	Safe state is not necessary shutdown state	X			
Canada	31	5.54		The Level 1 PSA documentation should include a list of the safety functions, credited systems, support systems and actions by operating personnel that are necessary for each initiating event to bring the reactor to a safe~~, stable shutdown~~ state.	The reactor could be brought a safe state without shutdown.	X			
ENISS	5	5.54		The Level 1 PSA documentation should include a list of the safety functions, credited systems~~, support systems~~ and actions by operating personnel that are necessary for each initiating event to bring the reactor to a safe, stable shutdown state.	No distinction should be introduced between credited systems and support systems. Support systems are part of credited systems.	X			

ENISS	6	5.55		The success criteria for the credited systems should be justified by supporting analysis. Supporting analysis would include the thermohydraulic analysis for decay heat removal following transients and loss of coolant accidents, and neutronics analysis for reactor shutdown and hold-down. Supporting analysis should be based on the plant specific data (whenever possible)~~,~~ <u>and</u> should conform to the best practice for using ~~the~~ <u>qualified and valid</u> computer code<u>s</u> ~~and should be independently reviewed~~.	We do not consider that an independent review is specifically needed on TH/N analysis supporting the definition of success criteria. Instead, we propose to stress that computer codes that may be used should be appropriately qualified and used over their domain of validity	X			
Egypt	11	5.58		A new para. suggested to be added after para. 5.58The computer codes used in the PSA should be validated and verified. In this context, **validation** is defined as providing the theoretical examination to demonstrate that the calculation methods used in the computer code are fit for purpose and **verification** is defined as ensuring that the controlling physical and logical equations have been correctly translated into computer code.	According to para. 4.60 of GSR Part 4, Any calculational methods and computer codes used in the safety analysis shall undergo verification and validation to a sufficient degree. So verification and validation for computer codes are essential and should be reflected in this Safety Guide.			<u>X</u>	Covered by 5.58

Indonesia	19	5.58	6	This paragraph provides recommendations on meeting Requirement 18 of GSR Part 4 [3] on use of computer codes for a Level 1 PSA. The computer codes used to justify the success criteria should be well qualified to model the transients, loss of coolant accidents and accident sequences being analysed and to obtain a best estimate prediction of the results. The computer codes should be used only within their established realm of applicability and should be used only by qualified code users. It is recommended to use couple hermohydraulic - neutronics codes. Best estimate input data and assumptions that avoid unnecessary conservatisms should be used whenever possible	The Thermohydraulic-Neutronics couple calculations give more alternative calculation for more than 1 dimension calculation			X	There is no need to provide further recommendations in this context.
FRANCE - CEA	37	5.59	Before 5.59	**Modelling of accident sequences** section may be moved before **Safety functions, safety systems and success criteria** section				X	Considering that this is a revision by ammendment, we suggest to keep it consistent with the current Safety Guide
Pakistan	4	5.59	5.7	Brief description about supporting analysis required for accident sequence modeling and HRA may be added.	During the development of Level 1 PSA, supporting analysis are required for confirmation of success/failure of event tree sequences as well as for calculation of operator actions time windows when this information cannot be explicitly extracted from design documents.			X	This topic is already discussed in several paragraphs.

FRANCE - CEA	38	5.61		The structure of the event tree should take account of the time sequence of the headings on the event tree representing actions by operating personnel or actuation of systems. The most natural way is to order them chronologically, following the time sequence of the demands made on the systems or on the operating personnel. Nevertheless model optimization may be needed to reduce the ET size and the duration of quantification, since the minimal cut sets determination is not impacted by the order of the event tree headings.	From practical point of view this recommendation can not be fully applied.	X	The structure of the event tree should take account of the time sequence of the headings on the event tree representing actions by operating personnel or actuation of systems. The most natural way is to order them chronologically, following the time sequence of the demands made on the systems or on the operating personnel. However, the headings can be sometimes ordered in another way to simplify treatment of dependencies or to reduce model size.		
Russia	14	5.61		5.61. The structure of the event tree should take into account the time sequence of the headings on the event tree representing actions by operating personnel or actuation of systems. The most natural way is to order them chronologically, following the time sequence of the demands made on the systems or on the operating personnel. *However, it is allowed to order headings in other way so that it simplifies treatment of dependencies or reduces model size.*		X	"However, the headings can be sometimes ordered in another way to simplify treatment of dependencies or to reduce model size."		

FRANCE - CEA	39	5.62		The event tree structure should take into account functional and physical dependencies (see para. 5.90) that may occur as a result of initiating event, equipment failures, ~~and~~ human errors…	5.90 is more complete	X			
FRANCE - CEA	40	5.62		~~Dependencies between safety systems (usually referred to as systems interactions) should also be represented on the event tree.~~	Not mentioned in 5.90. Different from functional dependencies?	X			
FRANCE - CEA	41	5.63		Similar with 5.40 but better wording than 5.40. Please check				X	5.40 is an introduction to the following requirements
Canada	32	5.63		The accident sequence analysis should cover all relevant combinations of success or failure of the ~~safety~~ mitigating systems in responding to the initiating event group and should identify all accident sequences leading either to a successful outcome, where sufficient ~~safety~~ mitigating systems have operated correctly	Not only limited to "safety systems". To be consistency of the discussion throughout the section.	X	credited systems		
Canada	33	5.64		~~For example, for CANDU type reactors, the different accident sequences representing the end states of the event trees are clearly defined as fuel damage categories (FDC) (e.g. FDC1, FDC2). Examples of fuel damage categories for CANDU type reactors could be found in [13].~~	Delete this text since it does not reflect current CANDU PSA practice. Although past practice for CANDU PSAs was to use FDCs as the plant damage states, the latest CANDU PSAs use different plant damage states than the FDCs (e.g., FDC2 is now subdivided into several different PDSs in the Level 2 PSA).	X			

Canada	34	5.65		Add the following footnote related to this para:"The combination of Level 1 end-states involving severe core damage and failures of containment subsystems may be generated by means of a Bridging Event Tree (Ref IAEA SSG4).	Guidance for generating plant damage states that will be an input for the Level 2 PSA	X	The combination of Level 1 end-states involving severe core damage and failures of containment subsystems may be generated by means of interface event trees		
Indonesia	20	5.71	1	The next step in the analysis is to model the credited system failures that are identified in the accident sequence analysis.	To be in consistent with Para 5.40	X			
Indonesia	21	5.71	2	If this is done by means of fault tree analysis, then the top event of the fault tree is taken as the credited system failure state(s) identified by the event tree analysis	To be in consistent with Para 5.40	X			
FRANCE - CEA	44	5.73		Where fault trees are used, they should be developed at a level of details sufficient to capture the possible dependencies and to provide a complete logical failure model for all the mitigating system failure states identified by the event tree analysis.	Dependencies is the most important aspect	X			
Canada	35	5.74		"The failure criterion that provides the top event of the fault tree for each ~~safety~~ mitigating system function should be the logical inverse …"	Not only limited to "safety systems". To bring consistency in the discussion throughout the section.	X	safety function		

FRANCE - CEA	45	5.76		The level of detail of the analysis is generally left to the discretion of the analyst, but it should be sufficient to capture the possible dependencies and it should be consistent with the available data on component failures and the proposed applications of the Level 1 PSA.	Dependencies is the most important aspect	X			
Canada	36	5.76		"The level of the analysis detail is generally left to the discretion of the analyst, but it should be consistent with the available data on component failures and the proposed applications of the Level 1 PSA."	To improve the clarity.	X	The level of detail of the analysis is generally left to the discretion of the analyst, but it should be sufficient to capture the possible dependencies and it should be consistent with the available data on component failures and the proposed applications of the Level 1 PSA.		
FRANCE - CEA	46	5.78		It should also include passive components whose failure could lead to failure of the system, for example, undetected filter blockages and pipe leaks.	Also detected can lead to systems failure	X			
FRANCE - CEA	47	5.78	5.79	Regarding the dependencies ok with the idea but the wording is different from 5.90. Please check		X	"The fault tree model should be developed in a way that ensures that the functional dependencies and component failure dependencies are taken into account explicitly."		

Russia	15	5.78		5.78… Omitting explicit modelling of these dependencies may significantly bias the results and underestimate the relative importance of the support systems. *Passive component may not be included in the PSA model if it is shown that its reliability is an order of magnitude lower than reliability of any component considered in the model which failure has the same consequences.*	It is impossible to include all passive components (pipelines, cables, etc.) in the model. This is also in line with TECDOC-1804		X Accepted with some revisions*Passive component (e.g.* pipelines, cables) *may not be included in the PSA model if it is shown that its reliability is an order of magnitude* ***higher*** *than reliability of any component considered in the model which failure has the same consequences.*"Passive component may be excluded in the PSA model if it is shown that its reliability is an order of magnitude lower than reliability of any component considered in the model which failure has the same consequences."		
Russia/ SEC NRS	4	5.78		A passive component may not be included in the PSA model if it is shown that its reliability is orders of magnitude higher than the reliability of any of the components considered in the model, the failure of which has the same consequences.	PSA model cannot include failures of all available passive components (e.g. pipelines, cables).	X	See previous comment		
FRANCE - CEA	49	5.79		Second part similar with 5.75 but different wording. Please check.				X	Agree that the paras are similar, but they have slightly different twist. 5.75 is related in general to all the basic events moddeled in the PSA, whereas 5.79 is more related to the components boundaries resolutions

FRANCE - CEA	50	5.84		Similar with 3.2 but better text in 5.84. Please check.		X	The para 3.2 was shortened as follows: 3.2. It should be recognized that the intended applications of PSA may impose additional requirements on the scope of the PSA, on the modelling approaches and on the level of detail. If such additional requirements are taken into account at the planning stage of the PSA project, it will help to avoid inconsistencies in the results and insights obtained. For instance, if it is planned to use the PSA for the development of a severe accident management programme, a Level 2 PSA should be performed. An extension to Level 2 or even Level 3 PSA should be also required if it is to be used to support definition of emergency planning zones. As another example, if it is planned to use the PSA model as a basis for a risk monitor, the PSA model should be ‘symmetrical’ in terms of the modelling of initiating events7. More details on the features of PSA necessary for various applications of PSA are provided in Section 12.		

FRANCE - CEA	51	5.85		5.85. Functional descriptions should be produced for each of the safety mitigation and support systems modelled in the Level 1 PSA to ensure that there is a valid and auditable basis for the logic model being developed.			X Accepted with some revisions		
Canada	37	5.86		At the end of the bullet (a), add:“The limit of resolution must, as a minimum, extend to the component level for which sufficient data is available”	Information added in support of the limit of resolution for modelling component failure mode.			X	Said in 5.74 and 5.78
Canada	38	5.86	to 5.88	Paragraph 5.87 is missing.	Editorial change	X			
Egypt	12	5.86		(d) The support system interfaces (e.g. power, cooling, instrumentation and control, ventilation).	The two systems "power" and "electrical" have the same meaning and used interchangably, so it is suggested to mension only one system. Also other support systems can be considered such as instrumentation and control, ventilation.	X	X Accepted with some revisionsinstrumentation and control system cannot be considered as “pure” supporting system		
Russia/ SEC NRS	5	5.86		To clarify	The paragraph says: *“A simplified schematic diagram should be provided for each system which shows the system as modelled in the fault tree, including the normal configurations of the components”*.It is recommended to give clarification or to bring another wording to this paragraph, since it is not clear what is meant by *“the normal configurations of the components”*.	X			

FRANCE - CEA	52	5.88		The functional descriptions and schematics provided for the safety mitigation and support system should			X Accepted with some revisions		
FRANCE - CEA	53	5.91		leading to the unavailability of mitigating and support system components			X Accepted with some revisions		
FRANCE - CEA	54	5.92 5.93 5.94		Modeling in ET or FT not coherent between the three paragraphs. Replace by PSA model?		X			
FRANCE - CEA	55	5.93		Functional dependencies should not be included among the component failure dependencies in the common cause failure probabilities of the system. ~~Rather, component failure dependencies are reserved for the more uncertain dependencies that have not been explicitly identified and that are quantified by means of beta factors and similar models.~~	Not corresponding to a PSA technique	X			
FRANCE - CEA	56	5.95		The sets of redundant equipment where component failure dependencies could arise should be identified and included in the Level 1 PSA model for the common cause failure of these components. There are a number of methods available for modelling common cause failure in a Level 1 PSA and the method chosen should be supported (when possible) by the collection of data.	Is necessary to model CCF even if the data collection is not possible (new plants, not enough OP ex..)	X			
FRANCE - CEA	57	5.96		The analysis should identify all the relevant component groups and the	The notion of important failure modes is not clear	X			

				~~important~~ relevant failure modes.					
Libya	6	5.96		4.Recent developments in the area of human factors in accident conditions to supplement the paragraphs 5.96 – 5.113	Its seems the article use may be incorrect here			X	The comment needs clarification
FRANCE - CEA	58	5.98		If expert judgement is to be used for the assignment of common cause failure parameters (when neither plant specific data nor generic data are available), an appropriate justification should be provided for the data and ~~error factors~~ uncertainty parameters- assigned and should be commensurate with the uncertainty in the process of specifying the common cause failure parameters. One case for use of only generic data could be for the PSA at design stage of a new nuclear power plant.	Not necessary lognormal	X			
FRANCE - CEA	59	5.99		The human errors that can contribute to the accident sequences development and to the failure of safety systems	Human actions are involved also in acc seq dev	X	The human errors that can contribute to the failure of safety functions or the failure of credited systems should be identified and included in the logic model.		
FRANCE - CEA	60	5.99		~~Given the high degrees of redundancy, diversity and reliability of safety systems typically incorporated in the design of current nuclear power plants,~~ fault sequences involving human failure events leading to initiating events or failure to mitigate them often make	high degrees of redundancy, diversity and reliability of safety systems is not the direct cause of human errors contribution to risk	X			

				a significant contribution to the core damage frequency.					
FRANCE - CEA	61	5.99		~~A useful starting point is to check the approach applied against one of the approaches generally used to ensure that all the necessary steps for a human reliability analysis are carried out.~~	Not PSA technique			X	This step is useful and could lead to useful insights regarding the utilization of specific approach.
Canada	39	5.99		"…~~Given the high degrees of redundancy, diversity and reliability of credited systems typically incorporated in the design of current nuclear power plants, fault sequences involving human failure events leading to initiating events or failure to mitigate them often make a significant contribution to the core damage frequency.~~"	Not clear.This sentence is too subjective and should be removed.High degrees of redundancy, diversity and reliability are not direct cause of human errors contribution to risk.	X			
Hungary Attila	6	5.99	lines 1-2	The human errors that can contribute to the failure of **safety functions or the failure of** credited systems should be identified and included in the logic models.	Human errors that can contribute to a functional failure without the failure of the related systems should be addressed too. For example, failure to initiate depressurization is a human failure event that can lead to depressurization failure without equipment failure.	X			

Pakistan	5	5.99	5.124	No explicit information on screening criteria of Type-A and Type-C human errors is provided.A screening criterion may be added for these kinds of operator errors separately.	Qualitative screening of human errors is an important part of the HRA and must be defined before performing the task. As the screening of internal fire and flood sources is provided in the guide, similarly some guideline may be included in the document to suggest some criteria for qualitative screening of human errors for internal initiating events, internal fire and internal flood PSA.			X	The comment presumably refers to "qualitative screening" since information on "quantitative screening" is given in the guide (5.120). The purpose of "qualitative screening" would be to screen out HFEs based on some rules. This is defined in 5.104–5.112, which specify HFEs to be covered by HRA.
Germany	14	6.01	Item (a)Line 4	… Examples of internal hazards are internal fires, internal floods, internal explosions, internal missiles (e.g. turbine missiles), drop of heavy loads, on-site transportation accidents and releases of hazardous substances from on-site storage facilities.	Clarification	X			
Germany	15	6.01	Item (b)Line 3	… Examples of natural external hazards are seismic hazards, external floods, high winds,; or severe weather conditions; examples for human induced hazards are aircraft crash, explosion pressure waves (blast), off-site transportation accidents, or releases of hazardous substances from outside the nuclear power plant site.	One important example was missing, grammar	X			

Germany	16	6.01	Line 19	~~Hazards including combined ones~~ Single hazards as well as combinations of hazards (called combined hazards) can damage the plant SSCs and thus generate accident sequences that might lead to core damage (or to other undesired end states as appropriate, if these are to be considered in the Level 1 PSA).	More precise wording and explanation of combined hazards			X	
Hungary Attila	33	6.01	After point (b)	**There is no international consensus on how to distinct external hazards from internal hazards. For example, according to IAEA NS-G-3.1, events originating on the site but outside the buildings important to safety should be treated the same manner as off-site external events, but taking into account the higher level of control over these events (this includes any coupled facilities on the site, e.g. to produce hydrogen).**	In the latest Revision of Safety Guide NS-G-3.1 the proposed text is stated as the definition of external hazards. Moreover, according to paragraph 4.26. of NS-G-3.1: “On-site transport of hazardous material relevant to collocated nuclear installations should also be considered as potential sources of HIEEs.” In some of the member states, external man-made hazards are defined as human induced hazards that occur off-site or on-site outside the technological buildings. We prefer such a definition to the one presented earlier in the document.			X	In line with SSG-64 and DS498 (which will become SSG-68) the proposed text change cannot be accepted
Russia	26	6.01		6.1 … Combinations of hazards cover combinations of external with other external hazards, external with *dependent* internal hazards and internal with *dependent* internal hazards. Combinations of hazards might have a significantly higher impact	E.g we can consider seismically induced internal fires, or fire induced internal flooding due to fire extinguishing system operation, but their independent emergence. It would be more correct to use term Dependent internal hazards, rather that hazards			X	In line with IAEA SSG-64 and corresponding operating experience with hazard combinations the proposed new text is too limited and cannot be accepted.

				on plant safety than each individual hazard considered separately, and the occurrence frequency of hazards combinations may be comparable to that of the individual hazards, e.g. a severe storm may cause important precipitation together with simultaneous dam failure resulting in high water level on the plant platform.*It should be emphasized that independent internal hazards are not considered.*	combination (for internal hazards).				
Russia	27	6.01		«Hazards including combined ones can damage the plant SSCs and thus generate accident sequences that might lead to core *and/or fuel* damage (or to other undesired end states as appropriate, if these are to be considered in the Level 1 PSA)».	For a clear understanding of the purpose, it is proposed to describe it in detail (1.4 SSG-3)		X Both core and fuel damage are covered in the document. As it is described in the very beginning of the document both core and fuel damages are covered. Sections 5 to 9 focuses only on the reactor core. Then the fuel damage is described in more detail separately in Section 10. Thus the Section 10 starts with the following statement "…Level 1 PSA for the spent fuel pool is based on the same methodology as Level 1 PSA for the reactor core outlined in Sections 5-9. Accordingly, the general process for conducting Level 1 PSA for the reactor core should be adapted for the spent fuel pool, considering the		

							specific aspects addressed in this section”.		

Germany	17	6.02	First sentence	A consistent approach should be applied to the identification of internal and external hazards and the analysis of their contribution to core and/or fuel damage frequency.	Addition for consistency; Hazards PSA are not limited to the reactor but should also include the spent fuel pool (SFP), therefore "and/or fuel" needs to be systematically added.		X Both core and fuel damage are covered in the document. As it is described in the very beginning of the document both core and fuel damages are covered. Sections 5 to 9 focuses only on the reactor core. Then the fuel damage is described in more detail separately in Section 10. Thus the Section 10 starts with the following statement "…Level 1 PSA for the spent fuel pool is based on the same methodology as Level 1 PSA for the reactor core outlined in Sections 5-9. Accordingly, the general process for conducting Level 1 PSA for the reactor core should be adapted for the spent fuel pool, considering the specific aspects addressed in this section".		
Germany	18	6.02	Item 3	(3) Hazard screening analysis, both ~~quantitative qualitative~~ qualitative and quantitative;	Correct order, first qualitative, then quantitative	X			

FRANCE - CEA	85	6.05		~~As explained in para. 5.168, in Level 1 PSA for internal initiating events, in order to eliminate logic loops, reduced fault tree models are developed by removing submodels representing random failures of components. For example, to eliminate the logic loop between service water and power supply, the links to fault trees of specific buses are removed. Dependent failures of these components (whose random failures have been eliminated from the logic model) resulting from damage due to internal and external hazards should be incorporated in the Level 1 PSA models for internal and external hazards.~~	The elimination of logic loops do not lead at removing submodels representing random failures of components. Other techniques are usually employed (example: using copies of specific FT not connected the support systems but checking that all dependencies and failures are still modelled).		X "As explained in para. 5.165, if the technique used to break logic loops within Level 1 PSA for internal initiating events consists of removing sub-models representing random failures of components Attention should be paid for example to eliminate the logic loop between service water and power supply, the links to fault trees of specific buses are removed. Dependent failures of these components (whose random failures have been eliminated from the logic model) resulting from damage due to internal and external hazards should be incorporated in the Level 1 PSA models for internal and external hazards. "		
Germany	19	6.06	Item c	Plant layout, geography and topography of the site and its surroundings;	Missing aspect added, grammar	X			
Russia	28	6.06	(d)	~~Environmental conditions, such as climate zone, meteorological characteristics~~ *Information on observations of meteorological and hydrological processes and phenomena in the area where the NPP site is located in maximum detail in accordance with the country's natural phenomena observation program.*	Information on meteorological, hydrological processes and phenomena is extremely important for the correct development of the PSA of external hazards. When analyzing combinations of external hazards, the importance of the most detailed observation data for meteorological and hydrological processes and events becomes critical	X			

Russia	30	6.06	E)	*Current* information on the location of pipelines, transportation routes (air, water, rail, road) and on-site and off-site storage facilities for hazardous (e.g. combustible, toxic, asphyxiant, explosive, corrosive) materials;	It is highly recommended to focus efforts on collecting information on the current state of industrial facilities and infrastructure, since, especially in developing countries, the situation with the location of industrial facilities can change rapidly, so that long-term, obtained 10 years ago, will no longer be suitable for analysis	X			
Russia	31	6.06	F)	*Current information on the* location of industrial and military facilities in the vicinity of the site;	It is highly recommended to focus efforts on collecting information on the current state of industrial facilities and infrastructure, since, especially in developing countries, the situation with the location of industrial facilities can change rapidly, so that long-term, obtained 10 years ago, will no longer be suitable for analysis	X			

Canada	50	6.08		In the list of internal hazards, add the following:(j) Vehicle Impacts - Onsite Vehicle Movement(k) Vehicle Impacts - Within Generating Station Buildings(l) Static ElectricityIn the list of external natural hazards, add the following(j) Animals	To complement the list of hazards		X (Reason: to be in line with IAEA Guides SSG-65, DS498, etc. and international good practice, e.g. from ASAMPSA_E, and to have a comprehensive list:_" The task of hazard identification should aim to generate a comprehensive and traceable list of potential internal and external hazards. Examples of specific hazards and hazard groups are (see Refs [6, 7, 21-25]):Internal hazards: Internal fires;Internal explosions;Internal missiles;Pipe breaks (including pipe whip and jet effects);Internal flooding;Heavy load drop;Onsite electromagnetic interference;Onsite release of hazardous substances;High energy arcing fault (HEAF);On-site transportation accidents;Onsite static electricity (Large Eddy Currents);Radiation accidents in other reactor units or radioactive sources collocated at the same site;External natural hazards:Seismic hazards;Hydrological hazards, such as external floods[3] and others;Meteorological hazards[4], such as high winds[5], precipitation, extreme temperatures, etc.; Extraterrestric phenomena, such as meteorites, solar			

							flares, etc.;Biological phenomena[6];Geological phenomena;Natural fires;External human induced hazards:Accidental aircraft crash.Offsite human induced fires (from industry or military installations);Offsite explosion pressure waves (blasts) (from industry or military installations);Offsite transportation accidents (air, rail, road, water);Offsite industrial storage accidents;Offsite releases of hazardous substances;Offsite electromagnetic interference;Offsite static electricity (Large Eddy Currents);		
Finland	1	6.08	Footnote 25	External floods is a hazard group that includes multiple hazards such as dam failure, tsunami, meteotsunami, riverine flood, storm surge	A tsunami-like wave of meteorological origin can cause a significant risk in certain areas		X (see above		

Finland	2	6.08	Footnote 26	High winds is a hazard group that includes hazards such as tornado, hurricane/typhoon, downburst and straight wind.	Downbursts can cause very strong winds.		X (see above)		
Germany	20	6.08	Items of internal hazards	Internal hazards: (a) Internal fires; (b) Internal explosions; (c) Internal missiles; (d) Pipe whip and jet effects;(e) Internal floodsing; (f) Collapse of structures and falling objects with a focus on hHeavy load drops; (g) High energy arcing fault (HEAF); (h) Electromagnetic interference; (i) Release of hazardous substances originating from within the site boundary inside the plant.	Clarification		X (see above)		
Germany	21	6.08	Items of external natural hazards	External natural hazards: (a) Seismic hazards; (b) External fires; (cb) External floodings[25] and other hydrological hazards; (dc) Meteorological conditions[28] covering high winds[26], precipitation, etc.; (ed) Extraterrestric phenomena, e.g. solar flares, meteorites;(e) Biological phenomena[27]; (f) Extreme meteorological conditions[28] (g) Extraterrestric phenomena; (h) Geological phenomena; (g) Natural external fires. (i) Solar storms.	The list should be systematic, following international practice (e.g. from EU Project ASAMPSA_E) and provide only groups/classes of hazards, with few examples for explanation		X (see above)		

Germany	22	6.08	Items of external human-induced hazards	External human-induced hazards covering at least: - (a) Aircraft crashes (accidental, military and civil aircrafts); - (b) Off-site explosions pressure waves (blasts); - (c) Off-site transportation accidents (air, water, rail, road); (d) Off-site industrial storage accidents; - (e) Off-site aAccidental releases of hazardous substances; - (f) Off-site human-induced fires; - Other military accidents; - Other industrial accidents.	More precision and completion: In contrary to the natural external hazards, there are no real subgroups (classes) of human-induced hazards; however, a more complete list demonstrating the variety of hazards covered needs to be provided	X	-		
Russia	29	6.08		Add:j) *radiation accident at the adjacent unit*	In accordance with Russian national standard NP-064-17		X (see above)		

Germany	23	6.09		As a starting point, the hazards listed in various publications (e.g. see Refs [26-2~~8~~9] Add a new reference [29]: Sperbeck, S., et al.: Information Tool Hazards Library – Analytical Tool for Providing Information and Data for Systematically Conducting PSA for Hazards, GRS-A-3914, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH, Cologne Germany, 2018 (in German).	Addition of a more recent and complete reference		X (better references have been provided):"… Refs [29 – 33]…"The following references could be added:[30] Röwekamp, M., et al.: Vervollständigung von Methoden und Werkzeugen für Probabilistische Sicherheitsanalysen (PSA), Technischer Bericht (Completion of Methods and Data for Probabilistic Safety Analyses (PSA), Technical Report), GRS-610, ISBN 978-3-947685-96-7, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH, Köln, Germany, October 2020.[31] Strack, G., M. Röwekamp: Hazards Screening Tool (HST) – Users Guide – Hazards Screening Tool (HST), Technische Notiz / Technical Note, GRS – V – RS1556 - 1/2020, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH, Köln, Germany, October 2020.[32] Roewekamp, M., S. Sperbeck, G. Gaenssmantel: Screening Approach for Systematically Considering Hazards and Hazards Combinations in PRA for a Nuclear Power Plant Site, in: Proceedings of ANS PSA 2017 International Topical Meeting on Probabilistic		

							Safety Assessment and Analysis, Pittsburgh, PA, USA, September 24-28, 2017, on CD-ROM, American Nuclear Society, LaGrange Park, IL, USA, 2017.[33] European Commission (EC): Advanced Safety Assessment Methodologies: extended PSA (ASAMPSA-E): Report 2 – Guidance document on practices to model and implement external flooding hazards in extended PSA, 2017.		

Germany	24	6.1		The generic list should be regularly checked, if all ~~complemented by additional~~ site or plant specific hazards are included and updated correspondingly~~, if any exist~~.	The generic list, if taking the most recent one, is complete covering all hazards known so far worldwide and represents the starting point for all sites and plants. So any complementary list is not meaningful. But it is important that the completeness and correctness of the generic list is regularly checked. In case of any new insights, the generic list needs to be updated.		X"The generic list of hazards should be complemented by additional site or plant specific hazards, if any exist. It should be regularly checked, if all ~~complemented by additional~~ site or plant specific hazards are included and updated correspondingly."		
Germany	25	6.1	Second sentence	New 6.11: The identification of ~~these~~ site and/or plant specific hazards should be performed in a systematic, structured framework to ensure completeness. For existing plants, an integral part of the process of identification of internal and external hazards should be a dedicated site survey and plant/site walkdown.	The second aspect a para 6.10 should be a new para 6.11 with a little more precision added.		X (see above)		
Germany	26	6.1	After	*Insertion of a new para 6.12 for individual (single) hazards screening*	The order of the paragraphs after 6.10 is not correct, first, a site an plant specific screening of hazards must be performed before from those single hazards remaining potential combinations of hazards, the combined hazards, can be identified and then also undergo a screening process.		X (after insertion of new 6.10 now 6.11 with the following modification):"The identification of site and/or plant specific hazards should be performed in a systematic, structured framework to ensure completeness. For existing plants, an integral part of the process of identification of internal and external hazards should be a dedicated site survey and plant/site walkdown."		

Germany	27	6.11		A list of potential combined hazards that may be significant for risk should be developed. In this context, combined hazards includes three types of hazard combinations described in [6]: consequential (subsequent), correlated and unrelated (independent) ones, see [6] for more detailed description.	Editorial	X				

Russia	32	6.11		6.11. A list of potential combined hazards that may be significant for risk should be developed. In this context, combined hazards include three types of hazard combinations ~~described in [6]~~: consequential (subsequent), correlated and unrelated (independent)~~, see [6] for more detailed description~~. *In this context, combined hazards are defined as follows: Consequential Hazards (i.e., causally connected hazards): The case when one of the hazards (i.e. the primary hazard), may result in one or more consequential, or secondary hazards (which may be internal or external), due to a direct relationship between the primary and secondary hazard(s) are to be specifically addressed in the assessment for the primary hazard. For example, the following hazards are not considered combined hazards but need to be addressed explicitly as an additional plant impact from primary hazard in PSA model (see Section 8):an earthquake could result in a tsunamian earthquake could result in a seismically-induced internal fire or internal floodhigh winds can generate missilesCorrelated*	Ref 6 “Protection against Internal Hazards in the Design of Nuclear Power Plants (former IAEA Safety Standards Series No. NS-G-1.7, currently being revised DS494) does not include any description of correlated hazards.It is recommended to provide description in SSG-3 to avoid misinterpretation.			X	In line with SSG-64 [6], the proposed change cannot be accepted

				Hazards: External hazards occurring as a consequence of a single underlying cause, in which case they can be assumed to be correlated. The underlying cause could be either internal or external. In this case the degree of correlation may range from low to high and needs to be identified on a case by case basis. For example:high sea water levels and transportation accidents caused by high windextreme rain and lightning triggered by extreme meteorological conditionsextreme low temperatures and heavy snow load caused by winter meteorological conditionsCoincidental Hazards: External hazards occurring simultaneously without a common mechanism as combination of independent phenomena. For example: a seismic event during extreme cold weather conditions high winds occurring during extended flooding conditions at the siteConsequential hazards should be included in the assessment of the primary hazard, while correlated and coincidental external hazards should be included in the hazard identification process for combined hazards. Coincidental external hazard combination					

				should consider the duration of the impact of individual hazards in the combination (e.g., a seismic event during a long drought period). Combined coincidental hazards are normally limited to two.						

Germany	28	6.12		~~For consequential hazards combinations the assessment of consequences of hazards should be part of the assessment of the primary hazard.~~ All three categories of hazard combinations ~~Correlated and unrelated hazards combinations~~ should be included in the hazards identification and screening process for combined hazards.	6.12 should only cover the general part, and not the specific aspect of treating consequences of combinations of consequential hazards.	X			
Germany	29	6.12	After	*New additional paragraph after former 6.12*: For combinations of consequential hazards the assessment of consequences of hazards should be part of the assessment of the primary hazard.	This specific aspect should be treated in a separate paragraph.	X			
Germany	30	6.13	And 6.14	*Please change the order, 6.14 must be first, followed by 6.13*	The actual order of paragraphs is not logical. The specific aspect of hazard durations for combinations of unrelated hazards should come after the general approach. Perhaps also the new paragraph provided in the comment above should come after the actual 6.14 and before the actual 6.13.			X	See modified texts before
Russia	33	6.13		6.13. Combinations of unrelated hazards should consider the duration of the impact of individual hazards in the combination (e.g. a seismic event during a long drought period, *a high wind* ~~plant internal fire~~ during a long-lasting external flooding).	Example is misleading and contradicts the note 29. Similarly, you can suggest considering all internal events independently occurring during long-lasting hazards. This will enormously, but uselessly increase the assessment			X	See comments above (e.g. in line with SSG-64 [6], DS498 and the and operating experience)

Russia	34	6.13		6.13. Combinations of unrelated hazards should consider the duration of the impact of individual hazards in the combination (e.g. a seismic event during a long drought period, *a high wind* ~~plant internal fire~~ during a long-lasting external flooding). *When analyzing combinations of independent hazards, it is necessary to take into account not only the duration of impact, but also the period of damaged SSCs recovery as a result of impact (for example, duration of seismic impact is equal to several seconds or minutes, but could require long time to maintain during which another unrelated hazard could occur)*	Original example is not representative. If external flood does not cause any damage, consideration of internal fire will have no major differences.Actually it is wrong - you can suggest considering all internal events independently occurring during long-lasting hazards. This will enormously, but uselessly increase the assessment . An important aspect has been added			X	See comments above (e.g. in line with SSG-64 [6], DS498 and operating experience)
Germany	31	6.16	After 6.16 Footnote 29 (Is actually footnote 30)	Usually, combinations of external hazards with other external hazards ~~combined hazards~~ involve only natural hazards (e.g. a combination of high wind and high sea water level).	This aspect is limited to combinations of external with external hazards only and not valid for combinations of external with internal hazards.		X with the modification to delete the footnote since it does not provide any valuable additional information and is not in line with other SSGs or their drafts		

Canada	51	6.17		At the end of the 1st sentence, add the following:"See Table 5-2 of Reference [26] for a listing of qualitative screening criteria. This criteria is used for a single hazard screening as well as for the screening of the combination of hazards."	Reference [26] provides multiple qualitative screening criteria that can be used for screening the hazard.		X (modified, just providing suitable references):"Quantitative screening criteria applied to hazards should depend on the overall objective of the Level 1 PSA and should correlate with the overall core damage frequency (typically obtained based on full scope PSA), see Refs. [26 – 27]. …"		
ENISS	23	6.17		(c) The hazard is included within the definition of another hazard or the hazard combination is included in the definition of ~~the~~ a more severe hazard.	Editorial correction	X			
Russia	35	6.17	A)	~~e.g. an external flooding scenario that does not generate an initiating event~~ *e.g. tsunami for non-coastal site*	The example was not suitable (in para 6.20 it is mentioned that external floods "should not be screened out as an entire hazard class", so it is better to replace "external flooding" with something more specific and evident)		X (see comment above)		
Russia	36	6.17	D)	*To add d) The hazard has a significantly lower mean frequency of occurrence than other hazards similar in character and will not result in consequences that are worse than those from other similar hazards. The uncertainty in the frequency estimate for a hazard screened out in this manner and cumulative impact of all screened out hazards are judged as not*	Suggested to add additional widely used screening criteria			X	The proposed added text cannot be accepted for reasons of consistency.

				significantly influencing the total risk.					
FRANCE - CEA	86	6.17		~~The hazard will not lead to an initiating event. For external hazards, this criterion is generally applied when the hazard cannot occur close enough to the plant to affect it, or when critical components are not impacted (e.g. an internal flooding scenario that does not generate an initiating event). Satisfaction of this criterion will also depend on the magnitude of the hazard.~~	This recommendation is not valid : some hazards relevant for PSA may not lead directly to an initiating event but may increase very significantly the CDF on a period of time (see for example the flooding event at Le Blayais NPPS in France).You can see the discussions in the ASAMPSA_E project in the report : http://asampsa.eu/wp-content/uploads/2014/10/ASAMPSA_E-D30.7-vol-2-initiating-events-selection.pdf		X (modified, just providing suitable references):“(a) The hazard will neither lead directly to an initiating event nor increase significantly the core damage frequency for a given time period. For external hazards, this criterion is generally applied when the hazard cannot occur close enough to the plant to affect it, or when critical components are not impacted. Satisfaction of this criterion will also depend on the magnitude of the hazard.”		

Canada	52	6.18		At the end of this para, add the following sentence:“See Table 5-4 of Reference [26] for a list of quantitative screening criteria. This criteria is used for a single hazard screening as well as for the screening of the combination of hazards”Related to the new sentence, please add the following note.“For the combination hazards, in addition to the hazard screening criteria in Reference [26], the multi-unit CANDU stations also employ the criteria of maintaining the 3 Cs (Control, Cool and Contain)	The guide provides only one quantitative screening criteria based on frequency of 1E-7/yr threshold. Reference [26] provides multiple quantitative screening criteria that can be used for screening the hazard.			X	This type of information about specific criteria used for screening is more suitable for a TECDOC type of publication. Suggest not to include it in the Safety Guide
Germany	32	6.18		Quantitative screening criteria applied to hazards should depend on the overall objective of the Level 1 PSA and should correlate with the overall core and/or fuel damage frequency (typically obtained based on full scope PSA).	Hazards PSA are not limited to power operation, therefore “and/or fuel” needs to be systematically added.			X	
Russia	37	6.18		Remove “core damage” for “core and/or fuel damage”	The same as for item Para 6.1			X	
Germany	33	6.20		~~The following external hazards should not be screened out as an entire hazard class: (a) Seismic hazards; (b) Wind hazards; (c) External floods; (d) Human induced hazards.~~	This paragraph must be deleted. According to the state-of-the-art hazards lists and screening approaches, this is neither meaningful nor correct.Moreover, (b) and (c) are groups of hazards within a hazard class but not complete hazard classes (see also comment before on the list with hazard classes (see ASAMPSA_E report or			X	See modification according to Hungarian text proposal

					German Hazards Screening Tool HST), representing good practice).				
Hungary Attila	34	6.20	Line 1	**Special emphasis should be put on the analysis of the following hazard classes as they are the most significant at many sites:**	According to the original wording, the listed hazard classes “should not be screened out”. This may not always be the case by definition, so it is proposed to refine wording (see proposal). It is also acceptable to us to delete the whole 6.20. paragraph, as, in our view, it does not provide much added value.		X (modified as follows to mention only hazard classes and not specific hazards):“Specific emphasis should be put on the analysis of the following hazard classes as they are the most significant at many sites:: Seismic hazards: Hydrological hazards; Meteorological hazards; Human induced hazards.”		
Germany	34	6.21		In order to screen out ~~eliminate~~ specific external hazards ~~from a given hazard class~~, it should be proven that the conditions specific to the location of the plant (topographic, geographic, meteorological, biologic) support the assumption that these hazards are not sufficient to damage the plant (e.g. hurricanes in a non-coastal area).	The statement was wrong and too general, needs to be limited to external hazards	X			
China	3	6.22		Further clarify “demonstrated that the frequency of exceedance of a particular magnitude is negligible or when uncertainties in hazard frequency are so large that they prevent any valuable insight to be driven ”.	There are no practical experience or consensus treatment for “a particular magnitude ” and “uncertainties in hazard frequency are so large that they prevent any valuable insight to be driven ”.			X	There is practical experience, available, which the commenter perhaps does not know, Therefore, the change cannot be accepted.

Hungary Attila	35	6.22		External hazards with a certain potential for damage should be screened out only when it is demonstrated that the frequency of exceedance of a particular magnitude is negligible**.**	According to the original text, screening is also applicable “when uncertainties in hazard frequency are so large that they prevent any valuable insight to be driven”. We suggest deleting this part of the sentence as it does not seem to be correct. Such cases cannot be screened out; the risk due to such scenarios should be estimated and considered in the risk results.		X with grammar modification		
Canada	53	6.24		“…so as to avoid screening out hazards with low frequency but high potential for damage. However, if a quantitative screening criterion can be applied to the hazard as a whole, it should not be applied to each subclass individually, so as not to screen out a hazard as a whole by subdividing it into sufficiently small subclasses such that each individual subclass is screened out.”	Clarification. Analysts should not try to screen out a hazard by breaking it up into enough subclasses so that each individual subclass is below a quantitative criterion (e.g., frequency < 1E-07/yr), even though the hazard as a whole would be above the criterion.Instead of adding the sentence to paragraph 6.24, it could be its own new paragraph.	X			
Canada	54	6.25		With the respect to the 1st sentence of the para, please add the following footnote:Review of the international practices shows that combinations of external hazards are considered only if the hazards are correlated and dependent. Independent combinations of beyond design basis hazards usually have an extremely low likelihood of occurrence.	To provide some guidance on considering combination of hazards.			X	In line with SSG-64 and operating experience; therefore, the text addition cannot be accepted.

Czech Republic, UJV Rez Stanislav Hustak	4	6.26		~~When the screening criteria cannot be applied to the hazard as a whole, but can be applied to the hazard with a certain magnitude, the hazard as a whole should be divided into subcategories and screening criteria applied to each subcategory, so as to avoid screening out hazards with low frequency but high potential for damage.~~	The screening should not be an obligation, but rather a useful tool in order to allow the efficient maintenance of the model and to focus on important scenarios instead on negligible contributors. So there should not be any “should statement” in such a context.If the screening criteria “cannot” be applied to the hazard as a whole, the guideline should not “insist” on further screening. In this case, such hazard can enter into analysis all the same.It is not also clear, how the division into subcategories can prevent screening out hazards with low frequency but high consequence.Moreover, it is expected that only qualitative screening criteria “cannot” be applied to the hazard as a whole. In this case, quantitative screening criteria can be used instead, which is a natural subsequent step.Is there any hazard for which quantitative screening criteria “cannot” be applied to the hazard as a whole?			X	In line with the requirement of IAEA for periodic Safety Reviews, at least during the PSR the hazards list needs to be reviewed applying a screening -demonstrating that the list is either still valid or an update is needed.

Russia	38	6.26	Footnote 30	Add “for example” in brackets, position C):C) Changes in environmental conditions (*for example*, average annual wind speed and maximum annual wind speed, water level, temperature, local precipitation) leading to an increase in the frequency of natural external hazards with a higher damage potential.	Evident		X (modified as follows):(c) Changes in environmental conditions (*e.g.*, average and maximum annual wind speed, water level, temperatures, local precipitation) which may lead to a change in the frequency of natural external hazards with a higher damage potential.		
Germany	35	7.03		Most internal hazards (e.g. ~~internal explosions~~, internal fire, ~~internal~~ flooding, explosion) can occur in a variety of different locations within the plant boundary ~~(rooms,~~ inside or outside buildings~~)~~. ~~In such cases~~Therefore, the hazard characterization should specify: …	Clarification	X			
FRANCE - CEA	87	7.03		Second, enclosed plant areas, assuming that the existing protection features (e.g. physical separation, barriers, isolation equipment) in the plant design will effectively contain the damage inside the areas.	This is rather detailed analysis not bounding. Please check.			X	A rough analysis needs to consider this aspect
Germany	36	7.04	first sentence; 7.5, 7.13, 7.38, 7.39, 7.40, 7.44, 7.45, 7.46, 7.66, 7.68 item (g), 7.86, 7.97, 7.102, 7.109, 7.120, 8.2, 8.87,	Contributions to the core and/or fuel damage frequency from those internal hazards that remain following the screening process should be determined using a Level 1 PSA for those hazards.	Hazards PSA are not limited to the reactor but should also include the spent fuel pool (SFP), therefore “and/or fuel” needs to be systematically added in the respective paragraphs of Sections 6, 7 and 8.	X	-		

			8.101, 8.110						
FRANCE - CEA	88	7.06	7.07 7.08 7.09 7.10 7.11		This is rather detailed analysis not bounding. Please check.		X – only the first sentence of 7.6 should remain, the second one. 7.7, 7.10 and 7.11 should be moved to the detailed analyses chapter.		
Germany	82	7.100		If the pathway along which a load is transported is located neither above the fuel nor above the regions containing SSCs important to safety, screening out of individual initiators of a collapse of structures and falling objects with a focus on heavy load drops may be possible.	Completion consistent to SSG-64	X			
Germany	83	7.102		The contribution of the collapse of structures and falling objects with a focus on heavy load drops to the core and/or fuel damage frequency should be calculated, unless the event can be discarded on a probabilistic basis.	Completion consistent to SSG-64;Hazards PSA are not limited to the reactor but should also include the spent fuel pool (SFP) – as already mentioned in the corresponding paragraphs on load drop, therefore "and/or fuel" needs to be systematically added		X The contribution of the collapse of structures and falling objects with a focus on heavy load drops to the damage frequency should be calculated, unless the event can be discarded on a probabilistic basis.		
Germany	84	7.104	First Sentence	All permanent lifting equipment in the plant should be considered. Areas where a collapse of structures and falling objects with a focus on dropped loads could adversely affect SSCs important to safety should be identified and examined in detail.	Completion consistent to SSG-64	X			

Germany	85	7.106		The frequencies of initiating events should be calculated in accordance with the recommendations in Sections 5 and 9. Calculations should consider failure of mechanical equipment, human error and possible unavailability of automatic protection functions. ~~If not considered in the Level 1 PSA for external hazards, external phenomena such as earthquakes or impacts of aircraft should be addressed in the initiating event analysis.~~	The last sentence needs to be deleted in consistency with 6.12 or the new par. Following 6.12 and the respective paragraphs in Sec. 7 for fire and flooding combinations.	X			
Germany	86	7.106	After 7.106 new paragraph	*New 7.10X*: The following effects on the performance shaping factors of operating personnel should be taken into account for combinations of a collapse of structures and falling objects with a focus on dropped loads and other hazards: (a) Accessibility of plant locations where actions need to be taken by personnel to ensure the required safety functions after initiation of the load drop; (b) Increased stress level; (c) Failures of indication or false indications; (d) Spurious actuation of systems and components important to nuclear safety; € Combined effects of a collapse of structures and falling objects with a focus on dropped loads and *… (with required changes to 7.64)…* on the behaviour of operating personnel.	Corrections and precision in line with the general approach for combined hazards in Section 6 and with changes to 7.64 were needed	X			

Russia	46	7.106		7.106. The frequencies of initiating events should be calculated in accordance with the recommendations in Sections 5 and 9. Calculations should consider failure of mechanical equipment, human error and possible unavailability of automatic protection functions. ~~If not considered in the Level 1 PSA for external hazards (, external phenomena such as earthquakes or impacts of aircraft should be addressed in the initiating event analysis.~~	Removed text is unclear and not precisely correct	X			
Russia/ SEC NRS	7	7.106		The frequencies of initiating events should be calculated in accordance with the recommendations in clauses 5 and 9. The calculations should take into account mechanical failures, operator errors and possible inoperability of automatic protection functions.	The last sentence of the paragraph is incorrect – it is proposed to delete it.	X			
FRANCE - CEA	102	7.107		For each heavy load drop event, it should be conservatively assumed that the maximum load is dropped and, if necessary, the nature of the dropped object and the cause of its dropping should be analysed.	Why conservatively? Realistic, if justified, may be also acceptable.	X			
Canada	62	7.108		“If a Level 2 PSA ~~if~~ is foreseen…”	Editorial change	X			
Germany	87	7.109		The contribution of turbine disintegration (e.g. failure of turbine rotor) to the core and/or fuel damage frequency should be calculated, unless the event can be discarded on	For consistency, see comment to 7.4: hazards PSA are not limited to the reactor but should also include the spent fuel pool (SFP). The last sentence should be deleted in line with the general approach			X	In this Section only core

				a probabilistic basis. ~~The impact of a fire due to ignition of hydrogen or due to oil combustion on components relevant to PSA should be considered in the context of the analysis of the impact of turbine missiles.~~	for combined hazards in Section 6 (there is nothing specific for missiles).				
Germany	88	7.115	After	*Few new paragraphs are neededSee comment*	Consistent to the other internal hazards, few paragraphs are needed:a par. Similar to the one added after 7.106, and paragraphs on risk quantification and documentation of the analyses – alternatively, reference could be made to the corresponding paragraphs for fire, flooding, load drop		X, addition of new paragraphs7.121. The frequencies of initiating events should be calculated in accordance with the recommendations in Sections 5 and 9. 7.122. The following effects on the performance shaping factors of operating personnel should be taken into account for combinations of missiles following turbine disintegration and other hazards: (a) Accessibility of plant locations where actions need to be taken by personnel to ensure the required safety functions after initiation of g turbine disintegration; (b) Increased stress level; (c) Failures of indication or false indications; (d) Spurious actuation of systems and components important to nuclear safety; (e) Combined effects of missiles following turbine disintegration on the behaviour of operating personnel.7.123. For each turbine disintegration event, it should be conservatively assumed that the maximum load is dropped and, if necessary,		

							the nature of the dropped object and the cause of its dropping should be analysed. The possible direction, size, shape and energy of the missile or missiles generated by the dropped load should be characterized and the effects on the building structure and on the plant should be assessed.7.124. If a Level 2 PSA if foreseen, each turbine disintegration event should be considered in order to determine the potential radiological consequences and the contribution to the frequency (if any) of a plant damage state.		
Germany	89	7.116		The general process for conducting Level 1 PSA for internal hazards should be adapted for a Level 1 PSA for internal explosion, considering that nuclear power plants are basically designed so as to minimize the likelihood and effects of internal explosions. ~~Analysis of internal explosions induced by or inducing internal fires should be considered in the Level 1 PSA for internal fire.~~	The last sentence should be deleted in line with the general approach for combined hazards in Section 6.		X the sentence should be implemented in additional paragraphs similar to those for internal flooding which probably should be added – this can be done by copying the corresponnding paragraphs here and modifying these.		

FRANCE - CEA	103	7.116		The general process for conducting Level 1 PSA for internal hazards should be adapted for a Level 1 PSA for internal explosion, considering that nuclear power plants are basically designed so as to minimize the likelihood and effects of internal explosions. Two types of explosion should be analyzed: explosions inside the circuits (mixing of products) and explosions externals to circuits (H2…).			X with modifications on different types(chemical, physical ,,,) of explosions to be written when providing additional paragaphs, which can be done		
FRANCE - CEA	104	7.117		The Level 1 PSA for internal explosion should rely mainly on the information and data collected during these analyses to allow the qualitative screening out of explosion scenarios. These data should be updated taking into account possible plant modifications and operating experience.	The design data is not enough. Recent explosion PSA showed that design/operation modifications are necessary to reduce the risk.		X – modified as follows:These data should be updated taking into account possible plant modifications and operating experience in each periodic safety revision		
FRANCE - CEA	89	7.12		(g) The ~~impact of~~ random equipment failures and human errors.		X			
Canada	55	7.12		(g) ~~The impact of~~ ~~r~~Random equipment failures and human errors.	To improve the clarity.		X – see modification above		

Egypt	22	7.12		The (g) item in para. 7.12 is replaced with the following two items:(g) Effects on component dependencies and component failure probabilities due to fire effects;(h) Estimation of the effects of the fire on human actions and possibilities for increasing the probabilities of identified human errors;(i) Effects of the fire, both direct ….	Item (g) in para. 7.12 is not clear and need more clarification.		X"…(g) Effects of fire on component dependencies and component failure probabilities;(h) ~~Estimation~~ Effects of fire on human actions and human error probabilities;(i) Effects of fire, both direct ….		
Germany	90	7.12		The contribution of internal explosion to the core and/or fuel damage frequency should be calculated, unless the event ~~can be discarded on a probabilistic basis~~ has been screened out.	Editorial consistency, and consistency with all other hazards, see comment to 7.4: Hazards PSA are not limited to the reactor but should also include the spent fuel pool (SFP).			X	
Germany	91	7.12	After	*New Heading:* **Other credible internal hazards**	Completion to be systematic and comprehensive		X with slight modification:**Analysis of further credible hazards**		
Russia	40	7.12		Important: To provide note in the beginning that this reference does not mean that details can be found in the reference, but that the text was first published in this Reference.	SSG-3 should be a self-sufficient document and it should be clear that you do not need to look for additional information in the referenced document. This comment is essential and is applicable to all cases where references are used.Note that SSG-3 is under review of MSs, but not the referenced documents.			X	SSG-3 needs to be in line with other IAEA SSGs , etc.

FRANCE - CEA	105	7.120		The contribution of internal explosion to the core damage frequency should be calculated, unless the event can be discarded on a probabilistic basis. In some cases the assessment of explosive atmosphere occurrence frequency may be sufficient to evaluate the need for safety improvements.				X	Considered to be too specific for the safety guide level.
Germany	92	7.121	New	The general process for conducting Level 1 PSA for internal hazards should be adapted for a Level 1 PSA for all other internal hazards remaining after the individual or combined hazards screening.	Completion to be systematic and comprehensive	X			
Germany	93	7.122	New	A plant walkdown should be performed for identification of potential sources of such other internal hazards and for verification purposes.	Completion to be systematic and comprehensive	X			
Germany	94	7.123	New	*Sentence from Para 7.119*. The frequency of events due to these internal hazards should be evaluated using the recommendations in Section 5.	Completion to be systematic and comprehensive		X, see comment above		

Germany	95	7.123	After New 7.123	*Few new paragraphs are needed. See comment*	Consistent to the other internal hazards, a few paragraphs are needed:a par. Similar to the one added after the new 7.123, and paragraphs on risk quantification and documentation of the analyses – alternatively, reference could be made to the corresponding paragraphs for fire, flooding, load drop		X, further paragraphs consistent with flooding and explosion, slightly modified, could be added; since this is a kind of duplication several times we should think about having common texts with references to the paragraphs above.		
FRANCE - CEA	90	7.13		~~The physical separation (fire barriers) between redundant trains of SSCs important to safety may limit the extent of fire damage~~. ~~Therefore~~, quantification of the contribution of fire to the core damage frequency with the Level 1 PSA model for internal fire should generally include probabilities of random failures of equipment not affected by the fire and the likelihood of a test or maintenance outage.	Not the only reason to consider random failuresAlready covered by 7.12 (g)?		X see modifications above in this paragraph		
Canada	56	7.13		"The physical separation (fire barriers) between redundant trains of SSCs important to safety may limit the extent of fire damage. ~~Therefore,~~ The quantification of the contribution of fire to the core damage frequency with the Level 1 PSA model for internal fire should generally include probabilities of random failures of equipment not affected by the fire and the likelihood of a test or maintenance outage."	Not clear.The random failures of equipment are not considered only due to physical separation.		X		

ENISS	24	7.15		(b) The screening should be performed separately to take account of the ~~greater~~ potentially higher and additional fire loads and different and/or additional potential ignition sources, particularly transient combustibles associated with maintenance activities performed during shutdown states.	Editorial correction		X editorially modified		
Germany	37	7.15	Item b	The screening should be performed separately to take into account ~~of~~ the ~~greater~~ potentially higher and different and/or additional fire loads (e.g. transient combustibles) and ~~different and/or additional~~ potential ignition sources, ~~particularly transient combustibles~~ typically associated with maintenance activities performed during shutdown states.	Precision and correction of partly wrong sentence	X			
Germany	38	7.15	Item e	The increased occupancy of different plant locations during outages, which may improve the fire detection capabilities but may also create additional fire sources.	Editorial	X			
UK	5	7.15	c)	Edit 7.15 point c to:The availability of fire protection means ..	Grammar / Readability.	X			
Canada	57	7.16		"Deterministic fire hazard analysis and fire safe shutdown analysis carried out…"	The fire safe shutdown analysis is also performed in addition to the fire hazard analysis that provides useful inputs for the fire PSA		X, modified as follows:"Deterministic fire hazard analysis and fire safe shutdown analysis carried out as far as applicable during the design (see [6]) …"		
UK	6	7.18	4	In accordance with ~~to~~ the level…	Grammar.	X			

Germany	39	7.20	Item C	*Item (c) should be split up into two aspects as follows (perhaps two items, or only mentioning both aspects:#* Data from the operating experience - on fire events, and- on observations of failures and/or deterioration of fire protection features	Item (c) did not covers all OPEX feedback data important for the analyses		X modified as follows:"c() Data from the operating experience - on fire events, and- on observations of failures and/or deterioration of fire protection features;"		
Germany	40	7.20	Item e	Estimates of the reliability of fire detection and suppression the means ~~for suppression of fire~~;	Editorial for a clear understanding		X With some revision		
Germany	41	7.20	Item H	~~Features of~~ F~~f~~ire suppression systems and equipment characteristics…	Precision	X			
Russia	39	7.21	Fig 3 - Para 7.21 Fig 4 - Para 7.69	Figure 3 should be changed in a way that any screening is to be performed after multi-compartment fire analyses. This change should be in line with para 7.35. Analyses of combined hazards should be removed or explained in more detail.	In the current figure fire scenarios can be screened out before analyses of fire propagation beyond plant area is performed (see para 7.35). Current process is wrong and will lead to underestimation of risk. Fig. 3 should be corrected.	~~X~~	X		

Germany	42	7.22	Items A to K	(a) Their physical boundaries (e.g. walls, floors, ceilings, including doors, dampers, other penetrations); (b) The fire protection features (e.g. extinguishing or fire suppression systems) in place; (c) The fire resistance (fire rating) of the barriers surrounding the compartment; (d) The components and equipment including cables located inside the fire compartment; (e) Adjacent fire compartments and the connections to these; (f) Ventilation paths (ducts) that connect the fire compartment to be analyszed with non-adjacent fire compartments; (g) The fire load (e.g. type, amount, whether protected or unprotected, location, local distribution and whether permanent or temporary); (h) Potential ignition sources (e.g. type, amount, location); (i) Procedures and other administrative provisions for control of combustible materials; (j) Occupancy level (i.e. the possibility of detectingon of the a fire by personnel); (k) Accessibility of the location (e.g. for the fire brigade).	Clarification		X(a) Their physical boundaries (e.g., walls, floors, ceilings, including doors, dampers, other penetrations); (b) The fire protection features in place (e.g. fir detection and extinguishing systems and equipment); (c) The fire resistance (fire rating) of the barriers surrounding the compartment; (d) The components and equipment including cables located inside the fire compartment; …(i) Procedures and other administrative provisions for control of combustible materials; (j) Occupancy level (i.e. the possibility of detecting a fire by personnel); …“		

Germany	43	7.24		Estimation of the fire ignition frequencies~~y~~ ~~of ignition of fires~~ either for fire compartments or for fire sources is an important part of the Level 1 PSA for internal fire and should be performed either before screening for all fire compartments, or at the beginning of the quantitative screening process for the most important fire compartments that survive the qualitative screening process (see para. 7.44).	The original text does not consider that both approaches, applying room specific fire compartment frequencies or component type specific fire source frequencies, can be used. Both are typical good practice, which approach is chosen, depends mainly on the country, where the analysis is performed.	X			
Canada	58	7.25		Related to this para, add the following footnote:“Latest generic fire ignition frequencies can be obtained from the updated fire events database in NUREG-2169. A Bayesian update of these generic fire ignition frequencies can be performed to obtain plant specific ignition frequencies”.	To provide a reference for a generic database for the fire ignition frequencies to support development of the plant specific ignition frequencies		Xreference to be added:OECD NUCLEAR ENERGYAGENCY, Committee on the Safety of Nuclear Installations, OECD/NEA FIRE Database, Version 2019:01, Paris, France (2021). (for Project members only)FSDEB … (US Fire Events Database)		
Germany	44	7.25		The frequency of ignition associated with fire ignition sources and/or fire compartments should be evaluated as far as feasible using plant specific data. ~~When~~ If plant specific data are insufficient, generic data should be used for estimation of the fire ignition frequencies~~y~~ along with the available plant specific data, adjusted in respect of the actual fire ignition sources ~~of fire ignition~~ (including sources resulting from hot	Precision for clarification	X			

				work), and the amounts of permanent and temporary combustibles and ignition sources ~~material~~ present in the fire compartments.					
Russia	41	7.27		7.27. Fire frequencies should be estimated as a mean with statistical uncertainty intervals ~~after identification and qualitative screening of fire scenarios~~.	It is not correct and can be done differently.	X			
Russia/ SEC NRS	6	7.27		The frequency of fires should be estimated as an average with statistical uncertainty intervals.	The statement is incorrect because the estimate of the frequency of fire occurrence is performed before analyzing the fire scenarios.		XText has been modified, see above		
Germany	45	7.34		For the purposes of screening, all components and cables exposed to fire should be assumed failed~~,~~. ~~t~~That is the pessimistic assumption is ~~usually~~ made that the fire detection and extinguishing features are either ineffective or not available. Other protective measures, such as fire shields, protective coatings or non-qualified (as fire resistant) enclosures are not usually taken into account.	Precision	X			

Germany	46	7.35	Last Sentence	… To limit the number of combinations that need to be considered, general pessimistic assumptions could be made regarding the reliability and effectiveness of fire barrier elements, based on relevant qualification programmes, industry and past facility performance data.	Screening must be based on pessimistic assumptions	X			
Germany	47	7.37		For a multi-unit and/or multi-source site, the potential spreading of a fire from one unit or source to a fire compartment of another unit should be considered in the analysis. ~~Also, t~~The possibility of fires in common areas (e.g. swing diesels (i.e. diesels shared between units), switchyard, etc.) should be considered.	State-of-the-art is that fires spreading from another source to as reactor unit have also to be considered, therefore, an addition is needed.		X For a multi-unit site and/or multi-source site, the potential spreading of a fire from one reactor unit or radioactive source to a fire compartment of another reactor unit should be considered in the analysis. The possibility of fires in common areas (e.g,. swing diesels (i.e. diesels shared between units), switchyard) should be considered.		
Germany	48	7.38	Heading	**Screening by contribution to core and/or fuel damage frequency**	Hazards PSA are not limited to the reactor but should also include the spent fuel pool (SFP), therefore "and/or fuel" needs to be systematically added here and in the following paragraphs , or a footnote is needed that only core damage is mentioned but the same is valid for fuel damage.		X, modified as follows to be more general:**Screening by frequency**		

FRANCE - CEA	91	7.39	7.40	The potential fire propagation should also be analyzed here. Please complete.			X7.40 With these assumptions, for each remaining fire compartment, the model for the Level 1 PSA for internal initiating events should be modified in order to map the fire effects inside the compartment and of fire spreading to other compartments and …”		
FRANCE - CEA	92	7.41		One of the most important specificities of fire management is the application of fire specific procedures which may lead to voluntary cut some part of power supply. Please complete with paragraph explaining the technique to model it in a L1 fire PSA.				X	Guidance on the techniques does not change the recommendation and is not necessary.
Canada	59	7.41		“…The assessment of Type C HFEs for fire PSAs should include the following three cases (see [15] for general guidelines on fire HRA):”“(b) HFEs that are relevant only for fire, including MCR abandonment [15].	To provide guidance from publically available sources on fire HRA.MCR abandonment actions are a special case of fire response actions and should be mentioned.	X			

Russia	42	7.45		7.45. Quantitative screening should be based on a pessimistic estimate of the conditional core damage probability or the absolute contribution of fire to the core damage frequency. Two criteria for quantitative screening of fire compartments could be defined as follows: …*(b) The contribution of fire for individual fire compartment to the core damage frequency is sufficiently low to retain all risk significant fire scenarios. The threshold for screening may be defined in the same way as for the previous criteria, but should be at least an order of magnitude lower.*	Original item b) was formulated in the way different than screening criteria and was not connected to the first statement in the para.			X	The Russian text only focusses on compartments and is misleading.
FRANCE - CEA	93	7.46		This paragraph may be moved after 7.40		X			

Germany	49	7.48		Detailed fire analysis should aim at reducing the level of conservatism in the fire scenarios identified so far in the screening process. The effect of fire barriers inside the compartment and other means of protection from fire, the location of SSCs important to safety and firefighting extinguishing systems and equipment in place in the fire compartment and other aspects such as growth and propagation of fire should be taken into account. All the direct effects of fire, including flame, plume, ceiling jet, radiant heat from hot gases, high energy arcing and fire by-products such as smoke and soot, and indirect fire effects and consequences(e.g. from fire extinguishing media, or consequential high energy arcs) should be considered and assessed. Generally, dedicated walkdowns should be performed in carrying out the Level 1 PSA for internal fire to gather supporting information for verification of the detailed analysis.	Precision and completion according to the state-of-the-art	X			
Germany	50	7.49		More realistic models should be applied for assessing human actions for reducing the probability of equipment damage, growth and propagation of fire, and	Completion, comprehensiveness	X			

				the effects of fire on SSCs ~~the equipment and cables~~.					
Germany	51	7.50		The effects of fire and fire by-products (e.g. smoke, or toxic gases) ~~of~~ possibly~~e~~ spreading ~~of smoke and toxic gases~~ on human performance should be assessed. It should also be noted that overpressure resulting from fire may prevent the opening of doors ~~necessary to~~ needed for access of personnel to recovery locations or the fire brigade for firefighting.	Factual corrections and precision	X			
Germany	52	7.52		Fire scenarios should characterize ~~describe~~ the time dependent course of a fire that is initiated in a selected compartment and any subsequent ~~component and cable~~ failures of SSCs (including cables). A fire scenario should be represented in the Level 1 PSA model for internal fire, for example, by fire ~~propagation~~ event trees (see example in Annex II), where all important features affecting fire development are modelled (design and quality of fire barriers, fire growth and propagation model, criteria~~on~~ for damage of equipment at risk, including cables, fire	More precision in consistency with other recent fire-related IAEA guidance documents (e.g. SSG-64)		X With some revisions		

				protection and suppression means ~~features~~). The recommendations in Section 5 should be applied for determining such fire ~~propagation~~ event trees.					
Germany	53	7.53		For the fire scenarios to be analyz~~s~~ed, human reliability for manual actions and component reliability of fire detection and suppression systems and equipment should be assessed using the same methodology as presented in Section 5 for PSA for internal initiating events.	Precision and completion	X			
Germany	54	7.54		Pathways that may be relevant for propagation of fire (e.g. ventilation ducts or cable trays and channels ~~gutters~~, failed fire barriers) should be taken into account in the fire scenarios.	Fire specific precision in consistency with SSG-64	X			

Germany	55	7.55		For fire compartments considered in the detailed fire analysis, data on the occurrence frequency ~~of occurrence~~ of a fire scenario should be complemented with additional data specific to the fire compartment, such as the presence of temporary fire loads and ~~non-permanent~~ ignition sources, ignitability, etc. ~~and the possible presence of fire load~~.	Completion and precision in line with SSG-64	X			
Germany	56	7.57	Item a	(a) The effects of fire and fire by-products (e.g. smoke and soot) on the availability ~~of the~~ required function of instrumentation and related equipment;	Completion in line with SSG-64	X			
Germany	57	7.57	Item B	(b) The capability of features for fire detection and suppression, including the potential adverse impact of indirect fire effects, typically by fire suppression (e.g., from extinguishing media) ~~flooding~~;	More precision and comprehensiveness in line with SSG-64	X			
Germany	58	7.57	Item E	(e) The effects of the spreading of fire by-products, such as smoke or ~~and~~ toxic gases.	Precision and completion in line with SSG-64	X			
Germany	59	7.57	Last Sentence	In addition, ~~intracavity~~ fire propagation inside a fire compartment should be taken into account, including the presence of physical segregation and separation means such as qualified fire barriers as well as spatial separation of ~~redundant~~ components of redundant trains.	Precision to be consistent with other fire-related IAEA guidance documents	X			

Germany	61	7.58		Rooms with ~~The~~ electrical components ~~rooms~~, switchgear rooms, cable spreading rooms and other rooms containing electrical instrumentation and control equipment tend to become natural centres of convergence for equipment and wiring. They contain electrical equipment and cables that may belong to more than one train of the credited system. Therefore, the potential impact of fire on redundant items important to safety ~~equipment for safe shutdown and~~ or on other Level 1 PSA related equipment is likely to be ~~greater~~ higher than the impact of fire in other plant locations and this should be considered.	Precision in line with other fire-related IAEA guidance documents	X			
Germany	60	7.58	Heading	***Analysis of fire in ~~the electrical component~~ rooms with electrical components***	Precision	X			
Germany	62	7.59		There is also a higher probability for single or multiple spurious actuations of electrical components because of fire induced electrical failures (e.g. shorts) in these locations. In the analysis of spurious actuation of electrical components, the particular fire induced circuit failures should be identified and the associated conditional probabilities assessed.	Precision and editorial	X			

FRANCE - CEA	94	7.60	Before 7.60	~~*Multicompartment fire analysis*~~	The multicompartment fire analysis is not a separate analysis; it is part of the normal fire PSA; No reason to create a separate section.			X	It should be mentioned here to avoid misleading due to lack of recommendations
Canada	60	7.60		"… It should be assumed that fire may spread from one compartment to another through shared barriers ~~or~~, via ventilation ducts that connect compartments, or as a result of the development of a hot gas layer and either an open adjacent compartment or a barrier failure."	To identify the hot gas layer as a source of spreading fire.		X with rewording		
Germany	63	7.6		Multicompartment fire analysis aims to identify the potential fire scenarios significant to risk that involve more than one fire compartment. It should be assumed that fire may spread from one compartment to another through ~~shared~~ fire barriers between fire compartments, particularly via fire barrier elements with active functions such as doors or dampers, or barrier penetrations by cable trays or ~~via~~ ventilation ducts ~~that connect the compartments~~. Compared with the analysis performed during the screening process, multicompartment detailed fire analysis should be based on a fire growth model, a model for analysis of fire propagation and a model	Fire specific precision in consistency with SSG-64	X			

				for fire detection and suppression.					
Germany	64	7.61		As for single fire compartments, the detailed analysis for multicompartment fires should consider the depth of propagation of the fire, the spread of direct and indirect fire effects (covering not only heat transfer between fire compartments but also other fire by, e.g. extinguishing media. ~~Products and effects from fire suppression~~~~combustion products and/or the transfer of heat to adjacent (or connected) fire compartments~~.	Fire specific precision in consistency with IAEA fire-related guidance documents		X As for single fire compartments, the detailed analysis for multi-compartment fires should consider the depth of propagation of the fire, the spread of direct and indirect fire effects (covering not only heat transfer between fire compartments but also other fire by-products, e.g. extinguishing media.		

Germany	65	7.62		The potential for the occurrence of combinations of fires and other hazards of all three combination categories (mentioned above in par. 6.11 as defined in [6], other fire-induced consequential internal hazards e.g. flooding caused by actuation of a fire extinguishing system discharging a large amount of water, explosion of hazardous material caused by fire, fire caused by explosion) should be identified. As required in par. 6.X *(new X instead of 12 according to the comment to 6.12)*, combinations of other hazards with consequential fire should be considered in the Level 1 PSA for those hazards and combinations of fires and consequential hazards should be considered in the Level 1 PSA for internal fire. For combinations of fires correlated with other hazards by a common cause or combinations of unrelated (independently occurring simultaneously) hazards involving internal fires not screened out, the analyst should decide, if these combined hazards are considered in the Level 1 PSA for internal fire or for one of the other hazards. The multiple independent fires could typically be screened out	7.62 was not consistent to the general approach as mentioned in Section 6 and was also incomplete. Precision has been given and the text was completed to make it comprehensive and generally applicable. The last sentence is no more needed, since this may be or not a result of screening.	X			

				~~based on low frequency of occurrence.~~						

Germany	66	7.63		A qualitative analysis of internal fires induced by other hazards (e.g. seismicity, lightning, external fire, airplane crash) should be performed. Fire compartments where the combined impact of other hazards and fire could be important for safety should be analysed. Ignition sources induced by hazards, spurious actuation or degradation of fire suppression systems, and difficulties in carrying out manual firefighting actions, are examples of impacts to be considered (see the recommendations on Level 1 PSA for external hazards provided in Section 8).	7.63 needs to be deleted, it is no more in line with the general approach for PSA for combined hazards outlined in Section 6.	X			
FRANCE - CEA	95	7.64		The following effects of internal fire induced by other hazards on the performance shaping factors (or other factors depending on the HRA method) of operating personnel should be taken into account:	Different methods may be used	X			

Germany	67	7.64		The following effects ~~of internal fire induced by other hazards~~ on the performance shaping factors of operating personnel should be taken into account for combinations of internal fires and other hazards: (a) Accessibility of plant locations where actions need to be taken by personnel to ensure the required safety functions or by the fire brigade to successfully suppress the fire ~~compartments of interest~~ after initiation of the fire; (b) Increased stress level; (c) Failures of indication or false indications; (d) Spurious actuation of systems and components either important to nuclear safety or used for fire extinguishing; (~~d~~e) Combined effects of fire and … on the behaviour of operating personnel.	Corrections and precision in line with the general approach for combined hazards in Section 6 were needed, the list was completed; however it is still unclear what was intended in former item (d), therefore only "…" was indicated as change there		X with some modifications:"The following effects of internal fire induced by other hazards on the performance shaping factors (or other factors depending on the HRA method) of operating personnel should be taken into account:Accessibility of plant locations where in the event of fire actions need to be taken by personnel to ensure the required safety functions or by the fire brigade to successfully suppress the fire.Increased stress level.Failures of indication or false indication,Combined effects of fire on the behaviour of operating personnel.		
Germany	68	7.65	Heading	**Quantification of the risk of internal fire**	Editorial, it could be also "Risk quantification of internal fire"		X, with the following modifications:**Risk quantification of internal fire**		
Russia	43	7.68		…The results of the specific analyses for detailed fire scenarios, for example for the main control room, the electrical component room, multi-compartment fire ~~and multiple hazards~~;	Not clear what it means in this context	X			

Egypt	23	7.69		For a Level 1 PSA for internal flooding for shutdown states, the similar aspects listed in para. 7.15 should be considered.	Paragraph 7.15 presents specific aspects to be considered for internal fire, to consider these aspects to internal flooding the word "similar" should be added.	X			
Germany	69	7.71	Item a	Possible sources of flooding are: pipes, internal vessels or tanks, pools, valves, heat exchangers, connections to open-ended sources (e.g., sea, lake, river), multi-unit and/or multi-source shared SSCs (e.g. fire main ring) systems or structures.	Precision and consistency, explanatory example in parenthesis	X	X modified as follows:Possible sources of flooding: pipes, vessels or tanks, pools, valves, heat exchangers, connections to open-ended sources (e.g. sea, lake, river), multi-unit and/or SSCs shared by multiple sources (e.g., fire main ring);		
Germany	70	7.72		When identifying potential flooding events, particular consideration should be given to plant shutdown conditions, as water pathways are frequently manually reconfigured during at such time periods.	Editorial precision	X			
FRANCE - CEA	96	7.73		In doing this, consideration should be given to multi-unit aspects and account should be taken of the potential for failure of flood barriers due to accumulated water.	Not only do to accumulated water. Can be open or missing.	X			
Canada	61	7.73		In doing this, consideration should be given to multi-unit aspects and account should be taken of the potential for failure of flood barriers, if any, due to accumulated water.	Sometimes, there are no barriers (open area), or barriers are missing.	X			

Germany	71	7.73		Plant areas that can be affected by internal flooding should be determined and possible propagation paths for the water should be identified. In doing this, consideration should be given to multi-unit and multi-source (e.g. spent fuel pool) aspects and account should be taken of the potential for failure of flood barriers due to accumulated water.	Missing aspect was added		X Modified as follows: In doing this, consideration should be given to multi-unit **and spent fuel pool** aspects and account should be taken of the potential for failure of flood barriers due to accumulated water.		
Germany	72	7.74		The plant should be divided into physically separated ‘flooding areas’, …	Editorial	X			
Germany	73	7.77		The frequency and severity of flooding events caused by human error should be also evaluated, considering plant specific maintenance procedures and experience as well as spurious actuation of water-based fire extinguishing ~~fighting~~ systems.	Precision in expert terminology and consistency	X			
Russia	44	7.78		7.78. Flood frequencies should be estimated as a mean with statistical uncertainty intervals ~~after identification and qualitative screening of flood scenarios~~.	This is not fully correct and might be done differently.	X			

Pakistan	7	7.79	7.84	The “buried piping” may be considered in flood analysis.	The buried piping may cause a possible flooding source and should be analyzed while performing internal flooding PSA.Reference EPRI guideline for Performance of Internal Flooding Probabilistic Risk Assessment (1019194), section 1.4.4 ‘Scope of flood sources’ it is mentioned that:“Buried piping: a pressure boundary failure of below-ground piping may result in water propagating through cracks in concrete floor. Plant aging management program documentation includes buried piping reliability considerations including degradation mechanism assessments of potential relevance to IFPRA”.	X			
Germany	74	7.80		Consideration of SSCs ~~components~~ affected by internal flooding should take into account elevations, barriers, doors and drains.	More comprehensive	X			
FRANCE - CEA	97	7.82		All possible routes for the propagation of floodwater should be taken into consideration, for example, equipment drains, and the possibility of normally closed doors or hatches being left open, reverse flow induced by water evacuation pipes plugging.		X			

Germany	75	7.82		All possible routes for the propagation of floodwater should be considerededation, for example, equipment drains, non-leak-tight doors, and the possibility of normally closed doors, or hatches, etc. being left open.	Precision, further examples provided	X			
Germany	76	7.83		The location, including the elevation and potentially present protection features, of electric and/or electronic components (e.g. cabinets, terminal boxes for cables for SSCs important to safety) and other sensitive equipment vulnerable/sensitive to humidity should be identified. In this way, the vulnerability of components with respect to flooding of certain rooms can be identified.	Precision and comprehensiveness		X With some revisions		
FRANCE - CEA	98	7.85		The compartment does not contain any sources of flooding, including in-leakage flooding originating from other compartments, sufficient to cause failure of equipment.		X			
Germany	77	7.86	Heading	**Screening by contribution to core and/or fuel damage frequency**	Hazards PSA are not limited to the reactor but should also include the spent fuel pool (SFP).See comment to 7.4		X (with slight revision to make it very general**Screening by frequency**		
FRANCE - CEA	99	7.89		It is not clear how the flooding propagation between areas should be considered. Please complete.			X with revision, see next comment as well		

Russia	45	7.89		7.89. Quantitative criteria for screening in accordance with contribution to the core damage frequency should be defined for Level 1 PSA for internal flooding. Example of such criteria could be as follows: … *(b) The contribution of flooding for individual flooding area to the core damage frequency is sufficiently low to retain all risk significant flood scenarios. The threshold for screening may be defined in the same way as for the previous criteria, but should be at least an order of magnitude lower.*	Original item b) was erroneously copied from para 7.90.	X	X modified as follows:The cumulative contribution of flooding to the core damage frequency for all flooding areas screened out should not exceed a specified threshold. This threshold may be defined as a specific absolute value or be given in relative terms (e.g. the contribution of internal initiating events to the core damage frequency). For an individual flooding area, the contribution of flooding to the core damage frequency is sufficiently low to retain all risk significant flood scenarios.		
FRANCE - CEA	100	7.92		All potentially contributory ~~initiating~~ flooding events should be analysed in terms of the means of detecting and controlling them. T		X			
FRANCE - CEA	101	7.94		HFEs that are relevant only for flooding (e.g. these include, for example, isolation and subsequent restoration of the electrical power supplies). In this case the methods to assess flood specific HFEs may usually follow same principles as the other types of HFE. The impact on the plant systems of the success of the flooding specific procedures (eg. Isolation and possible subsequent restoration of the electrical power supplies) should also be considered in the PSA model.			X, editorially modified…HFEs that are relevant only for flooding (e.g. isolation and subsequent restoration of the electrical power supplies). In this case, the methods to assess flood specific HFEs may usually follow the same principles as other types of HFE. The impact of the success of the flooding specific procedures (e.g. isolation and possible subsequent restoration of the electrical power supplies) on the plant SSCs should also be considered in the PSA model.		

Germany	78	7.95		~~A qualitative analysis of internal flooding induced by other hazards (e.g. seismicity) should be performed. Flooding compartments where the combined impact of other hazards and flooding could be important for safety should be analysed. Flooding sources induced by hazards and difficulties in carrying out manual flooding protection actions, are examples of impacts to be considered (see the recommendations on Level 1 PSA for external hazards provided in Section 8). In addition, flooding caused by actuation of a fire extinguishing system discharging a large amount of water should be addressed in the context of the Level 1 PSA for internal fire (see para. 7.62).~~	7.95 in consistency with 7.63 being deleted needs to be deleted, it is no more in line with the general approach for PSA for combined hazards outlined in Section 6.***Paragraphs similar to those for Fire PSA should be added (Germany could provide text proposals)***		X with revisions in line with the corresponding paragraphs for fire7.96. The potential for occurrence of combinations of internal flooding and other hazards of all three combination categories (mentioned above in par. 6.11—as defined in [6].—7.97. As required in par. 6.X, combinations of other hazards with consequential internal flooding should be considered in the Level 1 PSA for those hazards and combinations of internal flooding and consequential hazards should be considered in the Level 1 PSA for internal flooding. For combinations of internal flooding correlated with other hazards by a common cause or combinations of unrelated (independently occurring simultaneously) hazards involving internal floodings not screened out, the analyst should decide, if these combined hazards are considered in the Level 1 PSA for internal flooding or for one of the other hazards. A qualitative analysis of internal flooding induced by other hazards (e.g., seismicity, external flooding, aircraft crash, internal fire) should be performed as part of the analyses carried out for the initial event (see par. 6.X). Flooding areas or compartments where the		

							combined impact of other hazards and flooding could be important for safety should be analysed. Flood sources induced by hazards and difficulties in carrying out manual flood protection actions are examples of impacts to be considered (see the recommendations on Level 1 PSA for external hazards provided in Section 8). In addition, flooding caused by actuation of a fire extinguishing system discharging a large amount of water should be addressed in the context of the Level 1 PSA for internal fire (see para. 7.62).		

Germany	79	7.96		The following effects ~~of internal floods induced by other hazards~~ on the performance shaping factors of operating personnel should be taken into account for combinations of internal flooding and other hazards: (a) Accessibility of plant locations where actions need to be taken by personnel to ensure the required safety functions ~~the compartments of interest~~ after initiation of the flooding; (b) Increased stress level; (c) Failures of indication or false indications; (d) Spurious actuation of systems and components either important to nuclear safety or used for fire extinguishing through water-based systems; (~~d~~e) Combined effects of flooding and … on the behaviour of operating personnel.	Corrections and precision in line with the general approach for combined hazards in Section 6 and with changes to 7.64 were needed, the list was completed; however it is still unclear what was intended in former item (d), therefore only "…" was indicated as change there		X with revisions in line with the X with revisions in line with the corresponding paragraphs for fire7. 7.100. The following effects of internal flooding induced by other hazards on the performance shaping factors (or other factors depending on the HRA method) of operating personnel should be taken into account:Accessibility of plant locations where actions need to be taken by personnel to ensure the required safety functions after initiation of the flooding;Increased stress levelFailures of indication or false indication;Combined effects of flooding on the behaviour of operating personnel.		

Germany	81	7.99		PSAs normally focus on the failure to cool the core inside the reactor vessel or the fuel stored in the spent fuel pool. However, other, more direct damage can occur, for example, by heavy load drops onto the vessel, spent fuel pool or systems required to perform critical safety functions. Potential collapse of structures and falling objects with a focus on drops of heavy loads (e.g. the confinement dome, the reactor pressure vessel head, the spent fuel cask, concrete shielding blocks) should be analysed in respect of their potential to damage to SSCs needed to perform safety functions or in respect of their potential to result directly in mechanical damage to fuel assemblies.	Completion consistent to SSG-64	X			
Germany	80	7.99	Heading	**Analysis of the collapse of structures and falling objects with a focus on heavy load drops**	Completion consistent to SSG-64	X			

Germany	96	8.01	List of times	(a) Natural ~~Seismic~~ hazards: - Seismic hazards - Hydrological hazards (typically external flooding) - Meteorological hazards (typically high winds, snow)~~(b) High winds; (c) External floods;~~ (d) Human-induced hazards, e.g.: - aircraft crash - explosion pressure wave	The list must be more systematically structured and more complete according to the state of practice in member countries		X, modified as follows:(a) Natural hazards: - Seismic hazards - Hydrological hazards (e.g., external flooding) - Meteorological hazards (e.g., high winds, precipitation, etc.) - Extraterrestric hazards (e.g., meteorites, solar flares) - Biological hazards - Geological hazards - Natural fires(b) Human induced hazards (covering hazards from transport accidents such as aircraft crash, industrial and military accidents, here typically explosions, fires, releases of hazardous materials, etc.)		
Germany	97	8.02	to 8.6	***See comment***	These paragraphs must be carefully revised to be consistent with the respective general paragraphs in Section 6. This should be done by the consultants. Moreover, as mentioned in comment to 7.4, PSA for hazards (including external ones) are not limited to the reactor but should also include the spent fuel pool (SFP), therefore “and/or fuel” needs to be systematically added in the respective paragraphs Section 8 as well.	X			

Hungary Attila	36	8.02		The bounding analysis is performed with the aim of reducing the list of external hazards subject to detailed analysis, thereby focusing on the most **risk** significant accident scenarios. The bounding analysis should be performed in such a way that it provides assurance that the core damage **risk** associated with the specific external hazard is insignificant compared with other hazards.	It is not described in what sense accident scenarios are (risk) significant and core damage (risk) is insignificant. The word “risk” is missing in both cases.	X			
China	4	8.06		Publication of supporting guidelines for combinations of external hazards bounding analysis .	There are no practical experience or consensus treatment for combinations of external hazards bounding analysis.			X	Guidance is available, references to be given
FRANCE - CEA	106	8.07		The bounding estimations should be based on models and data that are realistic but demonstratively conservative.	Underlined text is not clear. Please explain.			X	Bounding needs to be pessimistic
Hungary Attila	37	8.07	(a) now 8.13	Assessment of the **occurrence** frequency of hazards (i.e. estimations of the frequency of exceedance **for** particular intensities);	Occurrence frequency is generally used for hazards. There are too many “of” in the brackets, hence “for” is proposed in one case.	X			
Germany	100	8.08	After	***See comment***	The order of the hazards after “seismic hazards” needs to be changed in line with their order in para 8.1		X, see comments before		

Germany	98	8.08		Seismic hazards are important contributors to core <u>and/or fuel</u> damage frequency in many Level 1 PSAs; consequently, a detailed analysis should be performed. However, in order to limit the effort required for Level 1 PSA for seismic hazards, it is possible to perform a simplified analysis with conservative assumptions. ~~The secondary effects of seismic hazards (e.g. seismically induced fires and floods) should also be considered at this stage~~. Additional details are provided in Refs [7, 25, 29, 31].	See comment to 7.4: Hazards PSA are not limited to the reactor but should also include the spent fuel pool (SFP).The third sentence should be deleted to be consistent with Section 6 on combined hazards and where the combination should be analyzed.	~~X~~		<u>X</u>	
Germany	99	8.08	After 8.8 new paragraphs	*Few paragraphs are neededSee comment*	Consistent to other hazards, a few paragraphs are needed:a par. Similar to the one added after the new 7.123 reflecting the specifics of seismic event sequences, paragraphs on combined seismic hazards, risk quantification and documentation of the analyses as a minimum		<u>X, see comments before</u>		
Libya	10	8.08	No. SSG-3	The design of spent fuel pool withstands the earthquake	Improved clarity			X	Seismic hazards can lead to SFP leak

Germany	101	8.09	Last sentence	~~The applicable combinations of high winds with other hazard phenomena identified as described in para. 6.11 should be considered, with account taken of possible dependencies (e.g. high winds and high water levels).~~	The last sentence needs to be deleted to be more consistent to Section 6: In line with other hazards, a few paragraphs are needed: a par. Similar to the one added after the new 7.123 reflecting the specifics of meteorological event sequences, particularly by high winds, paragraphs on combined hazards involving high winds , risk quantification and documentation of the analyses as a minimum			X	see modifications
Canada	63	8.10		To the list of external hazards, add the following:Flooding due to other natural causes, e.g., ice jamming, frazil ice	To list additional source of flooding.		X with rewording, see comments above		
Canada	72	8.100		After this para, add a new para as follows:“Effective walkdowns are an important part of the process of identifying seismically induced failures that may lead to consequential hazards such as internal fires and internal floods.	To provide more details about seismically induced fires and floods			X	This is something more general for combined hazards
Finland	3	8.10		(i) Meteotsunamis	A tsunami-like wave of meteorological origin can cause a significant risk in certain areas			X	Tsunami is mentioned as general category regardless the origin, and these waves have other names, see ASAMPSA_E

Germany	102	8.1	incl. list of items	The following flood related hazards should <u>at least</u> be considered in the Level 1 PSA: ……. ~~The applicable combinations of external floods with other hazard phenomena identified as described in para. 6.11 should be considered, with account taken of possible dependencies (e.g. high water level, consequential dam failures).~~	If the list of items is incomplete, “at least” needs to be added. ***Moreover, the list needs to be re-ordered and made a little more complete (see German proposal for new Annex I).*** The sentence after the item list needs to be deleted to be more consistent to Section 6 and 7		<u>X see comments above</u>		
Germany	127	8.100		~~Seismically induced fires and floods should be included in the Level 1 PSA model for seismic hazards, unless it is clearly justified that other seismic damage bounds additional effects from seismically induced fire and floods. Plant impacts associated with induced fires and floods scenarios should be consistent with the fire and flood scenarios discussed in paras 7.48–7.64 and 7.79–7.84, respectively36~~	In line with the general paragraphs in Section 6, this para should be deleted.	X			
Germany	128	8.101		**In quantifying the core <u>and/or fuel</u> damage frequency, …**	See comment to 7.4: Hazards PSA are not limited to the reactor but should also include the spent fuel pool (SFP)	<u>X</u>			
Germany	103	8.11		~~The consequences of heavy rain and other flooding, such as water collecting on rooftops and in low lying plant areas, should be included in the scope of the analysis.~~	This par. needs to be deleted to be consistent to Section 6 on combined hazards. However, separate paragraphs for other hydrological and meteorological hazards (flooding by external precipitation, heavy rain and other precipitation at the site, …) should be provided.		<u>X see comments above</u>		

Germany	129	8.11	Item A	(a) Core <u>and/or fuel</u> damage frequencies and their uncertainty distributions;	See comment to 7.4: Hazards PSA are not limited to the reactor but should also include the spent fuel pool (SFP)			<u>X</u>	See comments in chapter 6 and 7 in relation for SFP to Sec. 10
Hungary Attila	38	8.11		The consequences of heavy rain and other flood related hazards, such as water collecting on rooftops and in low lying plant areas, should be included in the scope of the analysis.	The expression “other flooding” seems inappropriate. In paragraph 8.10 “flood related hazards” are used that is proposed to be used in paragraph 8.11 too.		<u>X see comments above</u>		
Germany	104	8.13	and additional new paras after 8.13	The applicable combinations of natural hazards with <u>other internal or external</u> hazards ~~phenomena~~ identified as described in para. 6.11 should be considered <u>in Level 1 PSA for external natural hazards</u> ~~., with account taken of possible dependencies (e.g. severe weather conditions and transportation accidents).~~	Paragraph was made consistent to other hazards in line with Section 6, some general paragraphs as proposed for the natural hazards mentioned above in the comments before should also be added for completeness and consistency.		<u>X see comments above</u>		

Germany	105	8.14		The following sources of human-induced hazards should be considered at a minimum: (a) Fires spreading from ~~nearby plant units or facilities~~ industrial or military facilities or due to a transportation accident in the near vicinity of the site; (b) Explosions of solid substances or gas clouds from ~~nearby~~ industrial or military facilities or due to a transportation or pipeline accident in the near vicinity of the site; (c) Releases of chemical materials from ~~nearby~~ industrial or military facilities or due to a transportation or pipeline accident in the near vicinity of the site; (d) Aircraft crash; (e) Collisions of ships with water intake structures. The following sources could also be considered as human-induced hazards: ~~(f) Missiles from other plants on the site;~~ (~~g~~f) Excavation work outside ~~and inside~~ the site area; (~~h~~g) Electromagnetic interference (e.g. magnetic or electrical fields generated by radar, radio or mobile phones).	Precision and comprehensiveness; the order of the items should be changed to international practice (see new proposal for Annex I by Germany), item (f) must be deleted since it is an internal hazard		X see comments above		

Hungary Attila	39	8.16	lines 1-4	Seismic hazards are characterized by **the** following main parameters [7, 25]:(a) Peak ground motion (e.g. acceleration, velocity, displacement).(b) Frequency content, which is generally represented by spectral accelerations associated with the ground response spectrum. …	It is proposed to add an "and" before the word following, and delete the word "and" from the beginning of (a) and (b) points.	X			
Russia	47	8.16		8.16. Seismic hazards are characterized by following main parameters [7, 25]:(a) The peak ground motion (e.g. acceleration, velocity, displacement).(b) The ~~frequency~~ *energy* content, which is generally represented by spectral accelerations associated with the ground response spectrum *but may also include other intensity measures*When a single parameter is used in a simplified way in Level 1 PSA to characterize seismic damage potential (e.g. peak ground motion acceleration), other parameters should also be considered when specific impacts of seismic hazards are to be assessed, as follows:(a) The ~~frequency~~ *energy* content is essential for the consideration of relay 'chattering' and for determining the response and fragility of structures and components, and stress factors for human errors…	"Energy content" is a more correct term, because apart from PGA, other complementary information may be used in the analysis, such as power spectral density (PSD), CAV (Cumulative absolute velocity) and other intensity measures. (The acceleration time history with the same response spectra may have different PSD and different energy content)	X			

Russia	48	8.18		~~8.17~~ “Vibratory ground motion caused by earthquakes should not be eliminated from consideration…”8.18. “Earthquake ground motion should not be screened out…”	The items 8.17 and 8.18 seem as duplicate	X			
Russia/ SEC NRS	8	8.18		To delete a paragraph	The paragraph is proposed to be deleted as it duplicates a paragraph 8.17.	X			
Germany	106	8.27		The applicable combinations of ~~the~~ human-induced hazards with other internal or external hazards ~~phenomena~~ identified as described in para. 6.11 should ~~also~~ be considered in Level 1 PSA for external natural hazards. ~~with account taken of possible dependencies (e.g. chemical release, wind speed and direction).~~	Paragraph was made consistent to other hazards in line with Section 6, some general paragraphs as proposed for the natural hazards mentioned above in the comments before should also be added for completeness and consistency.		X see comments above		
Canada	64	8.28		Change this sentence as follows:A detailed analysis should be performed for all hazards that for which the bounding or simplified analysis with conservative assumptions has demonstrated that the risk coming from the hazard might be significant.	To improve the clarity.Section 8 uses both “simplified analysis with conservative” for seismic hazard and “bounding analysis for High Winds”.		X modified as follows considering also the comment from Germany:A detailed analysis should be performed for all (single and combined) hazards for which the bounding or simplified analysis with conservative assumptions has demonstrated that the risk from the hazard might be non-negligible		

Germany	107	8.28		A detailed analysis should be performed for all (single and combined) external hazards for which the simplified analysis with conservative assumptions has demonstrated that the risk ~~coming~~ resulting from the hazard might be non-negligible ~~significant~~.	Precision		X modified as follows considering also the comment from CanadaA detailed analysis should be performed for all (single and combined) hazards for which the tbounding or simplified analysis with conservative assumptions has demonstrated that the risk from the hazard might be non-negligible		
Germany	108	8.29		The availability of the Level 1 PSA model for internal initiating events is a prerequisite for carrying out the detailed analysis of the external hazards ~~events~~ PSA.	Terminology, consistency	X			
Hungary Attila	40	8.30	Line 19	The detailed analysis **of internal initiating events and internal hazards** should be based on realistic models and data, including a …	The sentence is related to internal initiating events and internal hazards; however, it is not specified in the text. It is suggested specifying this aspect clearly, as the absence of such a description may be misleading due to the fact that this section is dedicated to external hazards.	X			
Germany	109	8.31		~~While performing detailed analysis, the combined impact of external hazards should be considered when they have a common origin (e.g. high winds, lightning) or other dependencies (e.g. high level water due to precipitation, dam failure).~~	Par. 8.31 should be deleted to be consistent to Sections 6 and 7 regarding combined hazards.	X			
Hungary Attila	41	8.31	Line 3	… (e.g. high **water level** due to precipitation, dam failure).	The correct order of words is high water level, instead of high level water.	X			

ENISS	25	8.35		Analysis of time trends (e.g. variation of meteorological and hydrological parameters in time due to climate change) should be performed to confirm the absence of trends towards increased frequency of the hazards. Should the trends towards significantly increased frequency be confirmed, then, hazards frequencies should be defined to consider climate change over the time period of interest.Recent, short term trends to decreasing hazard frequencies should not be accounted for unless they are well understood as being caused by processes having a non-random nature.	The case when the trend toward increased frequency is confirmed should also be addressed.	X			
Germany	110	8.38		1. ~~When combined unrelated hazards are evaluated, the joint occurrence frequency should consider the individual hazard frequency, the duration of the individual hazards that are combined and the probability of conditions (e.g. seasonality) that allow the hazards to occur simultaneously.~~	Since this aspect is already generally mentioned in Section 6, par. 8.38 should be deleted.	X			
Germany	111	8.39		~~When combined correlated hazards are evaluated, the level of correlation used in the joint occurrence frequency estimate should be justified if full correlation is not assumed.~~	Since this aspect is already generally mentioned in Section 6, par. 8.39 should be deleted.	X			

Germany	112	8.4		When combined consequential hazards are evaluated, a conditional probability of the secondary hazard (e.g. water elevation due to a seismic-induced tsunami) to occur following the primary hazard of specific parameter (e.g. PGA or spectral acceleration for the seismic hazard) should be developed to allow for the quantification of the combined hazard effect.	Since this aspect is already generally mentioned in Section 6, par. 8.40 should be deleted.	X			
Hungary Attila	42	8.41	Line 2	… site specific probabilistic seismic hazard assessment (see Refs [7, 25, 31]).	The correct wording is probabilistic seismic hazard assessment, instead of probabilistic seismic hazards assessment.	X			
Canada	65	8.42		2. This paragraph refer to SSG-9 [23] issued in 2010 before the Fukushima accident. Since that time, several documents have been published providing better methods for the seismic hazard assessment.	Additional references on seismic hazard assessment published after Fukushima should be referenced in this paragraph.			X	SSG-9 (Rev.1) was published in 2022 https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1950_web.pdf
Russia	49	8.42		4. Probabilistic seismic hazard assessment should be conducted in accordance with the recommendations provided *in current release* of SSG-9 [23]	The new release of SSG-9 is coming soon		X see comment before		
USA	1	8.42		3. 8.42. Probabilistic seismic hazard assessment should consider recommendations provided in SSG-9 [23].	Since there may be more recent guidance that has emerged in this area during the last decade, the responsibility should be to consider that guidance.		X see comment before		

Canada	66	8.43		5. After this para, please add a new para as follows:"A reference earthquake (RE) should be selected to represent the fundamental seismic input (demand) for calculating seismic response and fragilities. The reference earthquake ground motion spectrum in a seismic PSA application is referred to the site-specific mean UHRS (Uniform Hazard Response Spectra) shape corresponding to a selected annual frequency of exceedance (AFE)".Related to this new para, also add a footnote: - Reference Earthquake (RE) may be referred to as Review Level Earthquake (RLE) or Seismic Margin Earthquake (SME) in deterministic SMA	To define the Reference Earthquake			X	These details are covered by other set of IAEA Safety Standards
Turkey	23	8.43	All and 8.44/All	It is needed to make clear comment about how far the PSA Model should go further when taking "seismic hazard curve" into consideration in defining the seismic initiated events.	For highly seismic regions, it is not proper to stop seismic initiating event at annual frequency like 10E-05 even 10E-06. One of the agency expert missions, two different correlations were suggested to use in this manner. Multiples of SSE or annual frequency till 10E-06 or 10E-07. It is better if that can be discussed and add one reference sentences including cliff-edge effect consideration.			X	too specific for IAEA Guide

Finland	4	8.44		For the lower bound parameter value for use in the hazard analysis, it should be demonstrated that seismic events with any lower parameter value can cause only insignificant damage to structures and components, including those off the site, such as power lines and pipework carrying hazardous material.	Criteria for seismic hazard should be based only on impact to the plant safety. Criteria should not be based on minor damages off the site.If we develop hazard that cannot cause any damage also off the site, frequency content of the hazard may be focused inaccurately, and it may lead inaccurate results for seismic risk.	X			
USA	3	8.46		8.46. Wind hazard assessment should consider recommendations provided in SSG-18 [24].	Since there may be more recent guidance that has emerged in this area during the last decade, the responsibility should be to consider that guidance.			X	No additional Safety Standards at IAEA
Russia	50	8.47		e.g. from ‘no failure’ to the ‘~~screening limit’~~, *upper-bound hazard parameter* in order to accurately estimate the seismic (wind in 8.47) risk.	The ‘screening limit’ term either requires to be explained as a concept in each case or be replaced				
Canada	67	8.60		Human-induced external hazard assessment should be conducted in accordance with therecommendations provided in ~~NS-G-3.1~~ DS520	DS520 is a new Revision of Safety Guide NS-G-3.1		X Also the list of reference updated		
USA	2	8.60		8.60. Human-induced hazard assessment should consider recommendations provided in NS-G-3.1 [22].	Since there may be more recent guidance that has emerged in this area during the two decades, the responsibility should be to consider that guidance.		X Also the list of reference updated		

Germany	113	8.61	Item (a) (i), last bullet	On the site: — Storehouse (e.g. acids, hydrazine).	This is an internal (onsite) hazard and needs to be deleted here but is considered under internal hazards		X (since human induced hazards are only hazards from outside the plant boundary):Appropriate information (preferably in the form of a database) should be collected and used to support the frequency assessment for specific human induced hazards. This information should include, at a minimum, the following data necessary to support realistic and valid estimations of the frequencies of hazards:Qualitative and quantitative information regarding the composition of hazardous (e.g., combustible, explosive, asphyxiant, toxic, corrosive) material stored (outside the site boundary) within a predetermined radius of the nuclear power plant, as follows:(i) Potential hazard sources (within a predetermined radius of the nuclear power plant) such as :— Oil or gas storage facilities; — Oil or gas transportation lines;— Road transportation of hazardous substances; — Air transportation of hazardous substance;s — Rail transportation of hazardous substances; — Water transportation of hazardous substances; — Other facilities.		
ENISS	26	8.65		If the combined hazards has have similar failure mechanism, the	Editorial correction	X			

				compounded fragility should be considered.					
Russia	51	8.65		8.65. ~~When combined hazards are considered, all the hazards-specific failure mechanisms resulting in SSC failure modes should be added in the Level 1 PSA model.~~ When combined hazards are considered and the impact mechanism of the individual hazards are similar or the same, compounding loading effects from the combined hazards should be considered in the fragility assessment (e.g., added snow load during a seismic or high wind event). If the combined hazards have different failure mechanisms, the failures should be represented by the individual hazard fragilities. If the combined hazard has similar failure mechanism, the compounded fragility should be considered. *See Ref. [] for an example*	Deleted statement seems wrong and generally contradicts the final statement of the para.Please also give reference to *compounded fragility* estimation			X	The proposed sentence is reflecting similar idea, but in more concise and clear manner.

Germany	114	8.67		The seismic equipment list (SEL) should be supplemented by any structure, system or component associated with any combined hazard identified as described in para. 6.11 and retained in the analysis. Depending on the retained combined hazard this may at least include dams, tsunami walls, internal flooding sources or internal fire sources identified systematically. Details on the development of the SEL are provided in [31].	Addition, since the list is not complete	X			

Canada	68	8.68		At the end of this para, add the following:“The walkdown will enable to:- Screen the inherently seismically rugged equipment items from the seismic model,- Identify correlation considerations (e.g., identical equipment with same configuration/orientation/anchorage on same level of same building,- Examine operator response pathways for potential seismic-induced interference,- Identify equipment or structures that are not included in the SEL, butwhose structural failure could potentially impact the nearby SEL items (i.e., seismic interaction concerns),- Address issues of seismic-induced fire and seismic-induced flooding	To list the key insights/results of a seismic walkdown		X, with little editorial modifications:All realistic failure modes of structures and components that interfere with the operability of the equipment during and after an earthquake should be identified through a review of the plant design documents and a plant walkdown. The walkdown will enable to:- Screen the inherently seismically rugged equipment items from the seismic model,- Identify correlation considerations (e.g., identical equipment with same configuration/orientation/anchorage on same level of same building,- Examine operator response pathways for potential seismic induced interference,- Identify equipment or structures that are not included in the SEL, but whose structural failure could potentially impact the nearby SEL items (i.e., seismic interaction concerns),- Address issues of seismic-induced fire and seismic-induced flooding.		
Germany	115	8.68		All realistic failure modes of structures, systems and components that interfere with the operability of the equipment during and after an earthquake should be identified through a review of the plant design documents and a plant walkdown.	Completeness	X			

FRANCE - CEA	107	8.7	Before 8.70	FRAGILITY ANALYSIS FOR STRUCTURES AND COMPONENTS+ reliability of hazard protective provisions ?	One important aspects which it seems not addressed is the reliability of hazard protective provisions (flooding external or internal, fire…). These SSC are in general passives and reliability data are often not available. A paragraph on this subject may be useful.		X, modified;but aspect of reliability of protection features needs further discussion and perhaps to be added by France:FRAGILITY ANALYSIS FOR STRUCTURES, SYSTEMS AND COMPONENT8.xy. The fragility[7] of structures, systems and components should be evaluated using available plant specific information to the extent necessary for the purpose of the analysis (bounding analysis or detailed analysis) and accepted engineering methods. Findings from plant walkdowns should be considered in these analyses.		
Russia	52	8.7		"The limiting fragility for a component ~~should be~~ *may be* used as a surrogate for the fragility associated with the fire ignition failure mode. Conditional ignition probabilities should be used to relate the functional failure to the fire ignition"	If any data is available there is no need for 'surrogate' fragility. The concept of 'surrogate' for the fragility should be referenced			X	probably a misunderstanding
Germany	116	8.72		The potential for seismic interaction (e.g. possibility that structures, systems or components could fall on to a seismic equipment list item), including the potential for additional interactions with fires and floods should also be included in the focus of the walkdown.	Editorial	X			

Russia	54	8.73	8.77	8.73 Calculations of parameters relating to seismic fragility (e.g. median seismic capacity of structures and its variability) should be based on plant specific data…8.77 ~~For all structures and components that appear in dominant accident sequences, it should be ensured that the associated site specific fragility parameters are derived on the basis of plant specific information.~~	In both cases plant specific data are required, so paras seem to be duplicated.			X	Misunderstanding, the texts are different in their meaning
Germany	117	8.74		When structures, systems and components of a low fragility …	Completeness	X			
Germany	118	8.75		The seismic responses of structures, systems and components at their failure level …	Completeness	X			
Germany	119	8.76	Line 2	… for the responses of structures, systems and components located in different buildings.	Completeness	X			
Russia	53	8.76		Uncertainties in the input ground motion and structural and soil properties should be taken into account ~~in developing joint probability distributions for the responses of structures and components located in different buildings.~~	Specific details are more appropriate for a specific guide or TecDoc, otherwise more details are required			X	That level of detail is not too much, but provides guidance

Canada	69	8.77		After this para, add the following new para:"For structures that are not founded on rock, Soil Structure Interaction Analysis (SSI) including the embedment effect and ground motion incoherence (GMI) function are required. Even for structures that are founded on rock, performance of SSI analyses with consideration of ground motion incoherence will have the benefit of computing realistic seismic response and potentially lowering the response spectra peaks in the high frequency range, which are expected to arise due to the high frequency content of the UHRS (Uniform Hazard Response Spectra)."	To identify the need for SSI analysis for structures not founded on rock	X			
Canada	70	8.8		"…In this assessment, findings from plant walkdowns should be used as an important source of information, e.g. justification of any modelling parameters".	To provide further insight/results of walkdown	X			
Germany	120	8.80		In evaluating wind related fragilities of structures, systems and components, …	Completeness	X			
Germany	121	8.81		A family of fragility curves corresponding to a particular failure mode for each structure, system or component … in median capacity of structures, systems or components.	Completeness	X			

Germany	122	8.83		In evaluation of fragilities of structures, systems and components in respect …p	Completeness	X			
Germany	123	8.84		The fragility analysis should include immersion, dynamic loads on structures, systems and components from …	Completeness	X			
Germany	124	8.86		The general aspects and recommendations for the fragility analysis of ~~seismic hazards, high winds and external floods~~ natural hazards should be followed for human-induced hazards as applicable.	More general wording		X modified as followa:The general aspects and recommendations for the fragility analysis of seismic, hydrological and meteorological hazards should be followed for other natural hazards as applicable.		
Germany	125	8.87	Line 6	… which could lead directly to core and/or fuel damage …	Addition, see comment to 7.4: Hazards PSA are not limited to the reactor but should also include the spent fuel pool (SFP).			X	
Canada	71	8.89			This paragraph should also mention the assessment of HFEs related to deployment of portable (mobile) equipment since this an important aspects of hazards HRA.		X, France and Canada should provide a paragraph		
FRANCE - CEA	108	8.89		One of the most important aspects for hazards HRA is the evaluation of HEP related to set-up of (mobile) protections for predictable hazards. There is no really an available method. A paragraph on this subject may be useful (to provide some advice).			X, France and Canada should provide a paragraph		

ENISS	27	8.89	(a)	In this case, it should be checked whether there is a need to revise the assessment of performance shaping factors due to the possibility that it might be ~~harder~~ more difficult for operating personnel to implement actions than in the base case.	Editorial correction		X, modified to "challenging		
Germany	126	8.99	Item list	(a) Accessibility of plant locations where actions need to be taken by personnel to ensure the required safety functions or to rescue humans ~~Availability of pathways to specific SSCs~~ after a seismic event; ((b) Increased stress levels; (c) Failures of indication or false indications; (d) Failure of communication systems; (e) ~~Scenarios with consequential fire and flood;~~ (f) Other applicable factors impacting the behaviour of operating personnel.	Consistency to other hazards in Section 7	X			

FRANCE - CEA	109	9		**LEVEL 1 PSA FOR SHUTDOWN STATES**	Why is this chapter separate from at Power PSA? Most of the aspects are common, with some specificities. Suggest to group in the same chapter and to indicate only the specific points for SD PSA. (note: in section 9 some of the texts are more complete that in chapter 5, for example 9.27, HRA part, data part…)			X	This separation was initially captured in the previous version of this guide. If the reader is interested in the specifics of LPSD PSA, he/she will try to look for the information in this Section, rather than reading through Section 5 and collecting the LPSD specific concerns. The same philosophy has been retained to present SFP PSA and MUPSA. Moreover, it was not in the scope of this SSG-3 update to perform such structural changes, just to focus the upgrade on some designated analysis areas.
Libya	11	9		It is estimated that revision of the Guide by the amendment would involve approximately 25 weeks of effort by experts.	Improved clarity/grammar.			X	The message of the comment appears to concern the DPP rather than the document itself.
Canada	73	9.04	(b)	With respect to this bullet, add the following footnote:“The list of potential configurations should consider all standard planned shutdown evolutions, standard power manoeuvres, and standard start-up conditions of the reactors”.	To provide direction for considering various plant configurations.		“All standard planned shutdown and startup conditions are generally considered among the different plant configurations.”		The proposal was accepted with some slight rewording to enhance understandability of the message. Standard power maneuvers were left out from the sentence as it is not state-of-practice to consider load following mode among planned outages.
Canada	74	9.08		In addition to the bullets included in this para, include the following bullet:"power dependent process parameters (e.g., pressurizer level and steam generator level)”;	To complement the existing list of physical and technical aspects of the plant for grouping of the similar states to reduce them to a manageable size for analysis.		“(d) Other relevant power dependent parameters, e.g. pressurizer level, water level in the primary system, steam generator level;”		The suggested new bullet would have largely overlapped with the original point (d), so they were merged. Moreover, parameters under bullets (a) to (c) may also be power dependent parameters, so the wording was slightly modified accordingly.

Russia	55	9.13		9.13 … In most cases, a Level 1 PSA for shutdown states considers the events that can lead to the following ~~end states~~ <u>*consequences:*</u>	Listed items below are not end states. An end state is a core damage.			X	We suggest retaining the original wording to ensure consistency with other parts of the document where end states are used to describe the consequences of accident sequences modelled in PSA.
Czech Republic, UJV Rez Stanislav Hustak	5	9.20		Add a new para. after para. 9.20:**The screening of initiating events in shutdown states should not consider the fraction of duration of plant operating states, which can be very low in some plant operating states, if the Level 1 PSA is to be used for a risk monitor application.**	The statement in para. 5.33 "... If screening is performed, it may still need to be revisited for specific PSA applications" seems to be too vague in order to assure that initiating events in shutdown states are not screened out just because of the very low fraction of plant operating state (POS) duration (the contribution to the risk profile can be high in some cases when the fraction of POS duration is removed).		"If some initiating events are screened out of further analysis due to low occurrence frequency attributable to the low fraction of duration of relevant plant operating states, then this assumption should be re-visited and justified in case using the Level 1 PSA for risk monitor application."		The proposal was accepted with some slight rewording to enhance understandability of the message.
Libya	12	9.31	No. SSG-3	The cooling system of spent fuel pool separated from the reactor core cooling system	Improved clarity			X	Comment is not clear

FRANCE - CEA	110	9.41	to 9.50	HRA for LPSD	It's confusing to develop a special section about HRA for LPSD.There are no real differences from HRA for full power (same methodology, same practice).If writers need to highlight particular aspects of LPSD (they should be few) it's possible to add comments in part 5.99 – 5.121).			X	These paragraphs try to capture the specifics of HRA for LPSD conditions. If the reader is interested in the specifics of HRA for LPSD, he/she will try to look for the information in this Section, rather than reading through 5.99-5.121 and collecting the LPSD specific concerns. In our point of view it is seen necessary to highlight the most important aspects of HRA for LPSD in this Section too. Moreover, it was not in the scope of this SSG-3 renewal to perform such structural changes, just to focus the upgrade on some designated analysis areas.
FRANCE - CEA	111	9.41		The analysis of human failure events during shutdown is complex. Therefore, human reliability analysis should be performed in a structured and logical manner.	It's also the case for full power.It should be better to identify differences.			X	In our view such a general statement in the first paragraph of a new Section is acceptable, to give a meaningful introduction. We suggest not deleting such a general (but important) concern.
UK	7	9.42	1	Typical aspects ~~conditions~~…	Grammar.	X			
FRANCE - CEA	112	9.48		Care should be taken that values generated by the use of time reliability correlations specific to power operation are not uncritically accepted, since the time windows in shutdown states may be well outside the applicable ranges of such correlations.	Generally time reliability correlations established from simulations at full power are not applicable for LPSD.		"Values generated by the use of time reliability correlations specific to power operation should be adopted with caution, since the time windows in shutdown states may be well outside the applicable ranges of such correlations."		In our understanding the text does not contradict to the comment; however, the paragraph was rephrased not to be misleading and to better reflect the message of the reviewer too.

Canada	75	9.51	(f)	With respect to this bullet, add a footnote as follows:“Maintenance and testing activities require review for the different configurations; while certain activities may be applicable throughout the outage, there may be activities which only apply to certain configurations. Also, maintenance and testing frequency may change depending on the given configuration.”	To point out that consideration of plant configuration is required in crediting maintenance/testing activities.		“9.53. Data assessment in relation to maintenance and testing activities should be reviewed for the different configurations; while certain activities may be applicable throughout the outage, there may be activities which only apply to certain configurations. Also, maintenance and testing frequency may change depending on the given configuration.”		We suggest adding a new Para, as opposed to putting the proposed text into a footnote. The proposal was accepted with some slight rewording.
UK	8	9.59		Add to the end of 9.59:However, the use of alternate methods should be justified and balanced against the usability of the tools, the meaningfulness of the results and the ability to substantiate the actions being claimed.	Supplementary text to expand the expectations in cases where alternative techniques are used.			X	According to the proposed new text, many things should be justified and evaluated, when alternate methods are applied. Such justifications and evaluations are not required to be carried out, when the “traditional” method is used. In our view the guide should not put more burden on those who wish to use alternate methods (in many cases leading to more realistic results) than to those using traditional methods, in order not to discourage them to use alternate techniques.

China	2	10	SPECIFICS OF LEVEL 1 PSA FOR THE SPENT FUEL POOL	-	It is suggested that the mission time (24h, 72h or longer time) of PSA for spent fuel pool should be confirmed considering that the some accident progression of spent fuel pool is slow and some spent fuel pool locates outside containment			X	Paragraph 10.15 addresses the main aspects of mission time definition for SFP PSA. The text in the "Reason" column does not contradict to the message of paragraph 10.15. Moreover, there is no proposed text that could be utilized to refine wording.
Russia	56	10.04		10.4. *For simplicity* beyond fuel damage, fuel uncovery and boiling of the pool water (e.g. for spent fuel pools located outside the containment) should also be considered in the identification process as a potential undesired end state. *However, when Level-1 PSA results are used as an input to Level-2 PSA this simplification should be removed.*	This para gives wrong impression that end states can be other than fuel damage beyond design limits.			X	According to the text, fuel uncovery and boiling of the pool water are only additional end states to fuel damage, hence fuel damage cannot be exchanged by these two end states, fuel damage frequency should be assessed (see also paragraph 10.3).
FRANCE - CEA	113	10.05		In lack of detailed thermohydraulic analyses, fuel uncovery (i.e. when the water level in the spent fuel pool drops below the top of the active part of the fuel assemblies stored in SFP of under handling as a result of boiling or draining) may also be applied as a criterion to assume fuel damage.			"In lack of detailed thermohydraulic analyses, fuel uncovery (i.e. when the water level in the spent fuel pool drops below the top of the active part of the fuel assemblies stored or handled in the spent fuel pool as a result of boiling or draining) may also be applied as a criterion to assume fuel damage."		The proposal was accepted with some slight rewording.

Belgium FANC/Bel V	1	10.08	(d)	No proposal. See "Reason"	The text referring to "lower part" and "upper part" of the pool and to "one layer" and "two layers" is not clear to us. Please clarify.		"(d) The storage position of fuel assemblies in the spent fuel pool (e.g. all fuel assemblies are stored in the rack at the lower part of the pool or a lower rack and an upper rack are also applied, as relevant to the design);"		For a number of SFP designs there is a possibility to store fuel assemblies in two zones in the SFP including a lower rack and an upper rack. These two rack levels were referred to as two layers in this paragraph. The text has been modified to avoid confusion over the meaning of layers. Also the following explanation has been added: "as relevant to the design".
Russia	57	10.08		10.8 …~~(g) The time for recovery actions and repairs to be credited; (h) Differences in potential initiating events in different fuel storage configurations and the associated fuel manipulations, as necessary.~~	These items are not related to the task. Opposite g) and h) should be performed based on the results of this task.			X	PSA is an iterative process, i.e. when (1) the potential recovery actions and repairs; and (2) differences in potential initiating events in different fuel storage configurations and associated fuel manipulations are determined, the POS definition should be reviewed and refined considering the calculated values. Moreover, bullet (g) was revised and reworded as follows: "The potential recovery actions and repairs;"
Canada	76	10.09		(f) Initiating events induced by internal hazards that may lead to loss of the spent fuel pool heat removal system (including pipe ruptures as sources of internal flooding in systems other than the heat removal circuit), <u>loss of spent fuel pool inventory</u> or falling of objects onto the fuel assemblies in the spent fuel pool originated by lifting activities;	Completeness and consistency with bullet (g) of that same paragraph. Internal hazards might lead to a loss of spent fuel pool inventory, not just to a loss of spent fuel pool cooling.	X			

Czech Republic, UJV Rez Stanislav Hustak	6	10.09		Add a new para. before para. 10.9:**The starting point of the Level 1 PSA for spent fuel pool is the identification of the set of initiating events. An initiating event for spent fuel pool is an event that could lead directly to fuel damage in spent fuel pool or that challenges normal operation of spent fuel pool, and which necessitates successful mitigation using safety or non-safety systems to prevent fuel damage in spent fuel pool.**	A definition of the initiating event (IE) analogous to one specified in para 5.11, which would be applicable for spent fuel pool (SFP), is missing in Section 10. Although it is stated in para 10.1 that "the general process for the reactor should be adopted for the spent fuel pool", the basic definitions should be specified explicitly for SFP as well (because they are definitions). However, the definition of IE in para. 5.11 is related only to core damage. The definition of the IE is the very basis for IE analysis, and this is valid for IE analysis for SFP operation as well.The alternative solution is to use the more general definition of the IE either somewhere in SSG-3 or in IAEA Safety Glossary as specified in the following comment No. 8.			X	The intention with Section 10 was not to repeat information that can be adopted from the reactor PSA to the SFP PSA self-evidently and in a straightforward manner. This includes definitions too, if the adaption does not require a substantial change in the original understanding. The proposed definition would not give valuable information to the text of Section 10, hence it is not supported to introduce it into Section 10 of the document.
Czech Republic, UJV Rez Stanislav Hustak	7	10.09		...(f) ~~Internal~~ **Initiating** events induced by external hazards that may lead to loss of spent fuel pool heat removal**, loss of spent fuel pool inventory** or falling of objects onto the fuel assemblies in the spent fuel pool due to hazard induced structural failure.	See item (e) for the use of the term initiating events instead of the term internal events. Some external hazards (seismic event) can cause also loss of spent fuel pool integrity.			X	Item (g) of paragraph 10.9 is identical to the proposed text, hence no further text modification is required.

Finland	5	10.09	(b)	Loss of coolant (pipe rupture in the spent fuel pool heat removal circuit. Siphon should also be considered);	Fuel uncovery is possible in case of pipe rupture and siphon break failure		10.13 "The failure (including the break) of siphons should also be considered in accident sequence analysis for loss of coolant initiating events."		Paragraph 10.13 was complemented by referring to siphon failures, since siphon break should be considered in accident sequence analysis as part of accident mitigation system failures, not as an initiating event.
FRANCE - CEA	114	10.09		(d) Inadvertent draining (due to erroneous human intervention or break/leak of SFP connected circuits);				X	Pipe rupture in the spent fuel pool heat removal circuit is addressed in bullet (b). Bullet (d) is dedicated to erroneous human interventions, as the mitigation thereof needs a different approach.
China	7	10.11		Delete "recovery from pipe rupture and"	In the mission time for Spent fuel pool Level 1 PSA, generally the time window is not enough for staff to recovery from the pipe rupture.			X	Longer time window, i.e. longer mission time is applicable to the SFP than to the reactor, hence recovery from pipe ruptures may be credited in the SFP PSA. Moreover, the text does not state that recovery from pipe rupture should be considered in the PSA model. It only claims that specific characteristics should be considered in the assessment. If these specific characteristics imply that credit cannot be given to timely recovery, then such recovery action should not be considered in the assessment.

Czech Republic, UJV Rez Stanislav Hustak	9	10.12		Potential dependencies between Level 1 PSA for the reactor core and Level 1 PSA for the spent fuel pool should be considered, with respect to shared mitigating systems, **or shared components or resources for mitigating systems,** in the case of common initiating events.	The common recourses (water) usable to mitigate accident affecting both reactor core and fuel in spent fuel pool (SFP), when those common resources are utilized by the different systems (one system is dedicated for the reactor core and the other for SFP), need not to be always understood as the “shared systems” (only tanks can be shared).As an illustrative example, ECCS uses water from ECCS tanks to mitigate accidents affecting reactor while ECCS tank drain pumps can be used to makeup SFP. When ECCS tank drainage pumps are credited in an accident scenario to mitigate the accident affecting SFP, it should be checked whether the water in ECCS tanks would be available for SFP makeup in this accident scenario when the accident affects both reactor core and SFP.		“Potential dependencies between Level 1 PSA for the reactor core and Level 1 PSA for the spent fuel pool should be considered, with respect to shared components or resources of credited systems (including water inventories) and shared human resources in the case of common initiating events.”		The proposal was accepted with some slight rewording.
Hungary Attila	43	10.12	Line 3-5	… resources in the case of common initiating events. **Interactions between the SFP and the reactor core** should also be considered, for example flooding effects, structural loads due to external hazards or other phenomena, draining events when SFP and reactor are connected etc.	The original wording “Consequential effects between SFP and reactor PSA” seems misleading. How can consequential effects between PSAs be interpreted? It is proposed to modify “Consequential effects” to “Interactions” and not to relate to PSAs, but the facilities themselves.	X			

Russia/ SEC NRS	9	10.14		To reword	The paragraph says: *"The accident sequence analysis should consider that boiling can cause pump cavitation which may prevent successful restart of the cooling system(s) and/or may disable local actions due to degraded ambient environmental conditions in the vicinity of the spent fuel pool".* In this case, it is not clear what kind of local impact we are talking about. Item should be reworded.		10.14. The accident sequence analysis should consider that boiling can cause pump cavitation which may prevent successful restart of the cooling system(s) and/or may disable local actions due to degraded ambient environmental conditions (including air temperature and radiation level) in the vicinity of the spent fuel pool.		The text was complemented in line with the comment.
Russia	58	10.15		10.15. For some spent fuel pool accident sequences, slow accident progression due to the large water inventory and low power level should be considered to define the ~~sequence mission~~ time *to fuel damage*, which can then be relatively long and allows reliable recovery actions and repair activity. ~~Termination of the analysis at a fixed pre-defined sequence mission time may prevent meaningful results from being obtained.~~	This is not the mission time we need to define.			X	According to paragraph 5.45, "For sequences ending in a safe stable state, the accident sequence analysis should be pursued over a time period, ended with the sequence mission time, that will allow for considering the effect of long term measures to be put in place to ensure that the risk estimate beyond the sequence mission time is negligible and that possible cliff-edge effects are appropriately captured." Paragraph 10.15 is aimed at addressing the SFP specific aspects to be considered when defining the sequence mission time (it does not state that it should be equal to time to fuel damage). The original wording of paragraph 10.15 was in line with the definition in 5.45, hence the text does not need to be modified.

Egypt	24	10.16		..... the participation of multiple factors in the process of	Editorial			X	“Actors” is not a typo in this paragraph, since it refers to (multiple) participants.
FRANCE - CEA	115	10.16		The SFP HRA has to consider the accessibility to perform the local actions (in general the make-up set-up is a local action as well as the reparations). Some specific human actions are needed to ensure this accessibility and shall be studied by the HRA. These aspects may be mentioned.				X	This aspect does not seem to be SFP specific, it needs similar treatment in the reactor PSA and in the SFP PSA. Although important, in our understanding it is not something that should be highlighted specifically for the SFP PSA, this aspect is addressed in the general HRA part.
Hungary Attila	44	10.16	Line 2-3	… makes possible the participation of multiple actors in the process of diagnosis, decision-making as well as in the execution of recovery actions and repair activity. This should be …	There was a typo: “and as well as”. We suggest deleting the word “and”.	X			
Russia/ SEC NRS	10	10.18		To clarify	The paragraph says:“…the aggravating effects of the increased workload due to mitigating concurrent accidents simultaneously should be considered when assessing the relevant human error probabilities “. This phrase requires clarification, since it is not clear how the workload increases due to the mitigation of the consequences of coincidental accidents.		Potential dependencies between human actions to prevent undesired end states for the spent fuel pool as well as for the reactor core should be considered. In addition, the aggravating effects of the increased workload due to mitigating concurrent accidents simultaneously by the same operators should be considered when assessing the relevant human error probabilities.		If the same operators and staff members try to mitigate the accident in the reactor core and in the SFP then it may be more challenging than when only the SFP accident should be mitigated. The text was complemented by the following: ”by the same operators” to clarify the issue.
China	5	11	LEVEL 1 MULTI-UNIT PSA	Publication of supporting guidelines for LEVEL 1 MULTI-UNIT PSA.	There are no practical experience or consensus treatment for LEVEL 1 MULTI-UNIT PSA.			X	This safety guide provides as recommendations but not as requirements. Developer can implement its approach in development of PSA. However multi-unit analysis is normal practice in current status of PSA

Hungary Attila	45	11.02		**MUPSA model is typically developed based on single unit PSA models, and takes into account the specifics of each unit under consideration.**	**Please correct “take” as “takes”.**	X			
Canada	77	11.04	Footnote 41	“Depending ~~of~~ on the scope of the PSA...”	Editorial change	X			
Hungary Attila	46	11.04		**The scope of MUPSA should include all risk-significant multi-unit initiating events and hazards, as well as all plant operating states, which can be identified from the review of single unit PSA results. For the purpose of determining the scope of a MUPSA, a screening approach may be adopted based on reviewing single unit PSA results, if necessary[41].**	**MUPSA should focus on multi-unit initiating events and hazards, instead of focusing on all initiating events and hazards (see paragraph 1.11 and footnote 42 too). It is proposed to address this distinction in this paragraph too.**	X			
Czech Republic, UJV Rez Stanislav Hustak	10	11.05		**(a) Single unit core damage frequency: frequency per site-year of an accident involving core damage on one and only one reactor on a multi-unit site;(b) Multiunit core damage frequency: frequency per site-year of an accident involving core damage on two or more reactors on a multi-unit site;(c) Site core damage frequency: frequency per site-year of an accident involving core damage on one or more reactors;(d) Multi-source fuel damage frequency: the frequency per site-year of an**	**Editorial corrections, see definition of risk metrics in items (a) to (c).**	X			

				accident involving fuel damage from two or more sources (i.e. reactor core, spent fuel pool) on a multi-unit site					
Germany	130	11.05	Item B	Multi-unit..	**Editorial**	X			
Germany	131	11.05	Item D	Multi-~~S~~source ~~F~~fuel ~~D~~damage ~~F~~frequency:	**Editorial**	X			
China	8	11.09		For a MUPSA, the probability or fraction of time that is spent in each modelled combination of plant operating state for each reactor unit or each source should be estimated.	**Base on the MUPSA, reactor core and SFP should be considered at least. In order to clarify this situation preciseness and clearly, it is better to modify the sentence.**			X	This document focuses on only reactor and SFP. Other sources like dry-storage or waste treatment buildings are out of scope. And the explanation will be included in the document.
Ukranie	1	11.10		Term “a significant contribution” needs to be quantified.	Quantifiable metrics are required for the screening process in the MUPSA analysis to work. Similarly to how it’s defined in the internal events level 1 PSA section of this document with the cut-off value of 10-E7 used for the screening of IE’s purposes.			X	This guide is not provided any recommended numbers

Hungary Attila	47	11.12	The table from MS said 1.12, I think they meant 11.12	For single unit PSAs, frequencies are estimated on a reactor calendar year basis, whereas for MUPSAs, frequencies are estimated on a site calendar year basis.	The following sentence is hardly understandable: “For a MUPSA, hazard event frequencies that are dependent on the combination of plant operating states should be calculated, taking into account the probability of the combination.” Does it relate to the same aspects that are addressed in paragraph 11.9? Please either remove the sentence, or try to make the message clearer as it is hardly understandable in its present form.		X Yes the first sentence is related to para 11.9. 11.9 asks to estimate this fraction and then 11.12 recomends to use that estimate when calculating the frequencies. Clarification is added as follows: For a MUPSA, hazard event frequencies that are dependent on the combination of plant operating states should be calculated, taking into account the probability of the combination (see also the recomendation in 11.9).		

Czech Republic, UJV Rez Stanislav Hustak	11	11.12		For a MUPSA, ~~hazard~~ **initiating** event frequencies that are dependent on the combination of plant operating states should be calculated, taking into account the probability of the combination. For single unit PSAs, ~~frequencies~~ **probabilities of plant operating state occurrence** are estimated on a reactor calendar year basis, whereas for MUPSAs, ~~frequencies~~ **probabilities of occurrence of plant operating state combination** are estimated on a ~~site~~ calendar year basis **for the scope of units subject to MUPSA (whole site, twin unit).**	**The term “hazard event” is not used in SSG-3.The second sentence is misleading. It is not clear, to which aspect the terms “on a reactor calendar year basis” and “on a site calendar year basis” are related. Based on the first sentence it is assumed that those terms are related to estimation of probability of occurrence of plant operating state (POS) combinations, not generally to initiating event (IE) frequency estimation.Moreover, the second sentence does not fit to MUPSA, in which MUCDF is calculated for concurrent core damage just for the selected units in a multiunit site (e.g. for two units in a twin-unit in a site with two or more twin-units).Note 1: Calculation of MUCDF just for a twin-unit in a site with two twin-units (e,g. Dukovany NPP or Paks NPP) can be useful as well, since units in the twin-unit can be cross-connected with many shared systems and can share the common buildings with safety systems (it is important for hazard estimation).Note 2: If cumulative reactor years or cumulative site years to determine initiating event (IE) frequency are meant, then even for single unit PSAs some frequencies of IEs (or hazards) are estimated using the applicable cumulative years for the site regardless the**	X			

					number of units in the site. Examples are frequencies of LOOP and external hazards (e.g. seismic, high wind).				

Russia	59	11.12		11.12. For a MUPSA, hazard event frequencies that are dependent on the combination of plant operating states should be calculated, taking into account the probability of the combination. ~~For single unit PSAs, frequencies are estimated on a reactor calendar year basis, whereas for MUPSAs, frequencies are estimated on a site calendar year basis~~	Removed text is ambiguous. It is not clear what the difference should be.	X			
India	3	11.13	11.15	Suggestion:Examples on consideration of shared SSCs for Initiating event frequency estimation and unavailability of shared safety system among multiple units may be elaborated.	It may be noted that at multiple places, guidance on 'shared systems' are included in safety standard (para 12.13, 12.64, 12.76, and 12.114) and MUPSA model is referred. Guidance on modeling of shared SSCs will be useful.			X	Examples are provided in IAEA technical reports on MUPSA in reference section.
Belgium FANC/Bel V	2	11.14		**The availability of ~~a~~ shared SSCs or resources …**	**Typographical correction (delete " a ")**	X			
Germany	132	11.14		**The availability of ~~a~~ shared SSCs …**	**Editorial**	X			
Hungary Attila	48	11.14		**The availability of shared SSCs or resources to each unit during accidents involving multiple units should be taken into account.**	**In the original text there was an unnecessary "a" in front of "shared SSCs" that should be deleted.**	X			
Germany	133	11.16		**Functional and spatial dependencies between SSCs of different units and/or sources collocated at the ~~on~~ site (e.g. fire main ring) should be considered in MUPSA system analysis.**	**In this context, see the example in parenthesis, it is more than MUPSA, there are SSCS which are shared also with non-reactor sources!**			X	This document focuses on only reactor and SFP. Other sources like dry-storage or waste treatment buildings are out of scope. And the explanation will be included in the document.

Germany	134	11.17		**For multi-unit initiating events and/or accident sequences, human actions (e.g. by the fire brigade) associated with the need to manage multiple reactor units and/or sources should be considered.**	**In this context, see the example in parenthesis, it is more than MUPSA, there are human resources which are shared also with non-reactor sources**			X	This document focuses on only reactor and SFP. Other sources like dry-storage or waste treatment buildings are out of scope. And the explanation will be included in the document.
Germany	135	11.18		**Human reliability analysis methods used in MUPSA should take into consideration the contextual characteristics of multiple units and/or sources such as increased stress due to site level accident conditions, shared human resources, working in the shared control rooms (when applicable), and the interaction of units with a common technical support centre.**	**In this context, it is more than MUPSA, there are human resources which are shared also with non-reactor sources**			X	This document focuses on only reactor and SFP. Other sources like dry-storage or waste treatment buildings are out of scope. And the explanation will be included in the document.
Germany	136	11.19		**The potential for dependencies between actions by operating personnel in different units and/or sources should be considered.**	**In this context, it is more than MUPSA, there are human resources which are shared also with non-reactor sources**			X	This document focuses on only reactor and SFP. Other sources like dry-storage or waste treatment buildings are out of scope. And the explanation will be included in the document.
Germany	137	11.2		In the event ~~case~~ of an accident on one or more units and/or sources collocated at the ~~on~~ site simultaneously, the adverse effects on the control and accident management on the other units and/or sources should be considered, taking into account the factors connected with severe accidents at other units and/or sources at the	In this context, it is more than MUPSA, there are accident management measures which are shared also with non-reactor sources			X	This document focuses on only reactor and SFP. Other sources like dry-storage or waste treatment buildings are out of scope. And the explanation will be included in the document.

				site (e.g. radiological release, hydrogen detonation).					
Hungary Attila	49	12.07	line 3	… significance of the contributions from the various types of accident initiator (internal initiating events, **internal hazards and external hazards**) and plant operating states to the PSA results. …	Internal hazards and external hazards are proposed to be used in general, since hazards other than internal fires, internal floods and earthquakes may be modelled in detail in the plant PSA.	X			
Hungary Attila	70	12.101	Line 1	When risk **based** safety performance indicators are established and agreed upon …	The terminology "risk based" is used throughout this part, instead of risk informed.	X			
Hungary Attila	71	12.105	Line 2	… as 'direct events') and may be carried out for events at other plants ('transposed events'). PSA based event analysis …	Analysing transported events is rather a possibility than a need/must in PSA based event analysis.			X	PSA based event analysis should consider events that occurred at other plants, in addition to events that occurred on the plant, provided that these events are also relevant for the plant considered. Proposal: *"… as 'direct events') and may be carried out for relevant events at other plants ('transposed events'). PSA based event analysis …"*

Hungary Attila	72	12.105	Suppleme nt to 12.105	… **In the PSA based event analysis known adverse occurrences (e.g. one or more initiating event or unavailability) should be modelled by TRUE events or changing failure probability thereof, while known successes (equipment known operable or operator actions taken) should not be taken into account, instead nominal probability values should be kept therefor.**	This aspect should be highlighted in order to avoid trivialities, e.g. no core damage occurred, so CCDP=.		Addressed by adding the following paragraph: *"When conducting PSA based event analysis, known adverse occurrences should be modelled setting to TRUE associated basic events, whereas known success occurrences should be modelled keeping associated basic events to their nominal probability."*		
Czech Republic, UJV Rez Stanislav Hustak	13	12.106		PSA based event analysis should be carried out for events at the plant (referred to as 'direct events') and events at other plants ('transposed events'). PSA based event analysis should include the analysis of initiating events ~~(where an initiating event actually occurred and where failures occurred, but where initiating event was prevented by prompt intervention by operating personnel)~~ and of conditional events (where the likelihood of an initiating event was increased or the availability of the mitigating systems required to respond to initiating events was reduced).	IE should be a subject of event analysis even when a prompt operator intervention was not done. Moreover, when IE has already occurred it means that it was not already prevented.	X			

Czech Republic, UJV Rez Stanislav Hustak	14	12.107		If the event in question is an initiating event, the living Level 1 PSA model should be used to estimate the conditional core or fuel damage ~~frequency~~ **probability**.	When an IE occurs, the failure of plant response is measured by probability.	X			
Egypt	27	12.107		taking into account	Editorial	X			
Hungary Attila	73	12.107	Lines 3 and 4	… conditional core damage **probability** or fuel damage **probability** taking **into** account the unavailability of the affected SSCs (e.g. using the risk monitor) **and the duration of the unavailability**.	For condition type events usually the increase in core damage probability is calculated that is the increase in CDF multiplied by the duration of the condition (unavailability). Moreover "taking into account" should be used instead of "taking in to account", and in the original version there was an unnecessary space before the full stop.		*"but is not an initiating event, the PSA model is used to calculate the conditional core or fuel damage probability taking into account the unavailability of the affected SSCs and its duration (e.g. using the risk monitor)."*		
Hungary Attila	74	12.11	lines 6	… for initiating events and the increase in core damage frequency or fuel damage frequency **over the duration of the unavailability, thus increase in core or fuel damage probability** for …	For condition type events usually the increase in core damage probability is calculated, that is the increase in CDF multiplied by the duration of the condition (unavailability).		*"The results necessary for comparison are typically the conditional core or fuel damage probabilities."*		
ENISS	30	12.115		Changes in risk metrics are used to evaluate possible changes to regulatory requirements needed to implement the risk management strategy.	Editorial correction	X			
ENISS	31	12.116		Missing linespacing between 12.115 and 12.116.	Editorial correction	X			
Belgium FANC/Bel V	9	12.119		The scope and level of details of the PSA should **be** commensurate with …	Typographical correction (missing word)	X			

Belgium FANC/Bel V	10	12.134		… and to develop (for plants under designs) or improve …	Typographical correction	X			
Canada	78	12.18		Either add the following information as new paragraphs, or add footnotes related to the para 12.18:"The cliff-edge effects may be tested in the analysis results in the form of a sensitivity study by varying a set of analysis assumptions that have the potential to be risk significant. The following factors should be considered as candidates for cliff edge effects:The following factors should be considered as candidates for cliff-edge effects:the magnitude of internal and external hazards, including hazards screened out)cutsets where the sequence is dominated by a single component or human action;c) Variations in the setpoint of poised functions; Note: For example, in the thermal-hydraulic analysis of a BDBA, a small variation in the setpoint of a relief valve might result in the failure of a pressure vessel and so significantly change the outcome of a BDBA sequence.d) The failure of passive SSCs due to small increases in a hazard; Note: For example, the failure of a flood protection barrier if the magnitude of the flood	The added information will provide guidance for a systematic approach for evaluation of cliff-edge effects and balanced design		The proposal is included in para 12.18 adding the following sentence: *"The cliff-edge effects should be tested in the analysis results in the form of sensitivity studies by varying a set of analysis input data that have the potential to be risk significant.*"The proposal to list possible parameters that may cause cliff-edge effects is not retained. We remind that sensitivities on thermal-hydraulic support studies input parameters are described in more details in SSG-2 Rev.1 guide.	X	Recommendation 12.26 is already addressing analysis to assess the balance of the design : *"The contributions to the core damage frequency or fuel damage frequency from individual groups of initiating events and contribution of minimal cutsets to core damage frequency or fuel damage frequency for individual groups should be used to determine whether the design of the plant is balanced in that no particular group of initiating events and no particular accident sequence within the group makes an unduly large contribution to the core or fuel damage frequency."*We believe that the choice of the technical method and tools to be used should be left open. In addition, in our understanding, your proposal to use Error Factor is to be used to deal with uncertainty analysis rather than analysis of the balance of the design.

				is increased by a small amount.e) Data assumptions used in the thermal-hydraulic analysis of BDBA sequences; andf) Changes in accident phenomenology.Note: For example, a small change in accident phenomenology could convert an inert atmosphere to an explosive atmosphere.-------------------------Balanced design may be assessed by uncertainty analysis to demonstrate that dominant contributors to severe core damage (SCD) risk do not havesignificant uncertainty by assessing that the SCDF error factor is less than 3. using the following equation:Error Factor = √(95%)/Cutset (5%)Assessment of a balanced design can also be demonstrated by ensuring the risk importance Fussell Vesely values do not exceed a certain specified range. Core damage cutset review should identify any dominant cutsets (contributing .5% or more of the total core damage) involving the initiating event and a single mitigation failure (component or human interaction); consideration of improvement initiatives to reduce the frequency of these cutsets may follow the risk importance evaluation process.					

Canada	79	12.21		"The PSA should include an investigation of variants and exploratory design options, the sufficiency of the redundancy and diversity of systems, and the effectiveness of on-site and off-site emergency response and accident management measures."	To indicate that both on-site and off-site emergency response should be investigated	X			
Hungary Attila	50	12.22	line 4	… and dependencies)**.**	A full stop was missing from the end of the paragraph.	X			
Hungary Attila	51	12.23	lines 2 and 3	… that are needed due to a lack of design and operating details should be documented, and at later stages of the design (e.g. construction or pre-operational stages) these assumptions should …	In the original version "at a later stages" seems to be incorrect wording.	X			
Russia	60	12.28		~~12.28. The list of dominant minimal cutsets should be reviewed to determine whether there are opportunities to enhance defence in depth if any deficiencies are identified.~~	PSA is never used for DiD			X	Cutsets analysis should be used to identify possible DiD bypass situations.

Russia	61	12.3		~~12.30. For multiple unit sites and/or sources collocated at a site the impact of one of these to NPP units being investigated should be considered in risk-informed design optimization process to support reduction of the risk significance of such impact~~.	At the current stage of MUPSA it is too early to use MUPSA results in decision-making. Otherwise, more details have to be included here.			X	For multiple unit sites, possible interactions between units or between SFP and reactor should be considered in some way. Developing MUPSA consists in one possible option to consider these interactions. Other alternative approaches may be used, possibly based on coarse decoupling hypothesis (e.g no credit taken on equipment/resources that may be shared between units of the same site).Para. 12.30 does not recommend MUPSA to be developed but only recommends multi-units interactions to be considered in some way.
Hungary Attila	52	12.31	lines 1-4	12.31. The assessment of the overall plant safety is necessary for applying for an operational licence and **it** usually involves a full scope Level 1. A safety evaluation for applying for a pre-construction licence may involve a limited scope of …	The following sentence is proposed to be removed: “A comparison of the results against probabilistic safety goals or criteria (if set) should be performed within this application”. As it is elaborated in detail in paragraphs 12.32. and 12.33, it seems an unnecessary repetition in paragraph 12.31.			X	12.31 announces what will be more developed in 12.32 and 12.33.

Canada	80	12.38		With respect to this para, add a footnote as follows:"To support PSR Safety Factor 6, the assessment should demonstrate-i) the effectiveness of the design features and accident management measures in reducing risk should be evaluated by the PSA, ii) provide a comparison of methodology, and events modelled in the PSA against the requirements of modern jurisdictional and regulatory codes and standards and iii) help confirm that the PSA programs and procedures are comprehensive, resulting in a systematic and disciplined approach to identifying, prioritizing and addressing any PSA related issues.	To identify how PSA results/insights will support PSR safety factor 6		SSG-25, which introduces PSR safety factor 6, should be added to the reference list. It is proposed to refer to this document rather than to duplicate it in SSG-3. It is proposed to change para as follows: *"In accordance with Requirement 12 of SSR-2/2 (Rev. 1) [34] probabilistic safety assessment is required to be used as an input to the periodic safety review to provide insight into the contributions to safety of different safety related aspects of the plant. The Level 1 PSA should be reviewed following recommendations from PSR Safety factor 6 of SSG-25 (Rev. 1) [43]."*		
Belgium FANC/Bel V	3	12.39		A safety assessment process for this application should consist~~s~~ **<u>in</u>** identifying safety issues, …	Two typographical corrections		*"A safety assessment process for this application should consist~~s~~ in identifying safety issues, assessing their safety significance and making decisions on the need for corrective measures."*		
Canada	81	12.39		"A safety assessment process for this application should consist~~s~~ <u>of</u> identifying…"	Editorial change	X			

Hungary Attila	53	12.39	line 1	12.39. A safety assessment process for this application should consist **of** identifying safety …	In the original version "should consists identifying" seems to be incorrect wording.			X	'consist of' is correct English.*"A safety assessment process for this application should consist~~s~~ of identifying safety issues, assessing their safety significance and making decisions on the need for corrective measures."*
Hungary Attila	54	12.41	line 1	12.41. The PSA for internal hazards and external hazards should be performed from …	In the original version there was an unnecessary repetition of PSA in the sentence (i.e. The PSA for internal hazards and external hazards PSA), that seems to be incorrect wording.	X			
Hungary Attila	55	12.43		**12.31.** PSA results and insights are dependent on the design features and provisions, including human interactions and associated procedures that are credited in the PSA. The actual implementation of features and provisions to achieve acceptably low risk estimates at the pre-construction stage should be verified in the PSA performed when applying for an operations licence. If any discrepancies leading to higher risk are identified, they should be reflected in the PSA and proposals for changes to reduce the risk should be made.	In the original version paragraph 12.43. was presented under the following title: "Optimization of protection against internal hazards and external hazards". It is proposed to move this paragraph to a more appropriate place, e.g. under: "Use of PSA to support decisions made during the design of a nuclear power plant".		Para 12.43 has been moved upward to 12.31 as it relates to design as opposed to licensing with a minor change to text: "PSA results and insights are dependent on the design features and provisions, including human interactions and associated procedures, that are credited in the PSA. The actual implementation of features and provisions to achieve acceptably low risk estimates at the pre-construction stage should be verified in the PSA performed before applying for an operations licence. If any discrepancies leading to higher risk are identified they should be reflected in the PSA and proposals for changes to reduce the risk should be made."		

Hungary Attila	56	12.43	After 12.43 Footnote 52/lines 2 and 4	… to an immediate reactor scram occurs, the allowed outage times **(or any other corresponding measures)** before implementation of these measures and additional …… of affected equipment, immediate repair of failed component). If the allowed outage time **(or the corresponding measures)** is exceeded, the technical …	Allowed outage time may not be the only measure used for such purposes. For example in Hungary, the so-called risk balance time is used and approved by the nuclear safety authority, instead of allowed outage time.	X			
Hungary Attila	57	12.46	In between 12.46 and 12.47	**PSA results should be used to support the specification of the equipment scope to be included in the technical specifications. Equipment of high safety significance should not be left out from the technical specifications without limiting conditions for operation.**	Equipment of high safety significance should be covered in the limitations of technical specifications.		*"If a PSA is fully relied on to develop technical specifications, it should be used to identify equipment to be included in the technical specifications. Then, equipment of high safety significance should not be left out from the technical specifications without limiting conditions for operation."*		
Hungary Attila	58	12.47	(a)/line 2	… different allowed outage times **(or any other corresponding measures)**, measures and actions in response to the same abnormal event. ….	Allowed outage time may not be the only measure used for such purposes. For example in Hungary the so-called risk balance time is used and approved by the nuclear safety authority, instead of allowed outage time.	X			

Hungary Attila	59	12.47	(b)/line 3	… appropriateness and to suggest measures and revisions of allowed outage times **(or any other corresponding measures)** where …	Allowed outage time may not be the only measure used for such purposes. For example in Hungary the so-called risk balance time is used and approved by the nuclear safety authority, instead of allowed outage time.	X			
Hungary Attila	60	12.51	lines 2 and 3	… to their impact on equipment reliability and how these tests impact the cost of operations. **Another goal may be to optimize testing strategies with respect to the overall (cumulative) risk.** Human errors during service test intervals that might have an adverse impact on safety, for …	If the overall cumulative risk can be reduced by changing the testing strategy, then such modifications should be performed. The basic example for this issue is the staggered testing of redundant system trains.		*"The goal of this application is to optimize the surveillance testing strategy and surveillance testing intervals with respect to their impact on equipment reliability or overall risk estimates."*		
Hungary Attila	61	12.52	(d)	The service testing intervals do not lead to **excessive** wearing of the tested components.	In the original version "exercise" seems to be incorrect wording.		*"The service testing intervals do not lead to excessive unavailability due to potential excessive wear of the tested components."*		
Belgium FANC/Bel V	4	12.55	(d)	The potential for errors of commission that may be introduced due **to** testing strategies …	Typographical correction (missing word)		Comment is obsolete due to other accepted change (see next).		
Hungary Attila	62	12.55	C and D	(c) The potential for HFEs **including errors of commission** during and after testing, leading to component(s) unavailability and/or an initiating event.	Both original points, i.e. (c) and (d), were related to human errors, so they can be merged as proposed.	X			
Hungary Attila	63	12.58	Lines 3 and 4	… risk significance and acceptability of the proposed change and the incremental risk metrics **or other alternative risk measures** should be used to evaluate the acceptability of the new	In some cases/countries, no incremental risk is allowed by the nuclear safety regulation. For example, this is the case in Hungary.			X	Then, in your case, the authorized increment in risk metrics is null. The recommendation still applies.

				proposed service testing interval.					
Hungary Attila	64	12.66	Line 3	… in order to determine whether the changes are acceptable**.**	A full stop was missing from the end of the paragraph.	X			
India	1	12.68	Line 5	The expectation is that this will lead to a reduction in the overall number of pipework inspections that are carried out and a ~~reduction~~ **optimization** in the associated occupational exposure, without ~~increasing the risk from~~ **compromising safety of** the plant	Eventually, the Risk Informed ISI will lead to reduction in dose due to reduced inspections, in some cases it may increase the inspections. In general the Risk Informed ISI methodology is used to optimize the existing ISI programme.			X	The reduction in the number of required pipework inspections and consequently in occupational exposure is presented as an expectation. In addition, the 'safety of the plant' can not be summed up in risk increase as PSA is not the sole mean to evaluate the 'safety of the plant'.
Russia	62	12.69		12.69. At the design stage, the application *can be* ~~is~~ *used to support the* develop*ment* of the inspection programme to prevent failures of the risk significant pipework. For operating plants this programme should be maintained and updated based on feedback from operating experience.	To emphasize that not based on PSA, but with use of PSA		*"At the design stage, the risk informed approach should be used to support the development of the inspection programme to prevent failures of the risk significant pipework."*		
Belgium FANC/Bel V	5	12.72		It should be checked that this is the case and conditional **core or** fuel damage probability should be assessed …	"Core" to be added, to be consistent with other articles, where systematically core or fuel damage is mentioned.		*"It should be checked that this is the case and that conditional core or fuel damage probability is assessed for all initiating events induced by pipework failure."*		

Hungary Andras	6	12.78	/footer55/ 1	The historical approach for the safety classification is that the level of quality assurance applied to the SSCs shall be commensurate with the safety importance of the SSCs. (I.e. higher safety safety importance demands higher level of quality assurance.)	There shall be levelization of the requirements even amongst the safety important SSCs. This is the reason of there are more than one safety classes besides non-safety class.		*"The historical approach for safety classification is to apply a high level of quality assurance to all SSCs identified as important to safety. However, the results of many PSAs carried out to date have shown that some safety-classified SSCs show a relatively low safety significance or that some non safety-classified SSCs show instead a relatively high safety significance."*		

Hungary Andras	7	12.78	5	The risk-informed review of safety classification may detect that the safety class of an item deviates from the class that would be reasonable based on its safety importance. In such cases a comprehensive assessment shall be performed to find the causes of the deviation. This assessment shall be performed by a group of experts of various related expertise (i.e. PSA, DSA, O&M, technology, licencing etc.). The assessment may result in a final proposal to upgrade or to downgrade the classification of the investigated item. Such change leads to modification in the quality assurance requirements to be applied to the item accordingly. In case of a resulting upgrade, a previously hiding design imbalance of the NPP, affecting nuclear safety, is eliminated. In case of a resulting downgrade, from the point of view of operating personnel, this reduces the resources necessary to carry out the surveillance programme, and from the point of view of the regulatory body, it will remove unnecessary burdens from the operating personnel, without increasing the risk from the plant.	The text focuses on those findings of the risk-informed review only, that would show that some items are over-classified and therefore should be downgraded. However, in some cases the review may point out that the safety class of an item is lower than its risk significance would demand. General comment: The methodology of the risk-informed review may be quite extensive to summarize in a subchapter of the present Guideline. As far as I know the topic is not comprehensively described in any IAEA guidelines yet, however it would make very much use, according to our experiences. Please consider the possibility to develop a separate guideline directly dedicated to this issue.		*"The aim of the application of a risk-informed classification is to provide one of the inputs to the process of assigning safety classes to SSCs in accordance with their risk significance. PSA should be used to consider whether changes can be made to the traditional prescriptive regulatory requirements for some of the SSCs to bring the requirements more in line with the safety significance of the SSCs. The analysis, to be conducted by a group of experts of various related expertise (i.e. PSA, DSA, O&M, technology, licensing etc.), may result in a final proposal to upgrade or to downgrade the classification of the investigated item. In case of a resulting upgrade, a previously hidden design imbalance of the NPP, affecting nuclear safety, is eliminated. In case of a resulting downgrade, from the point of view of operating personnel, this may reduce the resources necessary to carry out the surveillance programme, and from the point of view of the regulatory body, it may remove unnecessary burdens from the operating personnel, without increasing the risk from the plant."*		

Hungary Attila	65	12.78	Liones 5 and 7	… this **may** reduce the resources necessary to carry out the surveillance programme, and from the point of view of the regulatory body, it **may** remove unnecessary burdens from the operating …	The aim is to reduce resources and remove burden, but in fact the result may also be just the opposite when there are multiple non-safety related components of high safety significance.	X			
Hungary Andras	10	12.79		NEW paragraph is necessary with the following content: "For a comprehensive assessment the sensitivity of the results to the significant assumptions or estimates of the PSA model should be evaluated."	Such evaluation is also necessary to be performed in the classification review.General comment: The methodology of the risk-informed review may be quite extensive to summarize in a subchapter of the present Guideline. As far as I know the topic is not comprehensively described in any IAEA guidelines yet, however it would make very much use, according to our experiences. Please consider the possibility to develop a separate guideline directly dedicated to this issue.		The comment does not apply only to using PSA to support safety classification. As the comment is more general, it is rather proposed to consider it in the section entitled 'General aspects of PSA applications', adding a new paragraph 12.7: *"In deriving risk insights from the PSA, care should be taken to consider major sources of uncertainties, possibly requiring sensitivity analysis on main assumptions to be conducted."*		

Hungary Andras	8	12.79	3	The risk significance should be derived using both the Fussell–Vesely importance (or a measure with equivalent role such as the risk reduction worth or fractional contribution) and the Birnbaum importance (or the risk achievement worth) since both these importance measures provide insights into the risk significance of SSCs. These measures may be calculated in relation to PSA-1 and PSA-2 results, namely to CDF and LERF, or other pre-defined end-states.It is recommended to define levels of risk significance, the number of which should be set to be easily compatible with the conventional (deterministic) classification methodology used. (Typically High, Medium and Low risk significance levels are defined.) Their definition should be performed based on carefully defined threshold levels of the used importance measures (e.g. of FC=,005 and RAW=2 are widely used).	There are several equivalent importance measures that may be similarly used for the same goal, it may be useful not to restrict the experts only to FV in the guideline.These measures can be interpreted with regards level 1 and level 2 PSA result as well, which should also be mentioned.Furthermore, the levels of risk significance should be mentioned in the text to give help in understanding how it looks like in practice.General comment: The methodology of the risk-informed review may be quite extensive to summarize in a subchapter of the present Guideline. As far as I know the topic is not comprehensively described in any IAEA guidelines yet, however it would make very much use, according to our experiences. Please consider the possibility to develop a separate guideline directly dedicated to this issue.		*"The risk significance should be derived using both the Fussell–Vesely importance (or a measure with equivalent role such as the Risk Reduction Worth or the Fractional Contribution) and the Birnbaum importance (or the Risk Achievement Worth) since both these importance measures provide insights into the risk significance of SSCs."* It is proposed to supplement para 11.81 as follows: *"The Level 1 PSA should be used to determine the risk significance of SSCs used to prevent core or fuel damage. (…) Risk significance parameters should then be compared to thresholds defined to be consistent with the conventional (i.e. deterministic) classification methodology."*	X	As the SSG-3 is only addressing the Level 1 PSA scope, it has been chosen not to mention Level 2 PSA, which will be covered by SSG-4.

Hungary Andras	9	12.79		NEW paragraph is necessary with the following content: "The risk-importances of equipment may be different from the viewpoint of different main risk contributors (i.e. by radiological sources, by initiating events, by POSs). As a consequence, the simple approach of summing up the different importances deriving from these different aspects may result in under- or overestimations in the aggregated resuls. Therefore it is highly recommended to calculate the risk importance of the various equipment separately for each risk contributors. As an example this means that risk importance should be calculated separately with regards seismic events and with regards internal mpacto , or with regards the reactor and the spent fuel pool, or with regards the different POSs."	Neglecting this aspect may cause very significant deviations in the results, hence it should be mentioned in the guideline.General comment: The methodology of the risk-informed review may be quite extensive to summarize in a subchapter of the present Guideline. As far as I know the topic is not comprehensively described in any IAEA guidelines yet, however it would make very much use, according to our experiences. Please consider the possibility to develop a separate guideline directly dedicated to this issue.		The point raised by the reader is already partly addressed in para. 12.6. However, the reader proposes to further detail the recommended approach for using importance measures. Therefore, we propose to supplement para. 12.6 as follows. *"(...) This is of particular importance for applications of PSA that rely on the evaluation of importance measures and for risk monitor type applications. Therefore, it is highly recommended to calculate the risk importance of the various equipment separately for each risk contributor. As an example, risk importance measures for seismic events and internal events should be calculated separately.*		

Hungary Andras	11	12.82		NEW paragraph is necessary with the following content: “The values of risk significance parameters used should be in line with the all-time state of the design configuration, the PSA model and the related plant procedures. Therefore the risk-informed review of safety classification should be updated to follow design modifications, changes in the PSA model or changes in related plant procedures. Such review should be handled in a systematic way, taking into consideration the necessity for a periodic, general review besides the reviews incidental to modifications.”	The review of the risk-informed assessment is necessary from time to time during the NPP lifetime to follow the related changes in the design, in the PSA model or in the applied procedures. Otherwise the results shortly become out-of-date. General comment: The methodology of the risk-informed review may be quite extensive to summarize in a subchapter of the present Guideline. As far as I know the topic is not comprehensively described in any IAEA guidelines yet, however it would make very much use, according to our experiences. Please consider the possibility to develop a separate guideline directly dedicated to this issue.		The comment does not apply only to using PSA to support safety classification. As the comment is more general, it is rather proposed to consider it in the section entitled ‘General aspects of PSA applications’, adding a new paragraph 12.7: *“The PSA models, and if necessary, the PSA applications should be periodically updated throughout the lifetime of the plant to consider attributed changes in design, operational practices, operational experience, other issues that influences parameters modeled in PSA model.”*		

Japan	2	12.82	1	Cumulative mpacto f proposed re-classification of mpacto risk should be also taken into account when making the mpacto .	Clarification.The meaning of ‘Cumulative mpacto f proposed re-classification of SSCs’ is unclear. Brief explanation would be favorable.		*"~~Cumulative impact of proposed re-classification should be also taken into account when making the decision.~~ When a large number of SSC are re-classified and their treatments (e.g., testing and maintenance) is adjusted based on risk significance, estimated failure probabilities of a large number of SSCs modeled in the PRA may change. Therefore, cumulative impact of risk should be assessed to determine the conservative upper bound of cumulative impact to make sure that any cumulative potential risk increases are acceptable."*		

Czech Republic, UJV Rez Stanislav Hustak	12	12.84		A risk monitor is a real time analysis tool that should be used to generate risk information based on the actual plant configuration**, and eventually based on the actual environmental conditions**, in terms of a number of factors that typically include: the plant operating state (power operation or one of the shutdown states), the components that have been removed from service and the choice of operating trains and standby trains for normally operating systems..	Some risk monitor software use “Environmental and Testing Factors” (ETF) to address also the actual environmental conditions and to modify risk profile accordingly. As an example, the contribution from high snowfall or extremely low temperature should not appear in the risk profile during summer, or the contribution from extremely high temperature should not appear in the risk profile during winter, especially when such contributions would be relatively high.		*“A risk monitor is a real time analysis tool that should be used to generate risk information based on the actual plant configuration (through a number of factors that typically include the plant operating state (power operation or one of the shutdown states), the components that have been removed from service and the choice of operating trains and standby trains for normally operating systems) and eventually on the actual environmental operating conditions (as an example, the contribution from high snowfall or extremely low temperature should not appear in the risk profile during summer).”*		
Belgium FANC/Bel V	6	12.86		Even though risk monitors are used at operating plants it is a good practice to initiate its development at design stages …	Typographical correction		*“Even though risk monitors ~~are~~ is used at operating plants it is a good practice to initiate its development at design stages when plant design is already fixed.”*		
Egypt	25	12.86		Even though risk monitors are used at operating plants it is a good practice to initiate its development at design stages when plant design is already fixed.	Editorial		*“Even though risk monitors ~~are~~ is used at operating plants it is a good practice to initiate its development at design stages when plant design is already fixed.”*		

ENISS	28	12.86		Even though risk monitors are used at operating plants it is a good practice to initiate ~~it~~ their development at design stages when plant design is already fixed.	Editorial correction		*"Even though risk monitor~~s~~ ~~are~~ is used at operating plants it is a good practice to initiate its development at design stages when plant design is already fixed."*		
Hungary Attila	66	12.86	Line 5	… good practice to initiate **their** development at design stages when plant design is already fixed.	In the original version "it" seems to be an incorrect wording.		*"risk monitor is used at operating plants it is a good practice to initiate its development at design stages when plant design is already fixed."*		
Canada	82	12.89		The PSA model should be amended to remove any simplifications made to reduce the amount of analysis needed for the PSA (e.g. modelling asymmetries) that could lead to the risk monitor giving incorrect results for some of the plant configurations that could arise.	Clarification. The existing clause text seems to indicate that all simplifications must be removed, but some conservative simplifications are likely still valid for risk monitor applications.	X			
Russia	63	12.89		12.89. The PSA model should be amended to remove any simplifications made to reduce the amount of analysis needed for the PSA *if*~~, as~~ they could lead to the risk monitor giving incorrect results for some of the plant configurations that could arise.	We cannot remove all simplifications, but only important for RM		*"The PSA model should be amended to remove any simplifications made to reduce the amount of analysis needed for the PSA (e.g. modelling asymmetries) that could lead to the risk monitor giving incorrect results for some of the plant configurations that could arise."*		
Hungary Attila	67	12.9	Line 2 and 3	… a calculation of the risk that relates more closely to the actual plant configuration. For example, **it has to be symmetric to account for all the possible configurations (e.g. of operating systems),** and it	An important part of modifications in the basic PSA model is making the model symmetrical from the point of view of operating system configurations, break locations, etc.		*"For example, it has to be made symmetric to account for all possible configurations (e.g. of operating systems) and it has to be possible to set to TRUE or FALSE the status of basic events"*		

				has to be possible to set to TRUE or FALSE the status of basic events that describe …					
Belgium FANC/Bel V	7	12.92		The changes that a PSA practitioner and ~~**the user of**~~ the risk monitor users may make should **be** commensurate with the level of expertise …	Two typographical correction (delete double word and missing word)		*"The changes that a PSA practitioner or a risk monitor user may make should be commensurate with the level of expertise of those individuals and should be well documented."*		
Hungary Attila	68	12.92	Line 1	The changes that a PSA practitioner and the risk monitor users may …	In the original version "the user of the risk monitor users" seems to be an incorrect wording.		*"The changes that a PSA practitioner or a risk monitor user may make should be commensurate with the level of expertise of those individuals and should be well documented."*		
Belgium FANC/Bel V	8	12.94		The software should be capable of providing results within a time frame that meet the needs of ~~**needs of**~~ its primary users …	Typographical correction (delete double words)	X			
Egypt	26	12.94		The software should be capable of providing results within a time frame that meet the needs of ~~needs of~~ its primary users …	Editorial (repeated word)	X			
ENISS	29	12.94		The software should be capable of providing results within a time frame that meet the ~~needs of~~ needs of its primary users	Editorial correction	X			

Hungary Attila	69	12.94	Lines 1 and 2	The software should be capable of providing results within a time frame that meets the needs of its primary users (e.g. work planners and control room operators) to meet	In the original version “meet the needs of needs of” seems to be an incorrect wording.	X			
China	6	Annex I	A3 Downburst	Further clarify the definition and impact of downburst.	There are no practical experience or consensus treatment for Downburst.			X	Table in Annex is presents just general list of potential external hazards without going in detail whether there is practical experience on modeling of specific hazards in PSA
Egypt	1	General		In this Safety Guide some words have been written sometimes in American English and sometimes in British English, for example the words:fulfil - fulfillorganizations – organisationscharacterization – characterisationmodelling – modelingageing - agingAre written interchangeably throughout the Safety Guide.	The writing language should be standardized.		X This issue will be solved during the publication process		
Egypt	2	General		Some abbreviated words are written with no explanation, for example:SSCs (para. 1.4)I&C (para. 5.132)SFP (para. 10.12)	All abbreviations words should have explanation when mentioned at first time.	X			
Egypt	3	General		The following reference is suggested to be added to the list of references of this Safety Guide:IAEA-TECDOC-1135 "Regulatory review of probabilistic safety assessment (PSA) Level 1"	This reference provides guidance to regulatory authorities on the technical issues that need to be addressed when conducting review of the PSA Level 1 for nuclear power plants. (See comments No. 8, 10, 11, 16)			X	This TECDOC is considered to be outdated and superseded by recent IAEA publications on PSA (e.g. SSG-3, TECDOC-1804, etc)

USA	5	Global		One major change made to the document since we last reviewed is replacing the term “mitigating systems” with “credited systems” globally. Revert the global change to “mitigating systems.”	This change appears to imply that a PRA developer may model (or credit) a subset of mitigating systems. We agree that number of PRA model developers may credit only a subset of mitigating systems which results in PRA models that overestimate core damage frequency. Such overestimates may be acceptable for some PRA uses (e.g., identifying risk outliers) and yet bias results significantly for other applications (applications that rely on importance ranking.) I do not know what prompted this change.			X	The mitigating systems were originally used to indicate the systems credited and modeled in PSA. These are not only safety systems, could be also non-safety systems performing certain functions which could be credited and modeled in PSA. In the meantime, we agree that the word ‘mitigating’ is confusing and is used in other contexts. Therefore, the term ‘systems credited in PSA’ was used with relevant explanation provided in the footnote (see para 5.4). The overall idea is to indicate the entire spectrum of systems modeled in PSA. The concerns regarding the conservatism of the results is specifically addressed throughout of the Safety Guide (see e.g. paras 5.37, 5.57, 7.6, 12.6, etc.)
ENISS	33	I		(non-gaseous)	Editorial correction, consistency spelling throughout rest of the appendix	X			

Germany	139	I		***see comment***	The generic list from Knochenhauer et al. Provided in Annex I is no more state-of-the art and needs to be replaced! More recent and complete generic hazards lists are available:a) from the EU ASAMPSA_E Project by Decker et al. or b) from GRS provided for the regulatory body BMU and published as well providing an even more comprehensive list, based for external hazards mainly on the ASAMPSA_E list with some additions and including all internal hazards, both with the corresponding definitions by IAEA.		X Since the review of the Safety Guide was approved as revision by ammendment focusing on specific aspects, therefore the Annex I was not revised. However, if NUSSC agrees Annex I could be replaced to the list provided by ASAMPSA_E project.**TBD during the NUSSC meeting in June.**		

Czech Republic, UJV Rez Stanislav Hustak	8	IAEA Safety Glossary		Add the definition for “initiating event”:**An initiating event is an event that could lead directly to the undesired end state or that challenges normal operation, and which necessitates successful mitigation using safety or non-safety systems to prevent the undesired end state.**	A general definition of the initiating event (IE) to fit the PSA needs should be added to IAEA glossary as well (either to replace the current definition of the IE or as the specific definition of the IE for the purpose of PSA). It would be applicable also for the analysis of the other (undesired) end states in PSA, such as boiling in open reactor or in SFP.The definition of the IE in IAEA Safety Glossary would allow to avoid the necessity to specify in SSG-3 the specific definitions of the IE for each undesired end state (core damage, fuel damage in SFP, boiling, etc.) to be analyzed in PSA, i.e. when any definition is not specified in SSG-3 for fuel damage in SFP, boiling, etc. then the definition of the IE from IAEA Safety Glossary (after adjustment to PSA needs) would apply.			X	In general it is a good point, however the revision of IAEA Safety Glossary is out of scope of this activity. The information will be transferred to the relevant colleagues at IAEA dealing with IAEA Safety Glossary
Germany	140	II	Annex II	FIG. II–1. Example of a generic fire ~~propagation~~ event tree.***In the figure****:* ~~Pilot~~ Incipient fire	Proper terminology and precision	X			
India	4	II		Suggestion:Examples of Fire propagation event trees and seismic event trees are given in annexure. Example of flood propagation event trees may also be included.	The inclusion of flood propagation event tree will be useful addition to the standard.			X	Limited number of examples is considered to be sufficient for the purpose of the Annex. The completeness was not a main objective of providing the examples

UK	9	II-2	Fig II-2	**Whilst event tree Fig II-2 appears to be logically correct, the labelling convention is potentially confusing. The normal convention for event trees is for the top event descriptors to be written as positive statements, with the up branch being positive and the down branch being negative (as correctly used in Fig II-1).Please add a foot note (or some other form of explanatory note) to Fig II-2 highlighting the labelling convention used in this example and specifying where it differs from the previous example.**	Figure II-2 does not label the branches, but down is positive and up is negative. The event descriptors at the top are faults as opposed to positive statements (i.e. the reverse of the generally adopted convention and the opposite of Fig II-1). This should be highlighted to prevent confusion.	X	Footnote explanatory note is provided		
Germany	141	III	An additional reference	*New reference [III-X] added after [III-7]:*FACHARBEITSKREIS PROBABILISTISCHE SICHERHEITSANALYSE FÜR KERNKRAFTWERKE, Methoden und Daten zur probabilistischen Sicherheitsanalyse für Kernkraftwerke, Stand: Mai 2015, BfS-SCHR-61/16, Bundesamt für Strahlenschutz (BfS), Salzgitter, Germany (September 2016)	The most recent German reference was missing	X			

Russia	64	III		III–13. For the elements of this list, ~~empirical evaluations, including, for example, plant walkdowns, o~~f *the working environment and the tasks ~~are~~ performed are assessed* to identify potential human errors and consequences. The significance of each potential error is then judged. In determining possible consequences, it is distinguished between unavailabilities of components or system parts on the one hand and initiating events on the other	Clearer wording	X			
FRANCE - CEA	116	Page 110		USE OF PSA FOR DESIGN EVALUATION	One important application of PSA (at least in France) is the definition of DEC (design extension conditions) domain. It may be useful to add a paragraph..		Bullet (b) of para 12.16 is changed as follows: *“The PSA should be used at the concept stage to determine the spectrum of initiating events that need to be considered as the design basis and the licensing basis of the plant. To meet Requirement 20 of SSR-2/1 (Rev.1) Ref. [2], when applicable, the Level 1 PSA model for internal initiating events should be used to confirm the set of Design Extension Conditions without significant fuel degradation that should be deterministically derived as per para. 3.40 of SSG-2 Rev.1 Ref. [5].”*		

Canada	83	References	References [13], [14] and [41]	These References are Draft and do not contain the document number.	References required for these. When will these be finalized and issued for use?		X These references are currently under development. It is expected that they will be published before the SSG-3 revision is finally endorsed for publication.		
Canada	84	References	Reference [22]	[22] INTERNATIONAL ATOMIC ENERGY AGENCY, External Human Induced Events inSite Evaluation for Nuclear Power Plants, IAEA Draft Safety Guide ~~Standards Series~~ No. DS520 ~~NS-G-3.1,~~ IAEA, Vienna (~~2002~~ December 2020)	DS520 is a new Revision of Safety Guide NS-G-3.1	X			
Egypt	28	References	Reference [34]	INTERNATIONAL ATOMIC ENERGY AGENCY, ~~Safety of Nuclear Power Plants:~~ Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR-2/2 (Rev. 1), IAEA, Vienna (2016).	Editorial (repeated word)	X			
ENISS	32	References		[42] US NUCLEAR REGULATORY COMMISSION, NUREG/CR-~~6580~~6850, EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities, 2005.	Editorial correction	X			

Germany	138	Referen ces	Reference s	***References need to be updated and added***	See proposals in the respective paragraphs, e.g. [6] is SSG.64		X Yes, the references will be updated and finalized closer to the publication, because many of the draft references are expected to be published by that time and due to the changes in the text they might need to be reshuffled.		