DS523 Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants, Version 12th April 2022, STEP 11

Country	Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
Japan / Nuclear Regulation Authority (NRA)	1	General	"core damage" and "fuel damage" are used in several paras, but such usage does not seem consistent. For example, "core damage" in second sentence of footnote 2 is unnecessary; para. 7.4 and para. 8.5 are almost the same content but "fuel damage" is described only in para. 7.4; and so on. The usage of "core damage" and "fuel damage" should be checked for full document, especially from Sections 6-9.		X	Comment accepted and implemented systematically. Footnote 2 is revised accordingly, as well as other changes implemented (e.g. in Sections 6-8, 5.11 and Section 9).		
UK	0	General	The UK is supportive of the revised guidance, its scope and ambition. However, the UK has a small number of detailed comments relating specifically to changes made whilst addressing member state comments. These are presented with reasoning below.		X			
Germany	1	1.2 Line 13	Thus, probabilistic safety assessment (PSA) is considered to be an important tool for analysis to ensure the safety of a nuclear power plant in relation to potential initiating events that might be caused by random component failure or human error, as well as <u>by</u> internal and<u>/or</u> external hazards.	Clarification	X			
Germany	2	1.4	PSA has been shown to provide important safety insights in addition to those provided by deterministic analysis. PSA provides a methodological approach to identifying accident sequences that can follow from a broad range of initiating events and it includes a systematic and realistic determination of <u>damages and radioactive releases and their frequencies</u> ~~accident frequencies and consequences~~. In international practice, three levels of PSA are generally recognized: …	Principally we talk in PSA about damages and radioactive releases and their frequencies, but of course, accident frequencies are belonging to that for determining damage frequencies. Please make it clear in the text.	X			
Germany	3	1.11 Line 3	… Level 1 PSAs have ~~now~~ been carried out for most …	Editorial, non-necessary filling word	X			

Germany	4	1.11 Line 4	… The scope of a Level 1 PSA addressed in this Safety Guide includes all operating states of the plant (i.e. in power operation 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, floods, explosions, turbine missiles) and (c) external hazards, both natural (e.g., earthquake, external flooding, high winds, other meteorological hazards) and human induced (e.g., aircraft crash, explosion pressure waves, accidents at nearby industrial facilities) as well as combinations of ~~external~~ hazards.	Combinations are not limited to external hazards, there can be combinations of external with external, external with internal and internal with internal hazards.	X			
Japan	2	1.11.	This Safety Guide addresses the necessary technical features of a Level 1 PSA and applications for nuclear power plants (both existing and new plant, 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. in power operation 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, floods, explosions, turbine missiles) and (c) external hazards, both natural (e.g. earthquake, external flooding, high winds, other meteorological hazards) and human induced (e.g. aircraft crash, explosion pressure waves, accidents at nearby industrial facilities) as well as combinations of external hazards, such as consequent (subsequent) events, correlated events and unrelated (independent) events.	Types of combination of external hazards are stated in para. 6.13, but they are not stated in para. 1.11 even though the first time to state. The description for types of combination of external hazards should be added in para 1.11.	X			

Germany	5	1.12	This Safety Guide focuses on the assessment of the nuclear power plant reactor core and the fuel in the core and in the spent fuel pools.	Editorial, each reactor has only one SFP, if singular is used for reactor SFP must also be singular.	X			
Germany	6	1.14	In performing Level 1 PSA, the most common practice is to perform the analysis for the various hazards and plant operating states …	Expert terminology and for consistency. To make the text more user-friendly we would like to suggest to use the wording "**plant** operating state(s)" instead of "operating state(s)" all over the text, this applies e.g. for paras 2.2, 3.1 etc.	X			
Germany	7	1.15	The recommendations of this Safety Guide are intended to be technology neutral to the extent possible, and it is expected that the vast majority of the recommendations will be applicable to various types of nuclear power plants.	We guess plural for "plants" is more suitable here.	X			
Japan	3	2.5.	Requirement 18 of GSR Part 4 (Rev. 1) [3] states that **"Any calculational methods and computer codes used in the safety analysis shall undergo verification and validation."** PSA involves a number of analytical methods. These include the analysis of accident sequences and their associated systems, typically through the development of event tree and fault tree logic models along with methods for the solution of these logic models, the development of models of phenomena that could occur, for instance, within the containment and/or the spent fuel building of a nuclear power plant following core damage and/or fuel damage, and the development of 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).	For consistency with adding "and/or fuel damage", "and/or the building" should be added because the spent fuel pool is generally located outside the containment.	X			

Germany	8	2.12	In the Member States, probabilistic reference values are typically identified either as criteria, targets, goals, objectives, guidelines or as numerical values for orientation.	Clarification.	X			
Germany	9	2.13 Line 6	… If they have not, the design may still be acceptable provided in such a way that the higher level criteria have been met.	Clarification.	X			
Germany	10	2.14.	On the basis of current experience with the design and operation of nuclear power plants and on the basis of acceptable risks, ~~proposed~~ numerical values reference have been defined on a national level in some Member States to be used for existing and new nuclear power plants.	Clarification.	X			
Germany	11	2.24. Line 4	… Where the results of the PSA indicate that changes could be made to the design or operation of the plant to reduce risk, such changes should be incorporated where reasonably achievable~~, taking the relative costs and benefits of any modifications into account (see Ref. [13])~~.	Formulation “changes should be incorporated where reasonably achievable” should be enough, ~~—~~as different countries may have different priorities by question of costs and benefits.	X			
Germany	12	3.2.	The intended applications of PSA might have an impact on the scope of the PSA, the modelling approaches and the level of detail.	Clarification	X			
Germany	13	3.10 Line 5	… Once the working methods have been selected, the various procedural steps should be interfaced with the tasks of quality assurance and training of the team to produce a detailed plan of the tasks, including a schedule for the project.	We guess that “training of the team” is being meant in this contest, please clarify, otherwise misinterpretation may occur.	X			
Germany	14	3.11.	The resources needed to complete a PSA, including the expertise of the specialists involved, human resources, computer time and calendar time, strongly depend ~~greatly~~ on the scope of the PSA, which is in turn governed by the overall objectives, and on the expertise already available in the PSA team.	Wording	X			

Japan	4	3.16.	Quality assurance of the PSA should be viewed and established as an integral part of the PSA project, and quality assurance procedures should be an integral part of the PSA procedures. The quality assurance procedures should provide for control of the constituent activities associated with a PSA in the areas of organization, technical work and documentation. In their application to technical work, quality assurance procedures are aimed at ensuring consistency among goals, scope, methods and assumptions, as well as accuracy in the application of methods and in calculations. Quality assurance procedures should include control of the ~~PSA~~ documentation of the PSA and control of the different versions of the PSA models. General requirements for control of documents are established in GSR Part 2 [14].	Editorials.	X			
Germany	15	4.1 (c)	System(s) descriptions;	Clarification	X			

ENISS	1	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.	Even if it said to be 'accepted' in the table of comments, the change has not been made in the document. The 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. **We firmly insist on the need to make multi-unit PSA appear as one possible option to consider multi-units aspects.**	X	Thanks for noting and apologies for missing that one in the previous round. Section 11 presents the recommendations on quantification of multi-unit risk metrics. The process of doing that is called MUPSA in the document. These recommendations are supported by the Safety Report pre-print of which published last year (see here). The Safety Report includes various experiences available in Member States in this regard (see Annexes), all of which are considered to be compounded by the term 'MUPSA'. Therefore, we believe that we are on the same page here and would be glad to discuss different interpretation of the term 'MUPSA'.		
France	1	5.38	Add after 5.38 a § on particularization of multi-unit initiating events	Mentioned in the MUPSA section but it is better to not group MU IE form the IE grouping stage	X			
Germany	16	5.38 Line 3	… This aspect may be particularly important for applications for which Level 2 PSA is not available, as the consequences are ~~greater~~ more severe.	More precise wording	X			

France	2	5.45	For sequences ending in a safe stable state, accident sequence analysis should be pursued over a time period that will enable the effect of long term measures to be analysed. This will ensure that the risk estimate beyond the sequence mission time is negligible (as compared to the risk during the mission) and that possible cliff edge effects are appropriately captured. Please revise	The idea is ok but the text is not clear (what is sequence mission time and what is accident sequence analysis?) The text proposed to § 9.5 is somehow better (*It is essential that analysis of sequences following a disturbance be continued until a safe and stable state is reached*)	X	The concern of the reviewer is understandable. These 2 paras have a little bit different spin. In 5.45 the idea is to highlight the analysis / modelling of the long term measures. It is rephrased to make it clearer.		
France	3	5.57	Please revise	The text is redundant with 5.54 and 5.55 regarding the data and the code	X			
France	4	5.63	It is more useful to specify the plant damage states as part of the Level 1 PSA than to postpone the specification of plant damage states to the first step of the Level 2 PSA Proposal: the plant damage states are specified from the level 2 PSA need but can be usefully included in the Level 1 PSA modelling and then updated accordingly to the L1 PSA modelling evolution	The PDS specification must be done by the level 2 PSA project. Add a reference to the IAEA guide on L2 PSA?		X The proposed text is slightly modified. Reference to SSG-4 has been added.		
France	5	5.65		Add a reference to the IAEA guide on L2 PSA?	X			
France	6	5.66	The accident sequences leading to core damage, regarding the criteria defined at 5.42, should therefore be characterized in accordance with the general physical state of the plant to which each accident sequence leads and with the possible availability of the credited systems that could prevent or mitigate a release of radioactive material.		X			

France	7	5.71	~~Where f~~Fault trees ~~are~~can be used, ~~they should be developed at a level of detail sufficient to capture the possible dependencies, and~~ to provide a complete logical failure model for all the credited system failure states identified by the event tree analysis.	The same ideas, but slightly different, are mentioned also to § 5.74.	X			
Japan	5	5.76.	The fault tree model should include all the credited system components that need to be operational, including support system components. It should also include passive components whose failure could affect the operation of the system, for example, filter blockages and pipe leaks. The fault tree model should be developed in a way that ensures that dependencies are taken into account explicitly. Omitting the explicit modelling of these dependencies might significantly bias the results and lead to an underestimation of the relative importance of the support systems. Passive components (e.g. pipelines, cables) may be excluded from the PSA model if their reliability is shown to be ~~an order of magnitude~~ sufficiently higher than the reliability of any component considered in the model whose failure would have the same consequences.	It is better to describe as “sufficiently higher” because the criteria for passive components’ reliability could be determined based on the importance of passive components.		X This part is deleted		

UK	1	5.76/7	Please delete the last sentence: '~~Passive components (e.g. pipelines, cables) may be excluded from the PSA model if their reliability is shown to be an order of magnitude higher than the reliability of any component considered in the model whose failure would have the same consequences~~.'	The last sentence starting "Passive components…" is a new addition to what was Para. 5.78 in the version of the safety guide issued at Step 8. Explicit screening values should not be specified for the exclusion of passive components. If the proposed screening value of an order of magnitude were used, it would be possible for significant risk information to be lost (e.g. multiple passive components one order of magnitude more reliable than a single active component being screened out). It is also not clear why the screening criteria is applied to only passive components, there is no similar text for active components. If a component is being screened on a reliability basis, it is unclear why active components are not considered for screening on the same basis. This could lead to confusion and inconsistency in PSAs. The added text conflicts with paragraph 5.74 which states that the "fault tree models should be developed to the level of significant failure modes of individual components". The added text also potentially conflicts with paragraph 5.77 "The degree of resolution of the components in the fault tree should be sufficient to ensure that all the hardware dependencies can be modelled". The new text implies that these expectations	X			

France	8	5.77	Can be deleted	The 5.77 § is a repetition of 5.71, 5.74 and 5.86 (which are more complete)		X Partially deleted considering other comments		
France	9	5.80	The unavailability of systems owing to testing and maintenance should be modelled in a way that is consistent with plant technical specifications20 , ~~and~~ with testing and maintenance practices in the plant and operating experience if available.	The operating experience is important, especially for components which are not included in the TechSpecs	X			
France	10	5.83	….. (a) The function of the system; (b) The system ~~failure~~ operating modes~~;~~ (c) The system boundaries;	The system failure modes is not required information (it is a results of the PSA modeling)			X	It is important to have operating modes described, but that was foreseen by item (a) which is revised to make it clear. However, FMEA results are also part of the system information required.
France	11	5.90	These should be identified and modelled explicitly in PSA model ~~the fault tree analysis~~.	Can be also in ETs	X			
France	12	5.93	The common cause failures that can affect groups of redundant components should be identified and modelled using the appropriate features of the PSA software if appropriated	CCF can be also modeled manually	X			
Germany	17	5.99. New Footnote	The aim of quantitative assessment in human reliability analysis should be to generate probabilities of human errors that are consistent with one another in all the parts of the Level 1 PSA[FN]. FN: Modelling uncertainties behind human error probabilities should be discussed as well, as such a discussion provides the basis for a sensitivity analysis and increases the belief in the values for human error probabilities.	Additional footnote, emphasising 'modelling uncertainties' behind human error probabilities and encourage their discussion might be useful, e.g., with regard to another human resource accounting approach or their quantification by another human resource accounting expert.		X Slightly modified not to have a 'should' statement as a footnote		

France	13	5.102 and 5.103		The definition of type A human failure events is slightly different between the §. (SSC important to safety versus SSC modeled in PSA). Please check.	X			
Germany	18	5.102 Line 3	… These events can occur during ~~repair~~, inspection, maintenance, testing, ~~inspection,~~ repair or calibration tasks.	Re-ordering to be consistent to other IAEA Safety Guides	X			
Germany	19	5.103	A systematic review of plant procedures should be performed to identify human failure events that might occur during the inspection, ~~repair,~~ maintenance, testing, ~~inspection~~ repair ~~and~~ or calibration tasks undertaken by operating personnel for the systems modelled in the Level 1 PSA (type A human failure events).	Re-ordering to be consistent to other IAEA Safety Guides.	X			
France	14	5.104	A systematic review of plant procedures and operating experience should be performed to determine potential human failure events that could lead to an initiating event (type B human failure events). At a minimum, it should be checked that these types of human failure event have been taken into account in the evaluation of frequencies of initiating events used in the analysis.	The OPREX may highlight IE induced by human	X			
France	15	5.105	The review should determine the potential for human failure events to occur and the effect of these potential errors on the accident scenario development, on unavailability or failure of a component, system or safety function. type C human failure events usually make a significant contribution to the core damage frequency.	Human errors can change also the accident scenario all SSC being however available	X			

ENISS	2	5.106	Significant errors of commission (i.e. incorrectly performing a necessary task or action or performing an extraneous task that is not necessary and might exacerbate the accident progression or cause an initiating event) should be taken into consideration. As a result, additional accident sequences might be created. ~~While~~ However, it is not yet general practice to include errors of commission in the base case PSA~~, it is considered good practice to use information on the general causes of errors of commission to reduce their potential (see, e.g., Ref. [15])~~.	The sentence proposed for suppression is ambiguous. In the meantime, it states that errors of commission are generally not modelled but proposes to reduce their potential using Ref.[15]. We consider this last part of the sentence applies to optimization of plant operation with respect to human interaction rather than PSA area. In addition, **Ref.[15] is still a draft document that is not yet known so we can not accept to blindly reference that document.**		X The concern of the reviewer is understood. The main idea of the second sentence is to highlight usefulness of EOC modelling to use the PSA insights later to improve HMI and perhaps other aspects of Human Factors Engineering. So, the sentence is completely rewritten. We suggest keeping the Ref.15 which is in the final stages of publication process and there is a high chance that it will be published before DS523. It provides summary of description of specific MS experiences on EOCs and is considered to be a useful reference for the reader. Later in the process of developing of DS523 all the draft references will be revisited.		

Germany	20	5.108	Actions that might be considered 'heroic' (e.g. operating personnel entering an environment with extremely high radiation levels to perform the action) or actions that are performed without any procedural guidance or training should not be included or credited in the analysis as normal practice, although exceptions may be made with justification, e.g. in case of long-lasting events.	Example for more clarity added in line with good practice	X			
Germany	21	5.111 (f)	Therm~~o~~al hydraulic analyses;	Editorial	X			
Germany	22	5.113 Line 3	… If this is not possible, ~~then~~ expert judgement should be used for the activities listed above. In any case, the correspondence of qualitative information to the actual plant status should later be verified and the PSA should be updated, ~~as~~ if necessary.	Editorial	X			
Germany	23	5.117 Line 1 and Line 8	The risk ~~importance~~ significance of human failure events … … In this approach, it should be ensured that the risk ~~importance~~ significance …	We suggest to use terminology, consistent with other Safety Guides. Please apply this to all the text of current Safety Guide – there are13 locations in this document, where changes should be done, e.g. paras 12.7, 12.10 etc.			X	The term importance is being used consistently with the 'Importance analysis' term which is a commonly used term for this purposes.
France	16	5.118	The assessment of type C human failure ~~events for internal and external hazards should include the following~~	The § do not belong to internal events PSA. Please move it to hazards PSA			X	The idea of this para is to complete the picture of discussion on HRA. Later on in the document the specifics for hazards PSA HRA is highlighted in Sections 7 and 8. We suggest to keep the para in Section 5. This clarification is added.

France	17	5.119, 5.120		The dependency between human actions and automatic actions is not mentioned (ex. due to the same information). Please complete.			X	These paras are specifically dedicated to the dependedncies between HFEs. The effect raised by the reviewers are considered to be explicit dependencies from the information available for the operator (e.g. false indication) which is considered separately – see for instance 7.63
Germany	24	5.121	Human failure events should be incorporated as basic events into the logic model. Depending on the definition and effect of a human failure event, the corresponding basic event can appear at an appropriate level in the system(s) fault trees or it can represent an event tree heading.	Clarification, as there could be more than one system as well.	X			
ENISS	3	5.132	The reliability assessment of software based systems should cover both hardware and software components as well as configuration data for the programmable logic devices of those systems. Modelling the reliability of software based systems is a challenge because the standard statistical approaches have limited applicability for the software modules. Recognized industrial practice is still to be established.	As regards Level 1 PSA as an industrial tool and an answer to regulatory requirements, only recognized industrial practices shall be recommended. To our knowledge, the reliability assessment of software based systems is still a R&D topic which does not benefit from recognized industrial practice. Therefore, **unless a specific recognized guidance or standard can be referenced, we firmly insist on the need to mention that recognized industrial practice is still to be established.**		X In order not to repeat the same sentence twice in a row, the following general statement was used as a footnote in relation to both paras 5.132 and 5.133. "The experience related to para 5.132 and 5.133 is limited and comprehensive guidance on that still to be established"		

ENISS	4	5.133	As for any systems analysis, the first task for the reliability assessment of a digital 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, could have adverse effects on a safety function and cause initiating events to consider. In addition, the interactions between the instrumentation and control systems should be analysed to define system dependencies for the system tasks under consideration. Recognized industrial practice is still to be established.	The industrial practice is to consider spurious actuation of systems that can cause PSA initiating events. Spurious actuations of systems combined with independent accident management can be excluded as very unlikely. **Unless a specific recognized guidance or standard can be referenced, we firmly insist on the need to mention that recognized industrial practice is still to be established**.		X In order not to repeat the same sentence twice in a row, the following general statement was used as a footnote in relation to both paras 5.132 and 5.133. "The experience related to para 5.132 and 5.133 is limited and comprehensive guidance on that still to be established"		
France	18	5.138		The § is valid for any automatic functions not only for programable functions. Please clarify.	X			
Germany	25	5.143	If plant specific experience is limited or absent, one of the main issues that needs to be addressed is whether the available data are applicable to the equipment design and the operating regime of the plant ~~in question~~ under consideration.	Clarification; consistency in the Guide itself and with other IAEA Safety Guided	X			
France	19	5.145	~~If the available operating data do not indicate the occurrence of failures, the initiating event frequencies and component failure probabilities assigned should be justified.~~	In any case the frequencies and probabilities should be justified (as indicated in § 5.146)	X			
Germany	26	5.150	In addition to the techniques mentioned in paras 5.14~~2~~3–5.148, another way of ….	Please check the reference, we guess para 5.143 is more suitable, as technique mentioning is starting from it. The same for para 5.160.	X			
France	20	5.152 5.156 5.159	The Level 1 PSA report The Level 1 PSA documentation The Level 1 PSA report	Is the intention to have two different documentations for IE frequencies and for components probabilities and unavailabilities? Please check	X	Revised systematically in the document		

France	21	5.158	Wherever possible, determination of component outage frequencies and durations should be based on plant specific data obtained from an analysis of the plant maintenance records and the records of component unavailability or plant TechSpecs, supplemented by data from similar plants. If this is not possible, generic data or manufacturers' data can be used as long as justification can be provided that such data reflect plant operating practices.	On source of information can be the techspecs as indicated in §5.80	X			
Germany	27	5.159	The Level 1 PSA report should present the data on unavailability of systems and components …	More comprehensive recommendation	X			
Germany	28	5.163	The analysts applying ~~users of~~ the codes should be adequately experienced and should understand the ~~uses~~ applicability and limitations of the code.	Clarification	X			
France	22	5.165	A sample of the sequences should be checked, ~~focusing on those that make a significant contribution to the risk.~~	Low frequency sequences due to modeling errors or wrong assumptions may also be important to check.	X			
Germany	29	5.171	Importance measures for basic events, groups of basic events, credited systems and groups of initiating events, should be calculated and used ~~to interpret~~ for interpretation of the results of the PSA.	Wording	X			
Germany	30	5.175 New footnote	The sensitivity studies should be conducted for the assumptions and data that have a significant level of uncertainty and that are likely to have a significant impact on the results of the Level 1 PSA. The sensitivity studies[FN] should be conducted by requantifying the analysis using alternative assumptions or by taking a range of numerical values for the data that reflect the level of uncertainty. FN: C. Berner and R. Flage. Strengthening quantitative risk assessments by systematic treatment of uncertain assumptions, Reliability Engineering and Systems Safety, Vol. 151, Issue C, 46-59, 2016.	We suggest to add a new footnote, which refers to corresponding literature, as guidance might be useful in order to achieve a structured sensitivity analyses.			X	In general, we try to avoid referring to specific scientific papers in the Safety Standards. However, the paper could be successfully referenced in the current TECDOCs on PSA where the uncertainty topic is being discussed.

Germany	31	6.1 (a)	**Internal hazards**, which originate from within the site boundary and are associated with failures of facilities and activities that are under the control of the operating organization. Hazards caused by (or occurring at) different facilities collocated on the same site are also considered to be internal hazards. Examples of internal hazards are internal fires, internal floods, internal explosions, internal missiles (e.g. turbine missiles), drop of heavy loads, on-site transport accidents and releases of hazardous substances ~~from on-site storage facilities~~ originating from within the site boundary.	Consistency with other Safety Guides, e.g. SSG-64, para 1.2.	X			
Germany	32	6.1 (b)	**External hazards,** including natural or human induced events, which originate outside the site boundary and outside the activities that are under the control of the operating organization, over which the operating organization therefore has very little or no control. Examples of natural external hazards are seismic hazards, external floods, high winds and other severe weather conditions; examples of human induced hazards are aircraft crashes, explosion pressure waves (blast), off-site transport accidents and releases of hazardous substances originating from outside the nuclear power plant site boundary.	Clarification	X			
Germany	33	6.2	Hazards, ~~including~~ which can also be combined hazards, 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).	Clarification	X			
Finland/ STUK	1	6.4 & 6.8, Fig. 2		Fig. 2 is missing. (6.4 refers to Fig. 2 but Fig. 2 title is given later inside 6.8)	X	Dure to formatting. Figure 2 is added.		

France	23	6.7	Dependent failures of these components ~~(whose random failures have been eliminated from the logic model)~~ resulting from damage owing to internal and external hazards should be incorporated in the Level 1 PSA models for internal and external hazards.	It is not a good practice to eliminate the random failures	X			
France	24	6.7		The § is not specific for hazards (identical with 5.161) and can be removed.	X			
France	25	6.8	+ deterministic analysis of hazard risks			X Added 'if performed'		
Germany	34	6.8 (e)	Current information on the location of pipelines, transport routes (air, rail, road, water) and on-site and off-site storage facilities for hazardous (e.g. combustible, toxic, asphyxiant, explosive, corrosive, radioactive) materials;	Radioactive materials are also important hazardous ones.	X			
Germany	35	6.10	(i) High energy arcing faults; (l) Radiation accidents involving other reactor units or radioactive sources collocated at the same site.	Clarification, more precise wording in line with other documents on this topic	X			
Germany	36	6.13	A list of potential combined hazards that might be significant to risk should be developed. In this context, SSG-64 [6] establishes three types of hazard combinations: consequential (subsequent) events, correlated events and unrelated (independent) events.	Even if "consequent" is in line with SSG-64, this was a (leftover) editorial mistake in SSG-64, which should be corrected here to "consequential".	X			
Japan	6	6.14.	All three types ~~categories~~ of hazard combinations should be included in the hazard identification and screening process for combined hazards.	For consistency, "types" should be used for hazards combination as para. 6.13.	X			
Germany	37	After 6.14 New para	6.14. All three categories of hazard combinations should be included in the hazard identification and screening process for combined hazards. 6.14 A For event combinations of consequential hazards, the assessment of consequences of the combined hazard could be part of the assessment of one of the single hazards, preferably the primary one.	This additional paragraph shall provide guidance to avoid duplicate assessments.	X	Added as a footnote to 6.14		

Germany	38	6.15.	For combinations of unrelated events, account should be taken of the duration of the impact of the individual single hazards in the combination (e.g. a seismic event during a long drought period, an internal fire at the plant during long-lasting external flooding).	Precision and clarification	X			
Germany	39	6.16 Footnote 34	Typically ~~Usually~~, ~~combined hazards~~ event combinations of external with other external hazards involve only natural hazards (e.g. a combination of high wind and high sea water level). However, combinations of natural hazards and human induced hazards are also possible and cannot be excluded a priori (e.g. an increased risk of ship accidents during severe weather conditions).	The footnote was written for the external-external combined hazards; however, the main text is written for all combined hazards: Therefore, the footnote needs precision to prevent misinterpretation.	X			
Germany	40	Heading before 6.18	SCREENING OF SINGLE AND COMBINED HAZARDS ~~AND HAZARD COMBINATIONS~~	We suggest to precise the title	X			
Germany	41	6.18	A successive screening process is generally established to minimize the emphasis on internal and external single and combined hazards ~~and hazard combinations~~ identified in accordance with paras 6.11–6.13 whose significance to risk is low, and instead focus the analysis on hazards that are risk significant. The successive screening process should be based on clearly defined screening criteria and consistently applied to ensure that none of the significant risk contributors from any internal or external single hazard or hazard combination relevant to the plant and the site are omitted.	Precision and clarification.	X			
Germany	42	6.19	(a) The hazard will neither lead directly to an initiating event nor significantly increase the core and/or fuel damage frequency …. (d) The impact of a combined hazard is not ~~greater~~ more severe than the impact of the more severe hazard in the combination.	- Consistency in the document, the aspect is important also for the spent fuel pool - Consistency and correct wording in line, e.g. with 6.19 (c)	X			

Germany	43	6.20	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 on the basis of full scope PSA).	Consistency in the document, the aspect is important also for the spent fuel pool.	X			
Japan	7	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 subclasses and the screening criteria applied to each subclass, so as to avoid screening out hazards with low frequency but high potential for damage. However, this approach should not be taken if a quantitative screening criterion can be applied to the hazard as a whole, as it might result in the screening out of each individual subclass and thus to the screening out of the hazard as a whole.	In order to clarify the meaning, typical examples should be indicated for "hazards as a whole" and "subclasses."	X			
France	26	7.1	This section provides recommendations on meeting Requirements 6–13 of GSR Part 4 (Rev. 1) [3] for a Level 1 PSA for internal hazards (see para. 6.8 for a list of typical internal hazards). ~~Specific recommendations are provided for Level 1 PSA relating to the internal hazards for nuclear power plants.~~ Other internal hazards are not explicitly covered in this Safety Guide but may be addressed using similar approaches.	Not clear		X Clarified		
France	27	7.2	Internal hazards (see paras 6.1 and 6.8) should be…	Please check the link	X	Corrected		
France	28	7.3	Enclosed plant areas, taking into account ~~assuming that~~ the existing protection features (e.g. physical separation, barriers, isolation equipment) in the plant design ~~will effectively~~ to contain the damage inside the area where it was initiated.	Proposal to avoid the misunderstanding that that the propagation of hazard is not taken into account	X			
Germany	44	7.3	Most internal hazards (e.g., ~~internal explosions,~~ fire, explosion, flooding) can occur in a variety of different locations within the ~~plant~~ site boundary (inside or outside buildings). …	Correct terminology, editorial	X			

France	29	7.4	Contributions to core and/or fuel damage frequency from the internal hazards that remain after the screening process should be determined using a Level 1 PSA for those hazards.	§7.2 indicates that the screening process is not necessary for internal hazards. Please clarify	X	The misleading part of 7.2 removed		
France	30	7.5	For the purposes of quantitative simplified assessments of the risk resulting from a specific internal hazard or for the screening of enclosed plant areas as specified in para. 7.3,	§7.3 do not describe the screening. Please clarify	X	The reference to 7.3 is misleading. Para revised for clarity.		
Finland/ STUK	2	7.6	The impact analysis should consider the effect of hazard induced component failures on initiating events included in the PSA and on associated ~~**mitigatory**~~ safety functions. Detailed…	Delete "mitigatory", it is an unnecessary extra word.	X			
France	31	7.6	The impact analysis should consider the effect of hazard induced component failures on initiating events included in the hazard PSA and on associated mitigatory safety functions.		X	Internal hazards is referred, since the para is in Section 7.		
France	32	7.7 (7.8[1])	The potential failure of the protection features such as barriers or physical separation that could lead to the propagation of the damage to other areas should be addressed by means of a specific detailed ~~hazard~~ analysis.	The analysis is more that hazard	X			
France	33	7.11	The combination of the probabilities of hazard induced failures of modeled SSCs ~~important to safety~~ and independent failures in the Level 1 PSA model will yield the hazard induced core damage frequency.	proposal		X Credited systems term was used throughout the document.		

[1] Due to removal of the paragraphs and addition of new paragraphs the numbers might not match. So, the blue numbers in brackets indicate the numbers of paragraph in the current version of the DS523.

France	34	7.12	A Level 1 PSA for internal fire is the probabilistic analysis of fire events occurring on the site of a nuclear power plant and their potential impact on safety. Using probabilistic models, the Level 1 PSA for internal fire should take into account [31]: (a) The possibility of a fire at any location on the site ~~in the plant~~; (g) The effects of fire on component dependencies and component failure probabilities;	For consistency Not clear	X				
Germany	45	7.12 (d) (7.15)	The possibility of damage to equipment owing to actuation of fire suppression systems (e.g. spray and flood caused by fire suppression systems and equipment might damage equipment that would otherwise survive a fire, or the failure mode of such equipment might be altered); ….	Precision in line with e.g. SSG-64	X				
France	35	7.13 (7.16)	7.13. Physical separation (i.e. fire barriers) between redundant trains of SSCs important to safety can limit the extent of fire damage. The quantification of the contribution of fire to the core damage frequency using the Level 1 PSA model for internal fire should ~~therefore~~ ~~generally~~ include probabilities of random failures of equipment not affected by the fire and the likelihood of a test or maintenance outage.	In any case the random failures should be considered	X				
France	36	7.15	(b) The performance of separate screening to take into account the potentially higher and additional fire loads (e.g. transient combustibles) and additional potential ignition sources typically associated with maintenance activities performed during shutdown states;	The screening was not mentioned before (for at power PSA). Please clarify	X				

Germany	46	7.15	For a Level 1 PSA for internal fire in low power and shutdown states, the following specific aspects should be considered:…	Clarification			X	The aspects listed below are related to specifically to shutdown modes elaborated later in Section 9. This concept was systematically applied throughout the document.
Japan	8	7.15.	For a Level 1 PSA for internal fire in shutdown states, the following specific aspects should be considered: (a) The specific items of the methodology for a Level 1 PSA for internal initiating events in shutdown states, as presented in Section 9; (b) The performance of separate screening to take into account the potentially higher and additional fire loads (e.g. transient combustibles) and additional potential ignition sources typically associated with maintenance activities performed during shutdown states; (c) The availability of fire protection means; (d) The potential for further paths for fire propagation (e.g. some doors might be open during shutdown states); (e) The increased occupancy of different plant locations during outages, which might improve the fire detection capabilities but might also create additional fire ignition sources; (f) The fire related plant operating and configuration changes that are implemented to control combustibles and those that are implemented to provide compensatory measures for system or component outages.	For consistency, "fire ignition sources" should be used as paras 7.18, 7.20, and so on.	X			

Germany	47	7.16 (7.19)	Deterministic fire hazard analysis and fire safe shutdown analysis, performed as applicable during plant design (see SSG-64 [6]) and operation (see ~~NS-G-2.1~~ SSG-77 [32]), should be used to provide an important input to the Level 1 PSA for internal fire.	NS-G-2.1 is superseded by SSG-77.	X			
Germany	48	7.17 Line 2	The approach to the Level 1 PSA for internal fire should be based on a systematic analysis of all locations within the ~~plant~~ site boundary: see Ref. [31].	Precision and consistency in the document	X			
France	37	7.18	In accordance with the level of detail of the analysis for the Level 1 PSA for internal fire, the frequency associated with a particular fire scenario depends on the ignition frequency and the probability of failure of fire suppression or fire barriers.	To be clearer	X			
France	38	7.19	The task of data collection and assessment in the Level 1 PSA for internal fire is aimed at preparing the necessary data. The task should be focused on collecting the plant specific data necessary for modelling the fire risk. However, some data used in the Level 1 PSA for internal initiating events will have to be reassessed to take into account fire induced conditions.	Not clear. Any example?			X	For instance: timing for implementation of specific action, failure probabilities of credited systems equipment which will work in the worse environmental conditions due to the fire (e.g. significantly higher overall temperature in the room, smoke conditions).
Germany	49	7.19 (7.22) Line 2	… The task should be focused on collecting the plant and site specific data necessary for modelling the fire risk.	Precision in line with SSG-64	X			
France	39	7.20	(f) Human actions in the event of a fire ~~and human error probabilities~~;	Not a plant data	X			
France	40	7.20	+ TechSpecs (or equivalent Fire Risk control documents)		X			
Germany	50	7.20 (7.22)	The plant and site specific data …	Precision in line with SSG-64 and SSG-68, some of the bullets are valid for the whole site	X			
France	41	7.22 (7.25)	(a) Their physical boundaries (e.g. walls, doors, dampers, penetrations, distance);	Fire zones can be separated also by distance	X			

Japan	9	7.24.	Estimation of the fire ignition frequency, both for fire compartments and for fire ignition 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).	For consistency, "fire ignition sources" should be used as paras 7.18, 7.20, and so on.	X			
Germany	51	7.27	Fire frequencyies should be estimated as a mean values …	Clarification, it is not only one frequency	X			
France	42	7.28	On the basis of the examination of plant components considered in the Level 1 PSA for internal initiating events and of SSC located in the fire compartments, a list of equipment to be modelled in the Level 1 PSA for internal fire should be established.	The list of components modeled in the internal events PSA might not be sufficient for Fire PSA	X			
France	43	7.29	The plant components and all the related elements of the model important to Level 1 PSA for internal fire should be identified.	Not clear which model. Please clarify.	X	Accepted. Revised to make it clear.		
Germany	52	7.33 (a) (7.36)	The fire load density (per floor area of the fire compartment) is below a specified accepted threshold and the potential for propagation is very low;	Precision, in line with SSG-64, where the term "fire load density is explained)	X			
Germany	53	7.34 Line 3 (7.37)	… Other protective measures (e.g., fire shields, protective coatings, enclosures not qualified as fire resistant) are not usually not taken into account.	Editorial	X			
Germany	54	7.37 (7.40)	For a multi-unit site and/or multi-source site, the potential spread of a fire from one reactor unit or radioactive source to a fire compartment of another reactor unit or another source should be considered in the analysis. The possibility of fires in common areas (e.g. diesels shared between units, switchyard) should be considered as well.	Please add	X			
Germany	55	Sub-heading before 7.38	~~*Integration of internal fire in the Level 1 PSA for internal initiating events*~~	The Title should be moved to a more appropriate place below, we suggest before 7.40		X 7.39 is also related to the use of Internal IEs PSA model and Fire risk integration.		

Germany	56	7.38 (7.41)	Screening of fire compartments by their contribution to the core and/or fuel damage frequency, on the basis of quantitative criteria, is aimed at further elimination of fire compartments or complexes of multiple fire compartments remaining after the first step of qualitative screening by impact.	Consistency in the document, importance for spent fuel pool	X			
Finland/ STUK	3	7.39 (7.42)	… reducing fire effects): all equipment inside the fire compartment itself is pessimistically considered ~~**unavailable**~~ **failed** and the means of detecting and extinguishing fires are not credited. …	Replace unavailable with failed, because all possible failure modes have to be covered (e.g. spurious operations).	X			
France	44	7.39 7.46 (7.42)	At this step, the contribution of fire to the core damage frequency should be calculated using a probabilistic model developed on the basis of the existing Level 1 PSA model for internal initiating events. The results of Level 2 PSA should also be taken into account	Screening only on CDF may be too restrictive for the risk. The contribution to releases should also be taken into account	X			
France	45	7.39	~~Human error probabilities for type C human failure events are penalized to take account of the fire context, as described in para 5.118(a).~~	Specific HRA process is described at 7.41		X Reformulated in a form of a bullet list with specific reference to 7.41		
Germany	57	7.39	At this step, the contribution of fire to the core and/or fuel damage frequency should be calculated using a probabilistic model developed on the basis of the existing Level 1 PSA model for internal initiating events. Such a model is typically used to calculate the conditional core and/or fuel damage probability for specific fire scenarios.	Consistency in the document, importance for spent fuel pool	X			

Germany	58	7.40 Line 4	This will allow the conditional core and/or fuel damage probability for each fire compartment to be calculated, from which the global contribution of fire to the core damage frequency may be calculated using the formula given in para. 7.5.	Consistency in the document, importance for spent fuel pool. The same for paras 7.44, 7.45, 7.46, 7.67 (g), 7.85, 7.87, 7.88, 7.98 (e), 7.102, 7.110, 7.115, 7.125, 8.4 (e), 8.5, 8.100, 8.115 (f), 8.116 (a), 9.33, 9.69 (a), 9.72 (a) and (b), 9.73 (a) - (c), 9.74, 11.5 (several bullets), etc. **Please check in the whole Sections 7 and 8**	X			
Germany	59	7.41 (b) (7.44)	Human failure events that are relevant only for fire, including abandonment of the main and/or supplementary control rooms.	Please include supplementary control room.	X			
France	46	7.41, 7.42, 7.43		This detailed HRA process is specific for screening or for detailed Fire PSA? Please clarify		X This part is related to the screening (added under the screening heading). However later for detailed analysis more realistic modeling of the HFEs is recommended (see para 7.49 and 7.50)		
France	47	7.50		This should be also mentioned to 7.41			X	7.41 is related to fire impacts in general, it does not contain the detailed list of effects to be considered).

France	48	7.53	For the fire scenarios to be analysed, human reliability for manual actions and component reliability for fire detection and suppression systems and equipment should be assessed using the same methodology as presented in 7.41 ~~Section 5 for PSA for internal initiating events.~~	The HRA process presented in 7.41 is more appropriated		X Reference to 7.41, 7.49 and 7.50 added. Given that Section 5 contain complete set of recommendations related to HRA methodology in general, which should be also used in the context of fire (e.g. dependencies), therefore it is suggested to leave reference to Section 5 as well.		
France	49	7.57	In addition, 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 components of redundant trains.	This part is valid for any fire not only for control rooms. To be moved after 7.56		X It is mentioned in 7.48, however is not highlighted explicitly. 7.48 is now revised to stress that point. Also 7.57 is revised accordingly to focus on MCR and Supplementary CR.		
France	50	7.60 7.61	*Multicompartment fire analysis*	This part is not a specific analysis and should be considered for any Fire PSA scenario. To be moved after 7.56	X			
Germany	60	Sub-heading before 7.60, Paras 7.60, 7.61, 7.67 (f)	*Multi-compartment fire analysis*	Editorial (please check the whole document)			X	Based on consultation with editors, no hyphen is to be used

Germany	61	7.60 Line 5	… Multi-compartment detailed fire analysis should be based on a: - fire growth model, - a model for analysis of fire propagation and - a model for fire detection and suppression.	Editorial and suggestion to make the text more reader friendly		X Based on consultation with editors, no hyphen is to be used in 'multicompartment'		
Germany	62	7.61 A	7.62 A The potential for occurrence of combinations …	Paragraph number in one after 7.61 is missing, please add.	X			
Japan	10	Between paras. 7.61. and 7.62.	7.62. The potential for occurrence of combinations of fires and other hazards of all three combination types categories mentioned above in para. 6.13 (as defined in SSG-64 [6]) should be assessed. Combinations involving fire as a consequence of other hazards should be considered in the Level 1 PSA for those hazards, whereas combinations involving fire with other 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 and combinations of fires with unrelated hazards (occurring simultaneously but independently) that have not been screened out, the analysts should decide whether these combined hazards are to be considered in the Level 1 PSA for internal fire or for one of the other hazards.	Para. No. is missing. For consistency, "types" is used for hazards combination as para. 6.13.	X			
France	51	7.65	The results and the model used for quantitatively screening out fire compartments by frequency should be included in the Level 1 PSA for internal fire … Assumptions relating to screening should be reviewed at this final stage to consider whether contributors to the core damage frequency that were screened out need to be added to the detailed model.	Not clear what is the result of Fire PSA (detailed analysis only?). Please clarify.	X	Sentence revised.		
France	52	7.67	(f) The results of the detailed analyses of fire scenarios, for example for the main control room, for the electrical component room and for multicompartment fires;	Not clear what is the result of Fire PSA (detailed analysis only? quantitative screening included?). Please clarify	X	Sentence revised.		

France	53	7.68 (7.71)	A Level 1 PSA for internal flooding is the probabilistic analysis of events relating to release of liquids (usually water) occurring on site or inside plant buildings and the potential impact of such releases on safety.	To be consistent with the definition of internal hazards 6.1a	X			
France	54	7.70 (7.73)	(d) Flooding related alarms, leak detection systems, capacity of draining systems and flooding related protection for components (such as equipment trip signals) and flooding isolation means (valves…);		X			
Germany	63	7.77 (7.80)	The frequency~~y~~ies of flooding should be estimated as ~~a~~ mean values with statistical uncertainty intervals.	Editorial and consistency in the document	X			
France	55	7.78	For each flooding area, the SSCs that could be affected by flooding occurring inside should be identified. Depending on the scope of the analysis, the following flooding effects on equipment could be relevant: submersion, temperature, pressure, spray, steam, pipe whip or jet impingement as a consequence of a break in high energy piping or valve binding.	Not clear why the flooding PSA can cover only partially the risk related to flooding. Please explain.	X	Accepted. The consideration of the effects should not depend on the scope of analysis.		
Finland/ STUK	4	7.80 (7.83)	The possibility of flood~~water~~ spreading from one area to another should be assessed, including consideration of barrier failure.	Delete water, because also steam is included in flooding effects (given in 7.78).	X			
Finland/ STUK	5	7.81 (7.84)	All possible routes for the propagation of flood~~water~~ should be taken into consideration, for example, non-leaktight doors, equipment drains and the possibility of normally closed doors or hatches being left open.	Delete water, because also steam is included in flooding effects (given in 7.78).	X			
France	56	7.82 (7.85)	The location, including the elevation and any protection features of electrical and/or electronic components (e.g. cabinets, terminal boxes for cables for SSCs important for safety) and other components that are sensitive to humidity should be identified. In this way, the vulnerability of components with respect to flooding ~~of certain rooms~~ can be identified.	And the other rooms ?	X			

France	57	7.84	(i) The flooding area contains no equipment that can cause an initiating event or necessitate manual shutdown;	In coherence with 7.33			X	Leading to the necessity for a manual shutdown is a part of the IE definition (see 5.11 – 'challenges normal operation'). Therefore additional clarification is not needed.
Germany	64	7.84 (b) (7.87)	The ~~compartment~~ flooding area does not contain any sources of flooding, including flooding originating from other ~~compartments~~ flooding areas, sufficient to cause failure of equipment.	Consistency in the document	X			
France	58	7.86		Identical with fire PSA. Please consider regrouping in the hazard PSA general part		X The parts related to fire and floods in section 7 are harmonized. They are made with the similar internal structure, but kept as individual parts focusing on hazard specific discussions.		
France	59	7.87 (7.94)	For quantitative screening, a conservative approach should be taken, which assumes that all components in the area being affected by the flooding will fail. If this assumption does not give rise to a significant contribution to the core damage frequency (calculated using the formula given in para. 7.5), the flooding area can be screened out from detailed analysis. The results should however be counted in the global results of Flooding PSA.	To be more clear.	X			
Germany	65	7.89 (a) Line 3 (7.96)	…should however remain in the overall internal flooding PSA results~~, however~~.	Editorial	X			

France	60	7.93		Similar, but less complete that 7.86. Please check. However,7.86 HRA processes is too detailed for the screening analysis.		X The parts related to fire and floods in section 7 are harmonized. They are made with the similar internal structure, but kept as individual parts focusing on hazard specific discussions.		
France	61	7.94, 7.95		Similar as for fire. Propose to group in the general part of hazard PSA		X The parts related to fire and floods in section 7 are harmonized. They are made with the similar internal structure, but kept as individual parts focusing on hazard specific discussions.		

Japan	11	7.94. (7.103)	The potential for occurrence of combinations of internal flooding and other hazards of all three combination ~~categories~~ types mentioned in para. 6.13 (as defined in SSG-64 [6]) should be assessed. Combinations involving internal flooding as a consequence of other hazards should be considered in the Level 1 PSA for those hazards, whereas combinations involving internal flooding with other 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 and combinations of internal flooding with unrelated hazards (occurring simultaneously but independently) that have not been screened out, the analysts should decide whether these combined hazards are to be considered in the Level 1 PSA for internal flooding or for one of the other hazards.	For consistency, "types" should be used for hazards combination as para. 6.13.	X			
France	62	7.98	Add before (a) A description of the flooding protection features specific to the plant, including passive and active mitigation features, as well as partitioning of the plant into flooding zones.	To be consistent with fire PSA section (7.67).	X			
France	63	7.102	~~The contribution of the collapse of structures and heavy load drops to the core damage frequency should be calculated, unless the event can be discarded on a probabilistic basis~~.	Not clear how to discard on probabilistic basis. Please explain or delete the §.	X			
France	64	7.103	The Level 1 PSA for the collapse of structures or heavy load drops should be consistent with the plant response model developed for the Level 1 PSA for internal initiating events in shutdown states (see para. 9.12).	Why only in shutdown states? Can be also for power states and for SFP. Please explain.	X	Reference to 9.12 is left as an example		

France	65	7.107		Similar with before § on HRA (7.41, 7.86, 7.93,). Consider grouping.			X	The HRA related parts on different hazards in section 7 are harmonized. It is suggested to keep them as a part of each hazard description, focusing on hazard specific discussions (if applicable) and providing complete set of relevant paras for a particular hazard.
Finland/ STUK	6	7.110	**To be added:** The impact of flooding on components relevant to PSA should be considered in the context of the analysis of the impact of turbine missiles.	Turbine disintegration may cause also damages of the turbine condenser or pipelines (these kinds of events have really happened at NPPs).	X			
France	66	7.110	~~The contribution of turbine disintegration (e.g. failure of turbine rotor) to the core damage frequency should be calculated, unless the event can be discarded on a probabilistic basis~~.	Not clear how to discard on probabilistic basis. Please explain or delete the §.	X			
France	67	7.110	The impact of a fire owing to ignition of hydrogen or owing to oil combustion on components relevant to PSA should be considered in the context of the analysis of the impact of turbine missiles.	The link with turbine missiles is not clear? Please explain.	X			
Germany	66	7. 116	A plant walkdown should be performed to confirm the assumptions in the analysis regarding protection of structures, ~~buildings and the selected equipment~~ systems and components against turbine missiles.	Consistency	X			

France	68	7.118		Similar with before § on HRA (7.41, 7.86, 7.93, 7.107). Consider grouping.			X	The HRA related parts on different hazards in section 7 are harmonized. It is suggested to keep them as a part of each hazard description, focusing on hazard specific discussions (if applicable) and providing complete set of relevant paras for a particular hazard.
France	69	7.119		Different from 7.112. Please explain.	X	7.119 supplements discussion in 7.112. 7.112 refers to the overall list of potential turbine missile scenarios, whereas 7.119 says that within each scenario the worst possible configuratuion needs to be analysed. Paragraphs combined and rewritten.		
France	70	7.121	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 designed 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 section dedicated to internal explosion should at least mention the type of explosions which might be consider in the PSA: - H2 - Inside circuits - HEAF. Not clear how to split between fire PSA and explosion PSA.	X	Agree that in most of the cases explosion PSA is part of Fire Study (footnote added), however not always.		
France	71	7.125	~~The contribution of internal explosion to the core damage frequency should be calculated, unless the event can be discarded on a probabilistic basis.~~	Not clear how to discard on probabilistic basis. Please explain or delete the §.	X			

France	72	8.2	External hazards (see paras 6.1 and 6.8) should be considered in the frame of a bounding assessment and/or detailed analysis; ~~a conservative screening analysis is usually omitted (it has been demonstrated in many studies that such external hazards are sometimes significant contributors to the overall risk).~~	Not all external hazards are significant contributors for all plants. Initial screening is always necessary.				
France	73	8.4		The process described here is mainly applicable to the detailed analysis (which is not described anywhere else in the section). Please check	X	The process described is an overall approach for consideration of external hazards in PSA. Comment accepted and this para is moved out of description of bounding assessment and the detailed assessment coming later.		
Japan	12	8.5.	Contributions to the core damage frequency from those external hazards that remain after the screening process should be determined using a Level 1 PSA for those hazards. A Level 1 PSA for external hazards should rely on the model of plant response developed for the Level 1 PSA for internal initiating events, both for power operation and shutdown states. The availability of a Level 1 PSA for internal initiating events should be a prerequisite for the development of a Level 1 PSA for external hazards. The results of the hazard analysis may yield further initiating events in addition to those found by performing the Level 1 PSA for internal initiating events (e.g. ~~the loss of all information in the main control room in the event of fire~~ XXXXX). In such cases, new accident sequences should be developed and integrated into the Level 1 PSA.	The current example is a copy of para. 7.4 and is an example for internal hazards. Appropriate example that applies to external hazards should be given.	X			

Japan	13	8.8.	Since the information from plant walkdowns might provide significant input to the Level 1 PSA for ~~internal~~ external hazards, such walkdowns should be well planned, organized and thoroughly documented.	This section provides guides for external hazards.	X				
France	74	8.14	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.	Not easy to perform a simplified Level 1 PSA for seismic hazards. The seism effects (flooding and fires) are difficult to consider even in a detailed seismic PSA. Please give more details.	X	This is related to the bounding assessment of a certain range, where conservative assumptions could be used as a first approximation (e.g. seismic induced loss of certain building)			
Germany	67	8.14.	Seismic hazards are important contributors to core 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~~ pessimistic assumptions.	Please change to "pessimistic assumptions" as this is the case of screening.	X				
France	75	8.18		List of high winds different from 8.17. Please explain how it was reduced.	X	Para simplified (reference is made to the list above)			
Germany	68	8.18	The following types of high wind should be considered and be subjected to bounding assessment or detailed analysis, depending on the location of the site: …	Editorial	X				
France	76	8.19		List of floodings different from 8.15. Please explain how it was reduced.	X	Para simplified (reference is made to the list above)			
France	77	8.19	~~Applicable combinations of external flooding hazards with other hazards, as described in para. 6.11 should be considered, taking into account possible dependencies (e.g. high water levels, consequential dam failures).~~	Text identical with 8.16		X 8.14 (former 8.16) is removed. 8.16 (former 8.19 kept to reflect specifics of combinations of external flooding hazards).			

Germany	69	8.19 Line 10	Applicable combinations of external flooding hazards with other hazards, as described in para. 6.11 should be considered as well, taking into account possible dependencies (e.g. high water levels, consequential dam failures).	Clarification	X			
Germany	70	8.22	Applicable combinations of natural hazards with other hazards, as described in para. 6.11 should be considered, taking into account possible dependencies (e.g. severe weather conditions, transport accidents, internal fires).	For being systematic and comprehensive, not only examples of external hazards but also an example internal hazards should be mentioned.	X			
Germany	71	8.23 (d)	Releases of hazardous substances (e.g. asphyxiant, combustible, corrosive, explosive, ~~and~~ toxic or radioactive materials): …	Consistency in the document and with SSG-64 and SSG-68	X			

Germany	72	8.24 (8.22)	The following sources of human induced hazards should be considered ~~at~~ as a minimum: (a) Fires spreading from nearby facilities or owing to a transport or pipeline accident; (b) Explosions of solid substances or gas clouds from nearby facilities or owing to a transport or pipeline accident; (c) Releases of chemical materials from nearby facilities or owing to a transport or pipeline accident; (d) Aircraft crashes; (e) Collisions of ships with water intake structures. The following sources could also be considered as human induced hazards: ~~(f) Excavation work outside the site boundary;~~ (~~g~~ f) Electromagnetic interference, initiated by off-site sources (e.g. radio transmitters, military radar stations, particle accelerators, high voltage transmission lines, telephone network). ~~(e.g. magnetic or electrical fields generated by radar, radio or mobile phones) outside the site boundary.~~ (~~f~~g) Excavation work outside the site boundary.	- Editorial - Issues related to electromagnetic interference should be formulated in line with SSG-68 “Design of Nuclear Installations Against External Events Excluding Earthquakes” and SSG-77 “Protection Against Internal and External Hazards in the Operation of Nuclear Power Plants”.	X			
Japan	14	8.26. (b)	The frequency and/or energy content, which is generally represented by spectral accelerations associated with the ground response spectrum	The frequency content should also be given because it is considered in Japan.	X			
Germany	73	8.29	*The High Wind para 2.9 with Title to it in Chapter “PARAMETERIZATION OF EXTERNAL HAZARDS”, Section 8, must be moved behind the Hydrological Hazards in the same Chapter.*	Re-location of para 8.29 below 8.30 to 8.33 needed for consistency with the structure before (see, Chapter “BOUNDING ASSESSMENT AND DETAILED ANALYSIS FOR LEVEL 1 PSA FOR EXTERNAL HAZARDS”, Section 8) in the document		X Reorganization of the paras in this section was done in general to keep consistency and addressing other comments.		

Germany	74	8.34 (8.32)	For each human induced hazard, the parameters should be defined on the basis of their specific challenge to SSCs important to safety, for example as follows: …. (b) For releases from nearby industrial facilities, the nature of the hazardous material and the maximum amount that could be released in an accident are ~~appropriate~~ suitable parameters.	Clarification	X			
Germany	75	8.38 (8.36)	A detailed analysis should be performed for all (single and combined) hazards for which the bounding or simplified analysis with ~~conservative~~ pessimistic assumptions has demonstrated that the risk from the hazard might be non-negligible.	Please change to "pessimistic assumptions" as this is the case of screening.	X			
Germany	76	8.51 to 8.55	*The High Wind paras 8.51 to 8.55 with Title of them in Chapter "FREQUENCY ASSESSMENT FOR EXTERNAL HAZARDS", Section 8, must be moved behind the Hydrological Hazards in the same Chapter.*	Re-organisation of paras 8.51 to 8.55 below 8.56 to 8.62 needed for consistency with the structure before (see, Chapter "BOUNDING ASSESSMENT AND DETAILED ANALYSIS FOR LEVEL 1 PSA FOR EXTERNAL HAZARDS", Section 8) in the document		X Reorganization of the paras in this section was done in general to keep consistency and addressing other comments.		
Germany	77	8.67 (a) (ii) (8.65)	Distance (in kilometres) of potential hazard sources to the nuclear power plant: - To the structures; - To buildings housing ~~safety significant equipment~~ items important to safety; - To ventilation intakes.	Clarification	X			
France	78	8.72 (8.70)	The initial list of SSCs for seismic fragility analysis should be based on the ~~include all~~ SSCs that are included in the Level 1 PSA model for internal initiating events. The list should be expanded to include all SSCs and their combinations that, if failed, could contribute to core damage frequency or large release frequencies; the latter is important for Level 2 PSA considerations.	Not all SSC modeled in internal events PSA are considered in the SEL	X			

UK	2	8.74/4	Please provide clarification (or remove) the first bullet: 'Screening of inherently seismically rugged equipment items from the seismic model'.	The bullets within para. 8.74 are a new addition to what was para. 8.68 in the version of the safety guide issued at Step 8. Clarification is required to specify the screening criteria to be used to determine whether equipment is 'seismically rugged'. Could reference be made to related guidance or internationally adopted practice for seismic PSA? Is this the same as (or different to) high confidence low probability of failure (HCLPF)?	X			
Germany	78	8.84	For plant structures that are not founded on rock, soil structure interaction analysis, including the embedment effect and ground motion incoherence function, is needed.	Wording	X			
France	79	8.85 (8.83)	In assessing the impact of high winds, consideration should be given to specific features of exterior barriers (i.e. walls and roofs) surrounding SSCs important to safety, any weather exposed SSCs, or combinations thereof, and the consequences of damage from impact of windborne missiles or other effects (structure damages, ventilation ducts collapsing…) that might result in an initiating event or mitigation or support system failures.	To be more complete.	X			
Germany	79	8.85 to 8.88	*The High Wind paras 8.85 to 8.88 with Title of them in Chapter "FRAGILITY ANALYSIS FOR STRUCTURES, SYSTEMS AND COMPONENTS", Section 8, must be moved behind the Hydrological Hazards in the same Chapter.*	Re-organisation of paras 8.85 to 8.88 below 8.89 to 8.92 needed for consistency with the structure before (see, Chapter "BOUNDING ASSESSMENT AND DETAILED ANALYSIS FOR LEVEL 1 PSA FOR EXTERNAL HAZARDS", Section 8) in the document		X Reorganization of the paras in this section was done in general to keep consistency and addressing other comments.		

Japan	15	8.87. (8.85)	In evaluating wind related fragilities of SSCs, plant specific data <u>(e.g. anchorage of equipment for against high wind and installation of barriers for against windbome missiles)</u> should be used. Any structures that could fall into or onto structures that are important to safety, thereby causing damage, should be considered in the assessment. In this assessment, findings from plant walkdowns should be used as an important source of information, for example to justify any modelling parameters <u>for fragility analysis</u>.	In order to make clear the detail of "plant specific data" in this paragraph, the example should be added. "modelling parameters" is not clear.	X			
France	80	8.90	In assessing fragilities of SSCs in respect of external flooding, plant specific data should be used. ~~Any structures that could fall into or onto structures important to safety, thereby causing damage, should be considered in the assessment.~~	Not typical for flooding events.	X			
Germany	80	8.90 Line 4	… All structures located at low levels, in particular intakes and ultimate heat sinks, should be ~~included~~ taken into consideration.	Editorial	X			
Germany	81	8.93	The general aspects and recommendations for the fragility analysis <u>of SSCs with regard to</u> natural hazards should be followed for human induced hazards as applicable.	Clarification.	X			

Canada	1	8.96	Add this bullet to paragraph 8.96: *"(d) Human failure events that are related to deployment of Emergency Mitigation Equipment (EME) (mobile/portable and temporary equipment). In such cases, current Human Reliability Analysis methods that are commonly used in the nuclear power industry are not designed to accommodate the evaluation of some of the tasks associated with the EME deployment, such as the retrieval, transportation and installation of the EME (e.g. making temporary power and pipe connections.). Therefore, when using EME, the HRA method should account for the conditions that are anticipated to be relevant for deployment, including environmental considerations for common external events and the unique performance-influencing factors associated with EME human actions."*	This bullet should be added to highlight the importance of assessing HFEs related to deployment of Emergency Mitigation Equipment (EME) (mobile/portable and temporary equipment) in HRA for external hazards.		X This item was initially considered as a part of items (a) – portable equipment is expected to be modeled also as a part of internal IE PSA and item (b) if the portable equipment is to be used as a response to the specific external hazard. Therefore it is suggested not to mentioned it as item (d) in order not to duplicate. But to include it as a footnote to highlight the specific importance for external hazards. Limitations of the HRA methods for portable equipment is already mentioned in 5.109, so the reference is made to that and also currently developing IAEA Safety Report on HRA Ref. [15].		
France	81	8.96		HRA § already mentioned several times in the document.	X	Yes, but each time the HRA para is adjusted to the specific context (in this case to external hazards with associated example and the footnote)		

France	82	8.100	+ loss of site structures (dikes for example) + heavy load drop (polar crane for example)	Other seismic induced failures are also possible	X			
France	83	8.105		In the whole section for seismic PSA the seismic correlated failures are not mentioned. Please check.	X	Consideration of correlated failures is specifically mentioned in fragility analysis (see 8.72 bullet 1). Added also in 8.105.		
Germany	82	8.109 to 8.110	*The High Wind paras 8.109 and 8.110 with Title of them in Chapter "INTEGRATION OF EXTERNAL HAZARDS IN THE LEVEL 1 PSA MODEL", Section 8, must be moved behind the Hydrological Hazards in the same Chapter.*	Re-organisation of paras 8.109 to 8.110 below 8.111 to 8.112 needed for consistency with the structure before (see, Chapter "BOUNDING ASSESSMENT AND DETAILED ANALYSIS FOR LEVEL 1 PSA FOR EXTERNAL HAZARDS", Section 8) in the document		X Reorganization of the paras in this section was done in general to keep consistency and addressing other comments.		
Germany	83	8.110 Line 3 (8.108)	… Other factors to be considered should include unavailability or failure of the equipment and human errors ~~that are~~ not related to high winds. Probabilities of human errors should be adjusted to take into account the effects of wind on performance shaping factors, as discussed in para. 8.96.	Editorial, for better understanding that further equipment failures and human errors are to be considered in this case as well.	X			
Germany	84	8.111 Line 3 (8.109)	… Other factors to be considered should include unavailability or failure of the equipment and human errors ~~that are~~ not related to external floods.	Editorial, for better understanding that further equipment failures and human errors are to be considered in this case as well.	X			
France	84	8.112	Uncertainties, dependencies and correlations should be taken into full accounted in developing accident sequence models for initiating events induced by external flooding.	Please explain (give examples) of correlations in the context of external flooding.	X	Example is provided as a footnote.		
Germany	85	8.114 (8.112)	The general aspects and recommendations for model integration of ~~seismic hazards, high winds and~~ natural external ~~hazards~~ ~~floods~~ should be followed.	Precision and editorial	X			

Germany	86	8.122	*The High Wind para. with Title to it in Chapter "DOCUMENTATION AND PRESENTATION OF RESULTS", Section 8, must be moved behind the Hydrological Hazards in the same Chapter.*	Re-organisation of para 8.122 below 8.123 needed for consistency with the structure before in the document		X Reorganization of the paras in this section was done in general to keep consistency and addressing other comments.		
Germany	87	9.2 Line 6	… Obviously, the ~~probability of~~ occurrence frequency of an external hazard is ~~then~~ much smaller ~~in the~~ during shutdown states.	Clarification, consistency	X			
Germany	88	9.21	9.21. If some initiating events are screened out of further analysis owing to a low occurrence frequency attributable to the low fraction of duration of relevant plant operating states, then ~~this~~ assumption in para 9.20 should be revisited and justified if the Level 1 PSA is being used for risk monitor applications.	May we ask you kindly to verify what exactly assumption is meant here? We guess assumption from para. 9.20 might be suitable.	X			
Germany	89	9.31	In the accident sequence analysis, the possibility of actions by operating personnel aimed at recovering reactor core cooling as well as water supply into the reactor from alternative sources should be considered as mitigation actions, ~~at~~ as a minimum.	Clarification	X			
Germany	90	9.33 Line 7	… On the other hand, there are modern analytical tools offering the possibility of modelling the accident sequences ~~up to~~ and the corresponding release categories. Such approaches do not involve ~~such a grouping~~ the above-mentioned grouping of plant damage states for the Level 1 PSA. Appropriate sequence mission times should be specified (see para. 5.52), taking into account the specific features and timing of the processes taking place.	Clarification.	X			

Germany	91	9.37.	As described in paras 5.86–5.91 for power operation, the objective of this analysis is to identify dependencies that might influence the logic and quantification of the accident sequences and system models. The main types of dependencyies in this regard are functional dependenciese — on supply systems and support systems; hardware sharing between systems or ….	Clarification	X			
France	85	10.9	Examples of the types of initiating event to be considered in the Level 1 PSA for the spent fuel pool are as follows: (a) Loss of cooling (i.e. failure of spent fuel pool heat removal system, loss of off-site power); (b) Loss of coolant inventory (e.g. pipe rupture in the spent fuel pool heat removal circuit, inadvertent draining owing to erroneous human intervention); (c) Loss of off-site power; (d) Inadvertent draining (e.g. owing to erroneous human intervention); (e) Reactivity accidents (e.g. boron dilution, fuel loading errors)	Proposal in order to be consistent with actual practices and with the following paragraphs	X			
Germany	92	10.10	In the accident sequence analysis, the possibility of actions by operating personnel aimed at recovering the spent fuel pool cooling system as well as water supply into the spent fuel pool from alternative sources should be considered as mitigation actions, at as a minimum.	Clarification	X			
France	86	10.12	Potential dependencies between Level 1 PSA for the reactor core and Level 1 PSA for the spent fuel pool should be considered	The dependencies are between the reactor and SPF not between the PSAs	X			

France	87	10.16	In the accident sequence analysis, the possibility of actions by operating personnel aimed at recovering the spent fuel pool cooling system as well as water supply into the spent fuel pool from alternative sources should be considered as mitigation actions, at a minimum. The question of accessibility to perform local actions while the SFP temperature is increasing or even boiling should be addressed. Similarly, dewatering of the spent fuel element under handling may lead to difficulties to perform local actions (as for example the placing in safe position of this spent fuel element). Automatic actuations should also be considered, if applicable.	One very important aspect for SFP HRA is the question of accessibility to perform local actions.	X	The aspect related to potential issues with implementation of local actions specifically highlighted in 10.14. A para is added to HRA part to address accessibility concerns.		

Germany	93	Section 11 General comment	*Within MUPSA, consideration risk aggregation from (external and internal hazards) which may affect not only one reactor unit but several units or even the whole site (including negative effects on SSCs and human resources shared between reactor units, accessibility, etc.) is meanwhile accepted practice. The IAEA has recently published the corresponding information/guidance available in the frame of their MUPSA activities.* *This aspect is missing in Section 11 and should be addressed according to the state-of-the-art.*	A few paragraphs on the risk aggregation from hazards in MUPSA are therefore needed in Section 11 and could probably be taken from the MUPSA TECDOC (reference has been added already in the References Section) and modified accordingly.		X The need for aggregation is highlighted in general in the document and specially mentioned in 12.7 when describing the heterogeneity of different inputs during risk aggregation and importance of its consideration for risk-infromed decision making. Specific paragpaph added in the quantification part of Section 11 with corresponding references within the publication and also to the other recently developed IAEA documents (see Ref. [44] and Ref. [45]).		
Germany	94	11.4 Footnote 46	A multi-unit initiating event is an initiating event that immediately results in a reactor trip or challenge to normal operation (or a degraded condition that eventually leads to a trip or challenge to normal operation) of two or more units.	Consistency: it must be either reactor trip or reactor scram		X The footnote is significantly revised to address changes made in 5.11.		
Germany	95	11.21	Inter-unit common cause failures for relevant SSCs should be identified and modelled.	Clarification	X			

Japan	16	11.23.	The quantification of the MUPSA risk profile should take into account all undesired end state combinations of the units on site. In order to address all effects and interdependencies of multiple collocated units and/or spent fuel pools, it is practical to use the integral PSA model for the site which includes all considered initiating events, accident sequences and ~~mitigating~~ credited system functions.	Safety systems are also taken into account.	X			
Germany	96	12.7 Line 10	… Therefore, it is highly recommended to calculate the risk significance ~~importance~~ of the various equipment separately for each risk contributor. As an example, risk significance ~~importance~~ measures for seismic events and internal events should be calculated separately.	Please change to “risk significance” instead of “risk importance”. We suggest to use the same wording in all the text, applicable e.g. for para 12.27, line 5 etc.			X	The term importance is being used consistently with the ‘Importance analysis’ term which is a commonly used term for this purposes.

Japan	17	12.13.	In accordance with Requirement 4 of GSR Part 4 (Rev. 1) [3], depending on the specified probabilistic safety goals or criteria, the safety assessment should include a full scope PSA for evaluating and assessing challenges to safety in normal operation, anticipated operational occurrences and accident conditions. The completeness of the PSA (which includes a comprehensive set of internal initiating events, internal hazards and natural and human induced external hazards and addresses all plant operating states including startup, power operation, shutdown and refuelling) will ensure that the insights from the PSA relating to the risk significance of accident sequences, SSCs, human errors and common cause failures, are derived from a comprehensive, integrated model of the plant. However, for some PSA applications, it is expected that insights from a plant specific or a generic Level 2 or even Level 3 PSA might be necessary.	Safety assessment will be made by the proper combination of deterministic and probabilistic analysis. Full scope PSA is not a mandatory to meet the requirement 4 of GSR part 4 (Rev. 1). See 4.13 of GSR part4 (Rev. 1). The safety assessment shall include a safety analysis, which consists of a set of different quantitative analysis for evaluating and assessing challenges to safety by means of deterministic and also probabilistic methods. The scope and level of detail of the safety analysis are determined by use of a graded approach, as described in Section 3. Determination of the scope and level of detail of the safety analysis is an integral part of the safety assessment.	X			
Germany	97	12.25	In a PSA conducted at an early design stage, ~~the for~~ the fact that additional assumptions are needed owing to lack of design and operating details should be documented, and the validity of these assumptions should be checked at a later stage in the design (e.g. at the construction or pre-operational stage).	Editorial	X			

UK	3	12.33/all	Please remove the paragraph: '~~PSA results and insights are dependent on design features and provisions (including human interactions and associated procedures) that are credited in the PSA. The actual use of these 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 operating 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~~.'	This is a new paragraph added after what was para. 12.30 in the version of the safety guide issued at Step 8. This appears to go beyond the scope of the report. Not all increases in risk identified in the PSA automatically need to be reduced in the design and the expectations for PSA prior to licensing are a matter for each member state. This is considered in more detail in the following section (para. 12.34 onwards) and acknowledged in footnote 55 at the bottom of page 123. Removal of para. 12.33 will remove this potential inconsistency.	X			
Germany	98	12.41 (12.40)	Paragraph 4.46 of SSR-2/2 (Rev. 1) [37] states that "probabilistic safety assessment can be used for 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 the recommendations on ~~s~~Safety factor 6: Probabilistic safety assessment, provided in IAEA Safety Standards Series No. SSG-25, Periodic Safety Review for Nuclear Power Plants [41].	We suggest introducing a short clarification, what Factor 6 in SSG-25 is about, to make it more reader-friendly.	X			

France	88	12.43	In a periodic safety review, the PSA should be used to create an up to date overview of the whole nuclear power plant and to help in identifying cost-effective improvements to safety.56 Consequently, the PSA should use plant specific data, model as built and as operated plant conditions and address the possible impact of ageing phenomena and component lifetime considerations on the overall risk metrics. Sensitivity calculations could be performed to assess the potential effect of ageing on passive components, which are not normally maintained or replaced. Level 1 PSA for internal initiating events should be used to verify the adequacy of provisions for design extension conditions to prevent significant fuel degradation, taking into account operating experience or evolution of knowledge.	Proposal in accordance with the practices in France.		X New paragraph is added with the similar idea but for all potential PSA applications. DEC is mentioned as an example.		
Germany	99	12.45 (d)	Establishing criteria for separation/seggreation of fire compartments, drainage, flood detection and isolation, ~~and isolation of fire compartments~~;	More precise terminology concerning fire compartments, re-ordering for consistency in the document.	X			
Germany	100	12.46	Uncertainties related to aspects important for the PSAs for internal hazards and external hazards at the design stage (e.g. detailed cable ~~tracing~~ routing, fire and flood barriers, anchorage of the SSCs, location and orientation of the components) should be taken into account.	Precise fire related terminology	X			

UK	4	12.49/1	Please change the first sentence as follows: '**PSA should be used to** develop the technical specifications **and** to identify the equipment to be included in the technical specifications.'	This is a new paragraph added after what was para. 12.46 in the version of the safety guide issued at Step 8. It currently states: '***If the PSA alone is being*** *used to develop the technical specifications,* ***then it should also be used*** *to identify the equipment to be included in the technical specifications*.'. It is unlikely that PSA alone would be used to develop the technical specifications. The proposed revised text should still apply in the unlikely situation where PSA alone is used to develop the technical specifications.	X			
Germany	101	12.52 Line 3	… Examples of such information include the conditional core damage ~~frequency~~ or fuel damage frequency for maintenance and repair periods ~~when the plant item is undergoing maintenance;~~, the incremental conditional core and/or fuel damage probability ~~;~~, the cumulative~~,~~ incremental~~,~~ conditional core and/or fuel damage probability over the year, and the impact of a change on the average yearly core and/or fuel damage frequency.	Clarification	X			
Germany	102	12.55 (b)	(b) The components ~~that have high importance for safety~~ with high safety significance have more stringent testing requirements;	Clarification			X	The term importance is being used consistently with the 'Importance analysis' term which is a commonly used term for this purposes.

Japan	18	12.58.	In providing input from the PSA for the optimization or justification of the ~~service~~ surveillance test interval strategies the following should be investigated and taken into account: (a) The correlation between the ~~surveillance~~ service test interval and the component failure probability (e.g. wearing owing to frequent tests); (b) Common cause failures with due account taken of the type of testing (i.e. staggered or non-staggered); (c) The potential for human failure events, including errors of commission, during and after testing, leading to component unavailability and/or an initiating event.	Editorials.	X			
Germany	103	12.63	The current approach to periodic in-service testing is to perform it in accordance with a code or standard, which may or may not be incorporated into a prescribed regulation that uses a deterministic approach to decide on the programme of in-service testing that needs to be carried out for SSCs in the plant.	Precision. Please change into “periodic in-service testing” in paras 12.64, 12.65 and 12.68 as well.	X			
Germany	104	12.85	Consideration should be given to whether the requirements could be reduced for SSCs that have been classified as important to safety but which have a relatively low safety significance and whether they should be increased for the SSCs that have been classified as not being important to safety but which have a ~~relatively high safety~~ non-negligible significance to be considered within PSA.	Clarification.	X			

Japan	19	12.86.	When a large number of SSCs are reclassified and their treatment (e.g. testing and maintenance) is adjusted based on risk significance, the estimated failure probabilities of a large number of SSCs modelled in the PSA might change. Therefore, the cumulative impact of risk should be assessed to ~~determine the conservative upper bound of cumulative impact and~~ ensure that any cumulative potential risk increases are acceptable.	It is difficult to determine in advance a conservative upper limit for cumulative impact. It is realistic to ensure the evaluation including the reason for the judgment.	X			
Japan	20	12.115.	When conducting PSA based event analysis such as the significant determination process, known adverse occurrences should be modelled, setting associated basic events to TRUE, whereas known success occurrences should be modelled keeping associated basic events to their nominal probability.	It should clarify the event analysis with examples.	X			
Germany	105	12.134	Risk ~~importance~~ significance measures of the affected or proposed actions and associated accident sequences should be used to help prioritize possible changes in procedures.	We suggest to use “significance” instead of “importance” and “procedures” – plural – here			X	The term importance is being used consistently with the ‘Importance analysis’ term which is a commonly used term for this purposes.
France	89	12.148	USE OF PSA TO ADDRESS EMERGING ISSUES	Is this § covering equally the precursors (incidents) analysis? If it is the case the title and text may be complemented. If not, it may be useful to add a section on precursors analysis.		X Precursors analysis are implied in the chapter called ‘PSA based event analysis’ (12.107-12.119). Title and 12.107 are revised accordingly.		
Germany	106	Reference [27]	INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Nuclear Installations Against External Events Excluding Earthquakes ~~in the Design of Nuclear Power Plants~~, IAEA Safety Standards Series No. SSG-68, IAEA, Vienna (2021).	Editorial	X			

Germany	107	Reference [32]	[32] INTERNATIONAL ATOMIC ENERGY AGENCY, ~~Fire Safety in the Operation of Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-2.1, IAEA, Vienna (2000).~~ Protection against Internal and External Hazards in the Operation of Nuclear Power Plants, SSG-77, IAEA, Vienna (2022).	NS-G-2.1 is superseded by SSG-77.	X			
Germany	108	References New item	[44] INTERNATIONAL ATOMIC ENERGY AGENCY, Consideration of External Hazards in Probabilistic Safety Assessment for Single Unit and Multi-unit Nuclear Power Plants, Safety Reports Series No.92, Vienna (2018).	Please add this new reference, it is important for Sections 8 and 11	X	Safety Report 110 is added as Ref. 45		
Germany	109	References New item	[45] INTERNATIONAL ATOMIC ENERGY AGENCY, Technical Approach to Probabilistic Safety Assessment for Multiple Reactor Units, Safety Reports Series No.96, Vienna (2019).	Please add this new reference as well, she is particularly needed for Section 11; can also be useful for Sections 7 and 8.	X	Safety Report 110 is added as Ref. 45		
Japan	21	ANNEX I	For consistency, categorization and technical terms on hazards used in Section 8 and ANNEX I should be consistent; and all hazards mentioned in Section 8 should be included in the list of ANNEX I.		X	Accepted. But depends on the NUSSC decision whether to replace Annex I with the list from ASAMPSA_E project.		
Germany	110	Annex I	EXAMPLE OF A GENERIC LIST OF INTERNAL AND EXTERNAL HAZARDS *Annex I is outdated and should be replaced by state-of-the-art documents.*	Delete the existing text in Annex I and replace it by a state-of-art list, eg. from ASAMPSA_E-Project of the EC, and add the internal hazards list from GRS (both are published documents, see also out next comment)			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. We propose to discuss it during the NUSSC meeting in June.

Germany	111	References to ANNEX I	~~[I–1] KNOCHENHAUER, M., LOUKO, P., Guidance for External Events Analysis, Rep. SKI-R-02/27-SE, SKI, Stockholm (2003).~~ [I–1] DECKER, K., BRINKMAN, H. List of external hazards to be considered in ASAMPSA_E, Technical report ASAMPSA_E /WP21/D21.2/2017-4, European Commission (EC), Petten, The Netherlands. http://asampsa.eu. [I–2] RÖWEKAMP, M., ET AL. Methoden zur Bestimmung des standort- und anlagenspezifischen Risikos eines Kernkraftwerks durch übergreifende Einwirkungen / Estimation of the Site and Plant Specific Risk of a Nuclear Power Plant from Hazards, Technischer Fachbericht / Technical Report, GRS-A-3888, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH, Köln, Germany, (June 2017).	Please update references to Annex I.			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. We propose to discuss it during the NUSSC meeting in June.
UK	5	Figure II-2 and related footnote	Please change the footnote to state: The labelling convention in Figure II-2 does not follow the usual convention. Here the top gates/nodes are failure statements (rather than success statements), with the up branch being negative and the down branch being positive.	This footnote was added to address a previous UK comment that the labelling convention was potentially confusing and inconsistent with generally accepted convention (as correctly used in Figure II-1). Whilst the preferred option would be to revise the event tree to reflect the usual convention (success statements at the top, with success up and failure down) the footnote was seen as practicable solution. Here, the UK comment has been included as a footnote, rather than just the clarification requested.	X	The ET revised, no need to keep the footnote.		

Germany	112	Annex III, Table III-1 Title	TABLE III–1. PLANT OPERATING STATES DURING OUTAGE ~~IN THE REFERENCE~~ FOR A PRESSURIZED WATER REACTOR PLANT	Clarification	X			
Germany	113	Annex III, Table III-2 Title	TABLE III–2. INITIATING EVENTS DURING OUTAGE ~~IN THE REFERENCE~~ FOR A PRESSURIZED WATER REACTOR PLANT	Clarification	X			
Germany	114	Annex III, Table III-3 Title	TABLE III–3. PLANT OPERATING STATES FOR A TWO -WEEK OUTAGE IN A ~~THE REFERENCE~~ PRESSURIZED WATER REACTOR PLANT	Clarification	X			
Germany	115	Annex III, Table III-4 Title	TABLE III–4. INITIATING EVENTS DURING SHUTDOWN STATES FOR A PRESSURIZED WATER REACTOR PLANT *(with indication of the loss of critical safety functions or the mechanism triggering the initiating event, respectively)*	Clarification	X			