

Resolution of Comments

SSG-6: Safety of Uranium Fuel Fabrication Facilities (DS517B)

COMMENTS BY REVIEWER					RESOLUTION			
Reviewer: Country/Organization:			Page.... of.... Date:19 October 2021					
No.	Comment	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1.	FIN01	Throughout the document	Correct the notation for chemical compounds to use superscripts or subscripts for the numbers (eg.UF ₆ or ²³⁵ U)	Consistency with other sections, and clarity	X			
2.	FIN02	Whole document		The SSG-6 and SSG-7 standards should be reviewed together. A consistency between the two should be ensured. The order of various contents should be the same in the two as well as the order of paragraphs as far as possible. In addition, it would be helpful if the wordings of the ‘similar’ paragraphs would be as far as possible, the same. It should also be checked and ensured that no requirements given to one and relevant also to the other are left out. Now it seems to me the case.		X		We believe the content is important not the order. In practice, the standards are used not in parallel. The reason for different order is the revision by amendment and differences in the existing versions. Many modifications were applied to harmonize as much as practicable.
3.	USA01	Chapter titles	Delete the phrase “Uranium Fuel Fabrication Facilities” from all chapter titles	This phrase is not needed as the title of the document already states this			X	This is due to easiness of search functions (searching in titles only option)
4.	JAP01	1.09.	This Safety Guide deals specifically with the handling, processing, material transfer and storage of natural uranium	Since this guide also includes the handling of UF ₆ (see 2.1, 5.8), the left text should clearly state that	X			

			and low enriched uranium (LEU) that has a ²³⁵ U enrichment of no more than 6%, which could be derived from natural, high enriched or reprocessed uranium which might contain also traces of plutonium; it covers fabrication of uranium oxide fuels as a final product but it does not cover facilities that handle uranium metal fuels.	uranium oxide fuels are final product, to avoid misunderstandings.				
5.	FIN03	3.12 /4	... through audits, that suppliers have management systems that are adequate for ensuring safety of conversion facilities and uranium enrichment facilities fuel fabrication facilities.	Do you really mean to refer here to conversion and enrichment facilities? Or should this read fuel fabrication facilities?	X			
6.	UKR01	3.19	3.19. Any proposed modification to existing facilities or activities, or proposals for introduction of new activities, are required to be assessed for their implications on existing safety measures and appropriately approved before implementation: see paras. 9.57(b)-(c) of SSR-4 [1]. Modifications of safety significance are required to be subjected to safety assessment and regulatory review, and, where necessary, they are required to be authorized by the regulatory body before they are implemented: see paras 9.57(h) and 9.59 of SSR-4 [1]. The facility or activity documentation is required to be updated to reflect modifications (see paras. 9.57 (f)–(g) of SSR-4 [1]). The operating personnel, including supervisors, should receive adequate training on the modifications.	Editorial correction. Reference to plural paragraphs. Excessive point.	X			

7.	UKR02	3.23	3.23. Requirement 73 of SSR-4 [1] states that “ {t} The operating organization shall establish a programme to learn from events at the facility and events at other nuclear fuel cycle facilities and in the nuclear industry worldwide. ” Recommendations on operating experience programmes are provided in IAEA Safety Standards Series No. SSG-50, Operating Experience Feedback for Nuclear Installations [12].	Editorial correction			X	This is the correct citation of the original text.
8.	UKR03	3.25	3.25. Requirement 6 of SSR-4 [1] states that: “ {a} An independent safety committee (or an advisory group) shall be established to advise the management of the operating organization on all safety aspects of the nuclear fuel cycle facility. ”	Editorial correction			X	This is the correct citation of the original text.
9.	FIN04	5.04	For a facility licensed to use uranium from sources other than natural uranium, particular care should be taken to minimize contamination because of the different isotopic compositions.	Clarity and clearer relation between the various parts of the sentence. It is not that the <i>facility is licensed to use uranium from sources other than natural uranium because of different isotopic composition</i> but rather that they <i>should take particular care because of the different composition.</i>	X			This provision was deleted in the draft.
10.	UKR05	5.04	8.4. Requirement 56 of SSR-4 [1] states that: “ {t} The operating organization shall ensure that the nuclear fuel cycle facility is staffed with competent managers and sufficient qualified	Editorial correction			X	This is the correct citation of the original text.

			personnel for the safe operation of the facility.”					
11.	FIN05	5.08	The events listed in para. 4.4 External natural or human induced events may occur as a consequence of a postulated initiating event (PIE)	Para 4.4 only names "risks related to external natural and human induced event". For clarity and easier reading, please consider rewriting the sentence with these written out. Or if the reference is wrong please check and correct it		X		The wording was changed to correct the terminology.
12.	FIN06	5.12 /5		This sentence does not make sense! “For the following parameters should be subject to control: “	X			
13.	FIN07	5.12 /bullet 2	... vessels, control of slabs and appropriate separation distances between containers in storage; the loss of confinement/geometry due to leaks or breaks should also be accounted for	addition	X			
14.	JAP02	5.34.	If a fuel fabrication facility processes uranium with 235U mass fraction lower than 1% 235U <u>the level that meets exemption criteria specified by, or agreed with, the regulatory body (*),</u> a full criticality safety assessment is not necessary (see para. 6.138 of SSR-4 [1]). In such cases it should be demonstrated that there is no credible fault sequence in which uranium with higher than 1% 235U enrichment is fed to the process. For further recommendations see para 2.8 of SSG-27 [2]. <u>(* footnote) The minimum critical enrichment of uranium is provided on the order of 0.9 in some nuclear critical</u>	Since the 1% 235U can be misleading, this value should be reviewed or the left sentence should be deleted. *:Los Alamos National Laboratory, “Nuclear Criticality Safety Guide”, LA-12808, Sep. 1996. Japan Atomic Energy Research Institute, “Nuclear Criticality Safety Handbook, Version2 (English Translation), JAERI-Review 2001-028, Aug. 2001.	X			The footnote was not added, but the proposed modification make it very clear.

			safety handbooks, such as :Los Alamos National Laboratory, “Nuclear Criticality Safety Guide” (LA-12808, Sep. 1996) and Japan Atomic Energy Research Institute, “Nuclear Criticality Safety Handbook, Version2 (English Translation; JAERI-Review 2001-028, Aug. 2001).					
15.	JAP03	5.40. (a)	<p>The following parameters should be included in the scope of a subcriticality analysis for a uranium fuel fabrication facility (see para. 6.144 of SSR-4 [1])</p> <p>(a) Enrichment. The potential for errors uncertainties in the calculation of uranium enrichment of a fissile material should be considered if the maximum authorized enrichment level is not used in the criticality safety analysis (see para. 5.38)</p> <p>[...]</p>	If “errors” intends the uncertainty of enrichment, this should be “unertainties”.	X			
16.	GER01	5.44 / 5.55	<p>Fire hazard analysis</p> <p>5.45. As an important aspect...</p>	The headline “fire hazard analysis” on page 14 should not be separated from the following paragraph. It might be more convenient to place the headline on the following page.	X			
17.	JAP04	5.58 and 5.61.	<p>5.58 Flooding in a uranium fuel fabrication facility might lead to the dispersion of radioactive material and to changes in the conditions for neutron moderation. Flooding can potentially result in buoyancy induced failure of vessels, pipes and equipment causing a loss of confinement.</p>	In this guide, “moderation” is basically used without “neutron”.	X			

			5.61 In addition to the loss of raw materials and its environmental impact, leaks from equipment and components such as pumps, valves and pipes can lead to the dispersion of radioactive material (e.g. UO ₂ , triuranium octoxide (U ₃ O ₈) powder, UF ₆) and toxic chemicals (e.g. hydrogen fluoride), and to the unnecessary generation of waste. Leaks of hydrogenous fluids (e.g. water, oil) can alter the neutron moderation and/or reflection and thereby reduce criticality safety. Leaks of flammable gases (e.g. hydrogen, natural gas, propane) or liquids can lead to explosions and/or fires. Leak detection systems should be deployed where leaks could occur.					
18.	FIN08	5.63 (d)	The effect on criticality safety functions such as geometry and/or moderation of the following: i) deformation (geometry control); ii) displacement (geometry control, fixed poisons absorbers); iii) loss of material (geometry control, soluble poisons absorbers).		X			
19.	FIN09	5.65	Hazards from external fires and explosions could arise from various sources in the vicinity of uranium fuel fabrication facilities, such as petrochemical installations, forests, pipelines and road, rail or sea routes used for the transport of flammable material such as gas or oil, and volcanic hazards.	Please reconsider the place of the word ‘and’ in the list. The clarity might also need some reordering of the items in the list.	X			
20.	FIN10	5.67	Dashed bullets should be numbered (a), (b), (c).,	Clarity and consistency with SSG7 5.77	X			

21.	FIN11	5.68 /4	... with specific national regulations relating to hazards from tornadoes.	Clarity and consistency with SSG7 5.78	X			
22.	FIN12	5.69 /3	... The possibility of impacts of tornado missiles such as these should be taken into consideration	Clarity and consistency with SSG7 5.79	X			
23.	FIN13	5.72	The occurrence of snowfall and ice storm and its effects should be taken into account in the design and safety analysis. Snow and ice are is generally taken into account as an additional load on the roofs of buildings. The neutron reflecting effect, or the interspersed moderation effect of the snow, if relevant, should be considered.	Consistency with the heading and SSG7 5.82	X			
24.	JAP05	5.75.	Depending on the site characteristics and location of the uranium fuel fabrication facility, as evaluated in the site assessment (see Section 4), the effect of a tsunami and/or soil liquefaction induced by an earthquake and other extreme flooding events should be addressed in the facility design.	Soil liquefaction can be another important side effect of an earthquake.	X			
25.	FIN14	5.81	Control rooms and Human-Machine-Interface panels should be provided to centralize the availability of information and monitoring of actions. Occupational exposure and safety of personnel should be considered in the location of control rooms in the facility. Where applicable, it may be useful to have dedicated control rooms to allow for the remote monitoring of operations, thereby reducing exposures and risks to personnel. Particular consideration should be paid to identifying those events, both internal and external to the control rooms, that may pose a direct	Consider using the same the formulation as in SSG7 5.91	X			

			threat to the operation of control rooms. Human Ergonomic factors should be taken into account in the design of control rooms and the design of control room displays and systems					
26.	JAP06	5.83.	If safety limits for humidity and/or temperature are specified in a building or a compartment, the air conditioning system should be designed to perform efficiently also under extreme hot or wet weather conditions <u>and condensation inside facilities.</u>	Clarification. Condensation inside roofs and walls may cause problems.	X			
27.	USA02	5.88	Add language to specify the type of design basis aircraft.	This is a generalized statement and does not provide any parameters on the type of aircrafts to be considered.			X	Facility specific SSGs do not define the design basis parameters, no magnitudes are quantified. Qualitative scope is provided. See also other similar IAEA safety standards. The precise specification is up to the national practice and regulatory framework.
28.	JAP07	5.94. (a)	Safety related instrumentation and control system of a uranium fuel fabrication facility should include systems for the following: (a) Criticality control and criticality detection alarm:	In addition to additives, other surrounding materials, e.g. concrete, may act as reflector as described in para 5.40 (f)(ii).	X			

			(i) Depending on the method of criticality control, the control parameters usually include mass, density, moisture content, isotopic composition, field content, moderation, poisoning, reflection of <u>additives nearby surrounding materials such as additives</u> and spacing items. [...]					
29.	GER02	5.100		There might be enough space on page 23 for the text following on page 24.	X			
30.	GER03	5.104 (1)	... It also involves and demonstrating that these structures, systems and components can reduce the consequences and/or the likelihoods of potential accidents below the pre-established criteria. <u>This approach would also provide information for the development of the emergency plans.</u>	Please add this sentence in compliance with DS 517 A. Is there a reason why this paragraph is missing in DS 517 C?	X			Yes, for MOX fuel fabrication facilities such reduction is not possible.
31.	JAP08	5.108.	The safety analysis should also identify design extension conditions The objective is to ... Design extension conditions include events more severe than design basis accidents that could originate from extreme events or combinations of <u>such</u> events, <u>sequentially or simultaneously</u> , which could cause damage to structures, systems, and components important to safety or which could challenge the fulfilment of the main safety functions. The postulated initiating events provided in	Clarification. Sequential events, e.g. tsunami after an earthquake, should be explicitly described.	X			
32.	IRA01	5.119	“The emergency plans <u>and procedures should be prepared</u> and the necessary equipment and provisions should be	Please consider paragraph 6.20 (requirement 23) of GSR Part 7.		X		‘procedures’ added, but their existence is a requirement so

		/ Second and third lines	determined on the basis of selected scenarios...”					cannot use ‘should’ statement
33.	IRA02	5.119 / Line 5	“The conditions under which an off-site emergency response is might be required to be declared initiated for a facility should include criticality accidents, widespread fires in the uranium powder area at the facility , and earthquake.”	Off-site emergency response because of emergency condition at the facility should be initiated. Also even for the mentioned conditions, sometimes it is not necessary to initiate the off-site emergency response.		X		The ‘should’ statement needs to stay.
34.	GER04	7.3 (2)	... Testing in this second step should be performed with the use of natural or depleted uranium to prevent risks of criticality, to minimize occupational exposure and to reduce the possible need for decontamination. <u>In this stage, the operating organization should continue taking the opportunity to train personnel in the safety requirements, operating procedures and emergency procedures.</u>	Please add this sentence, since it might appear to the reader that training of personnel is only relevant in the cold commissioning stage.			X	We understand the intent of the comment, however the objective here was to underline the fact that the personnel should be fully ready/trained/qualified before the hot commissioning. At this stage all personnel should be ready to operate in full scope. Continuous retraining is then captured in Section 8.
35.	FIN15	8.02		This sentence does not make sense to me: “In a uranium fuel fabrication facility, recent developments have made full automation of individual processes serves mainly to improve productivity	X			

				and reduce human interaction with radioactive material.”				
36.	UKR04	8.03	8.3. The internal safety committee in a uranium fuel fabrication facility, in accordance with para. 4.29 of SSR-4 [1], should be created from the safety committee established for commissioning (see also para.s 3.26).	Editorial correction. Reference to a single paragraph.	X			
37.	FIN16	8.4	The safety committee in a conversion-facility or an enrichment facility fuel fabrication facility , as defined in SSR-4	This is a standard for a fuel fabrication facility	X			
38.	UKR06	8.05	8.5. Para. 9.16 of SSR-4 [1] states that: “ fa A detailed programme for the operation and utilization of the nuclear fuel cycle facility shall be prepared in advance and shall be subject to the approval of senior management.”	Editorial correction			X	This is the correct citation of the original text.
39.	FIN17	8.19		The dashed bullets should be numbered a), b) etc. for clarity and to make it easier to refer to them. See SSG-7 para 8.27	X			
40.	JAP09	8.20.	Maintenance activities in a uranium fuel fabrication facility should be <u>pre-authorized</u> on the basis of a safety assessment.	Please clarify by whom maintenance activities is pre-authorized. If it is a practice of regulatory bodey, please clarify a defference between pre-authorization and authorization.	X			
41.	IRA03	8.24 / Second line of Bullet (d)	“...fully functional personal protective equipment and ensuring its use, emergency response procedures...”	Definition of the term “emergency procedures” is included in IAEA Safety Glossary.	X			
42.	FIN18	8.32 /5	foreseen effects on the overall safety of the facility. This should be part of (or additional to) periodic safety review or an equivalent process.	Give a time frame for the requirement, like in SSG-7 8.40	X			

43.	UKR07	8.34	8.34. Requirement 61 of SSR-4 [1] states that “ [t] The operating organization shall establish and implement a programme for the control of modifications to the facility. ” The management system for a uranium fuel fabrication facility should include a standard process for all modifications (see para. 3.19). The work control system, quality assurance procedures and appropriate testing procedures of the facility should be used for the implementation of modifications.	Editorial correction			X	This is the correct citation of the original text.
44.	FIN19	8.36		The dashed bullets should be numbered a), b) etc. for clarity and to make it easier to refer to them. See SSG-7 para 8.52	X			
45.	FIN20	8.36 /10	Specifying in the work permit the procedures protective measures for the intervention	As in SSG-7 8.52	X			
46.	FIN21	8.37 /2-3	The risks of exposure of members of the public should be controlled minimized by ensuring that, as far as reasonably practicable, radioactive material is removed kept away and/or removed from ventilation exhaust gases to prevent its being discharged to the atmosphere.	I think you really want to minimize the dose as far as possible. The wording is taken from SSG 7 8.53	X			
47.	FIN22	8.43 and 8.45		Why are paras .43 and 8.45 in different order than 8 in SSG6 8.60 and 8.62. Consistency between the two standards is needed.		X		We believe the content is important not the order. In practice, the standards are used not in parallel. The reason for different order is the revision

								by amendment and differences in the existing versions. Many modifications were applied to harmonize as much as practicable.
48.	PAK01	8.44	The requirements for criticality safety in uranium fuel fabrication facilities are established in Requirement 66 and para 9.83 – 9.85 and 9.87 of SSR-4 [1]	Requirement 66 is also about criticality control in operation.	X			
49.	FIN23	8.49		The dashed bullets should be numbered a), b) etc. for clarity and to make it easier to refer to them. See SSG-7 para 8.65	X			
50.	FIN24	8.52		The dashed bullets should be numbered a), b) etc. for clarity and to make it easier to refer to them.	X			
51.	FIN25	8.52 /bullet 2	...and leakages of oils from gear boxes or use of a water or CO ₂ based firefighting system (e.g. automatic sprinklers)	CO ₂ is equally bad as water in firefighting because carbon is a very good moderator	X			
52.	FIN26	8.56	8.33. The requirements relating	There is an extra number	X			
53.	FIN27	8.57		The dashed bullets should be numbered a), b) etc. for clarity and to make it easier to refer to them. See SSG-7 para 8.67	X			
54.	FIN28	8.65 /3	material is transferred to contaminated areas.	Preposition missing	X			
55.	FIN29	8.73	8.73. Requirements on feedback of operating experience are listed in SSR-4 [1], paras. 9.133 – 9.137. Further	I suggest you divide this paragraph into two for clarity.	X			

			guidance on operational experience program is provided in SSG-50 [9]. 8.74. The programme for the feedback of operational experience at uranium fuel fabrication facilities should cover experience and lessons learnt from events and accidents at the nuclear facility as well as from other nuclear fuel cycle facilities ...					
56.	IRA04	8.74	“During an emergency, special consideration should be given to the presence of both non-radiological (such as chemical) and radiological hazards.	It is very important to consider non-radiological hazards not only chemical too.	X			
57.	IRA05	8.79 / Line 4	“The conditions at a uranium fuel fabrication facility for declaration that might require to initiate of an off-site emergency response at a uranium fuel-fabrication facility may include... ”	The sentence is not clear enough. Also Off-site emergency response because of emergency condition at the facility should be initiated.	X			
58.	UKR08	8.79	8.79. The requirements for emergency preparedness and response are established in Requirement 72 and paras. 9.120–9.132 of SSR-4 [1] and in GSR Part 7 [23], and recommendations are provided in GS-G-2.1 [22] and in IAEA Safety Standards Series No. GSG-2, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency [32]. The conditions for declaration of an off-site emergency at a uranium fuel fabrication facility may include large releases of UF ₆ , and also depending on national requirements and facility specific considerations, criticality accidents, large fires or explosions.	Editorial correction. Excessive point.	X			

59.	IRA06	8.81 / Two first lines	<p>“As part of the The emergency preparedness, arrangements should be developed for establishment of address how and when an interfaces with local, regional and national emergency response organizations should be established.”</p>	<p>It is not the matter of how and when. The arrangements for the establishment of interfaces should be developed as part of the emergency preparedness. Please consider the paragraphs 6.7 and 6.12 of GSR Part 7.</p>	X			
60.	IRA07	8.82	<p>“ The operating organization should ensure availability of personnel with specific expertise on the type the nature and extent of hazard present in the facility as well as availability of specific environmental sampling equipment to support local authorities in decision-making relating to an emergency at the facility and reliability of all supplies, equipment, communication systems, plans, procedures and other arrangements necessary for effective response in an emergency. The operating organization and response organizations should develop analytical tools that may be used early in an emergency response for supporting decision making on protective actions and other response actions.”</p>	<p>It is suggested to revise this paragraph to use the terms from GSR Part 7. Also it is not clear why only “the availability of environmental sampling equipment” to support local authorities in decision making is mentioned. Please take into consideration paragraphs 6.20, 6.21 and 6.34 of GSR Part 7.</p> <p>Not only nature of hazard is important, the extent of hazard is important too.</p>	X			
61.	IRA08	8.83	<p>“Emergency plans, security plans and contingency plans should be developed in a coordinated manner, considering all responsibilities of the facility personnel and security forces, to ensure that in the case of an event when simultaneous response of both groups is needed, all crucial functions can be performed in a timely manner. Paragraph 5.6 of GSR Part 7 [35] states:</p>	<p>It is suggested to revise this paragraph according to GSR Part 7 (1.2, 1.16, 5.6 and 6.17) and the definition of “first responder” in IAEA Safety Glossary.</p>		X		Security plans were added, reference to GSR Part 7 provided.

			<p>“Arrangements for response to a nuclear or radiological emergency shall be coordinated and integrated with arrangements at the local, regional and national levels for response to a conventional emergency and to a nuclear security event. These arrangements shall take into consideration the fact that the initiator of the nuclear or radiological emergency may not be known early in the response.”</p> <p>Emergency response plans should consider nuclear security events as possible initiator of an emergency and their implications on emergency situations and should be coordinated with the security response. Strategies for rapidly determining the origin of events and deploying appropriate first responders (safety personnel, security forces or a combination of both) should be developed. These strategies should also include the roles and actions of security forces and emergency response personnel emergency workers. The response to such events should be jointly exercised and evaluated by security forces and emergency response personnel emergency workers. From these exercises or evaluations, lessons should be identified and recommendations should be made to improve the overall response to a potential event.”</p>					
62.	USA03	8.83	<p>These strategies should also include the roles and actions of security forces and emergency response personnel, with a</p>	Coordinated command and control interfaces and communications (interoperability)	X			

			focus on coordinated command and control interfaces and communications (interoperability). The response to such events should be jointly exercised and evaluated by...	should be included in the strategies				
63.	FIN30	9.4		The dashed bullets should be numbered a), b) etc. for clarity and to make it easier to refer to them.	X			
64.	FIN31	9.4 /bullet 3	Preparation of risk assessments and method statements for the licensing of the decommissioning process.	Preparatory steps of preparation of risk assessment? There is an extra preparation.	X			
65.	FIN32	Ref[2]	SSG-27 is under review, if published before this one, the reference should be updated.		X			