Resolution of Comments

SSG-5: Safety of Conversion Facilities and Uranium Enrichment Facilities (DS517A)

COMMENTS BY REVIEWER **Reviewer:** **Page.... of....** **Country/Organization:** **Date: 19 October 2021**					**RESOLUTION**			
No.	Comment	Para/Line No.	**Proposed new text**	**Reason**	**Accepted**	**Accepted, but modified as follows**	**Rejected**	**Reason for modification/ rejection**
1.	FIN01	General 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.	USA01	General 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)
3.	GER01	3 Chapter 3	3. MANAGEMENT AND VERIFICATION OF SAFETY FOR CONVERSION FACILITIES AND URANIUM ENRICHMENT FACILITIES	The headline on page 3 and 4 should not be separated. It might be more convenient to place the headline on the following page.	X			All documents are corrected for points like this in the final publication step.
4.	UKR01	3.20.	3.20. 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	Editorial correction. Reference to a plural paragraph. Excessive point.	X			

			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.					
5.	UKR02	4.2.	4.2. The scope of the site evaluation for a conversion facility or a uranium enrichment facility is established in Requirement 3 of SSR-1 [13], Requirement 11 and paras 5.1–5.14 of SSR-4 [1] and should reflect the specific hazards listed in Section 2 of this Safety Guide.	Editorial correction. Excessive point.	X			

6.	UKR03	4.6.	4.6. The site characteristics should be reviewed periodically for their adequacy and persistent applicability during the lifetime of a conversion facility and uranium enrichment facility. Any changes to these characteristics which might require safety reassessment should be identified and evaluated (see para. 5.14 of SSR-4 [1]). This includes the case of an increase of a production capacity beyond the original envelope.	Editorial correction. Missing point.	X			
7.	USA02	5.1	Add "for the purpose of ensuring safety as maybe the case for reprocessing facilities" after "radioactive material." Change "is not applicable to" to "is not as significant for." At the end of the sentence add "as it is for reprocessing facilities."	Unlike at reprocessing plants, cooling of radioactive material to prevent radioactive releases from overheating does not occur in conversion and enrichment facilities. See Paras 5.45 to 5.47.		X		We agree, the provision did not correspond to 5.45 and was misleading. The whole sentence deleted for clarity.
8.	UKR04	5.8(a) (i)… (ii)… (i)… (ii)…	 (i)… (ii)… (iii)… (iv)…	Wrong numbering	X			
9.	FIN02	5.9 and 5.13	The first four types of events ((a)–(d)) are of	Clarity: one thing in one sentence makes it easier to read and understand.	X			

			major safety significance as they might result in chemical and radiological consequences for on-site personnel. However, they may also result in some adverse off-site consequences for public or the environment					
10.	JAP01	5.12.	To meet Requirements 34 and 42 of SSR-4 [1] on protection against internal radiation exposure and against toxic chemical hazards, the risk of releasing ~~nuclear~~ radiaoactive and toxic chemical material from the conversion or enrichment process should be decreased by minimizing the following parameters as far as possible: (i) The amount of liquid UF6 in process areas, e.g. by limiting the size of crystallization (desublimation) vessels in both conversion facilities and uranium enrichment facilities; (ii) The amount of ~~nuclear~~ radiaoactive and toxic chemical material	The original of "nuclear material" is vague so concrete words are required to meet with the title of this section.	X			

			unaccounted for in the process vessels;					
11.	JAP02	5.16.	(vii) the potential accumulation of nuclear fissile materials in ventilation elements (filters, ventilation ducts); and ~~(vii)~~ (viii) the humidity and potential for moisture within the ventilation system; ~~(viii)~~ (ix) predictive and preventive maintenance strategies.	Typo.	X			
12.	FIN03	5.18/bullet 2 *(the comment relates to para 5.38)*	… vessels, control of slabs and appropriate distances in and between storage vessels; the loss of confinement/geometry due to leaks or breaks should also be accounted for	addition	X			
13.	FIN04	5.18/bullet 4 *(the comment relates to para 5.40*	… should be designed for the maximum authorized enrichment level including a reasonable/an appropriate safety margin.		X			
14.	JAP03	5.19.	Requirements on the design of conversion facilities and uranium enrichment facilities ~~uranium fuel fabrication facilities~~ to	Mistake of the facility.	X			

15.	UKR05	5.20	5.20. Conversion facilities and uranium enrichment facilities are required to be designed with appropriately sized ventilation and containment systems in areas of the facility identified as having potential for giving rise to significant concentrations of airborne radioactive material and other hazardous material: see para. 6.126 of SSR-4 [1]. The ventilation system should be used as one of the means of minimizing the radiation exposure of workers and exposure to hazardous material that could become airborne and so could be inhaled by workers. Where possible, the layout of ventilation equipment should be such that the flow of air is away from the personnel workplaces and from personnel evacuation routes.	Editorial correction. Missing point.	X			
16.	UKR06	5.21.	5.21. For normal operation, the need for the use of protective respiratory equipment is required to be avoided through careful design of	Editorial correction. Missing point.	X			

			the containment and ventilation systems: see para. 9.100 of SSR-4 [1]. For example, a glovebox, hood or special device should be used to ensure the continuity of the first confinement barrier rather than reliance on the need for respiratory protection.					
17.	UKR07	5.24.	5.24. Audible alarm systems should be installed to alert operators to fan failure or high or low differential pressures. At the design stage, provision is also required to be made for the installation of equipment for monitoring airborne radioactive material and/or gas monitoring equipment: see para. 6.120 of SSR-4 [1]. Monitoring points should be chosen that would correspond most accurately to the exposure of personnel and would minimize the time for detection of any leakage: see para. 6.121 of SSR-4 [1].	Editorial correction. Missing point.	X			
18.	JAP04	5.30.	…The preferred number of barriers is ~~often~~ three.	The word “often” is vague.	X			
19.	JAP05	5.37.	In such cases it should be demonstrated that there is	Completeness.	X			

			no credible fault sequence in which uranium with equal to or higher than 1% 235U enrichment is fed to the process as, for example, the use of recycled uranium.	There is no description when 235U is just 1%.				
20.	UKR08	5.37	5.37. If a conversion facility processes natural uranium, depleted uranium, or uranium with less than 1% ^{235}U enrichment, 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% ^{235}U enrichment is fed to the process as, for example, the use of recycled uranium. For further recommendations see para. 2.8 of SSG-27 [2].	Editorial correction. Missing point.	X			
21.	FIN05	5.39 *(the comment related to para. 5.28)*	The design should also provide for the monitoring of the source of releases (air emissions and liquid effluents). The design should also provide for monitoring of the receiving environment around the facility and the	The sentence is too complicated and thus very hard to understand. Especially, the end of the paragraph. In the last sentence, what should precede the end: '… and the impact to the environment and the public'. Please, use one thing in one sentence		X		The sentence was split in several parts.

			identification of breaches. The monitoring of the breaches should confirm that there is no breach of containment barriers and thus no impact to the environment or the public.					
22.	FIN06	5.50	Fire hazard analyses should at least be carried out for: (a) high-risk fire sources such as centrifuges; (b) combustible materials (including low voltage cables); (c) safety equipment which should be protected.	Correct the numbering of the items specified		X		The text was transformed to continuous text, no bullet list.
23.	JAP06	5.50.	... 6.146 of ~~SRS-4~~ SSR-4 [1], the choice of …	Typo.	X			
24.	UKR09	5.72	5.72. The licensing documentation (safety case) should address the remedial actions necessary for the facility, including the items identified in para. 5.70 to return to a safe operational state, unless the likelihood of an extended loss of power can be ruled out on probabilistic grounds.	Editorial correction. Missing point.	X			
25.	JAP07	5.73. (a)	Loss of gas supply to gas controlled safety valves and dampers: In accordance	Better wording.		X		‘fail-safe’ term used in line with

			with the safety analysis, valves should be designed to move ~~used that are 'design to fail' to~~ a safe position in loss of gas supply.	The words 'design to fail" may be not popular so it's better to be described in another words.				SSR-2/1 (Rev.1), Requirement 26
26.	FIN07	5.78	Hazards from external fires and explosions could arise from various sources in the vicinity of conversion facilities or enrichment 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			
27.	JAP08	5.81.	Depending on the site characteristics and the location of the conversion facility or uranium enrichment 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			
28.	JAP09	5.89.	If safety limits for humidity or temperature are specified in a building or a compartment, the air conditioning system should	Condensation inside roofs and walls may cause problems.		X		New sentence added.

			be designed to perform efficiently also under extreme hot or wet weather conditions and condensation inside facilities. For structures without expansion joints, the additional loads due to thermal expansion on structural systems should be considered in the design.					
29.	USA03	5.95	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.
30.	UKR10	5.104 (a) (iii)… (iv)…	 (i) (ii)	Wrong numbering	X			
31.	UKR11	5.115	5.115. The safety analysis should identify design extension conditions, and their progression and consequences should be analysed in accordance	Editorial correction. Missing point.	X			

			with Requirement 21 of SSR-4 [1]. The objective is to identify and analyse additional accident scenarios to be addressed in the design of a conversion facility or uranium enrichment facility to ensure that the design is such that, for design extension conditions, off-site protective actions that are limited in terms of times and areas of application are sufficient for the protection of the public, and sufficient time would be available to take such actions and moreover that the possibility of conditions arising that could lead to early releases of radioactive material or to large releases of radioactive material is practically eliminated (see para. 6.74 of SSR-4 [1]).					
32.	UKR12	5.118.	5.118. For analysing design extension conditions, best estimate methods with realistic boundary conditions can be applied. Acceptance criteria for this analysis, in accordance with para.	Editorial correction. Missing point.	X			

			6.74 of SSR-4 [1], should be defined by the operating organization and should be reviewed by the national regulatory body.					
33.	GER02	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. In this stage, the operating organization should continue taking the opportunity to train personnel in the safety requirements, operating procedures and emergency procedures.	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.
34.	UKR13	8.02.	8.2. The internal safety committee in a conversion facility or a uranium enrichment facility, in accordance with para. 4.29 of SSR-4 [1], should be created from the safety committee established for commissioning (see also para. 3.26).	Editorial correction. Missing point.	X			
35.	UKR14	8.03.	8.3. Requirement 56 of SSR-4 [1] states~~,~~ that:	Editorial corrections	X			

			“~~[t]~~ T~~he operating organization shall ensure that the nuclear fuel cycle facility is staffed with competent managers and sufficient qualified personnel for the safe operation of the facility.”~~					
36.	UKR15	8.04.	8.4. Para. 9.16 of SSR-4 [1] states~~,~~ that: “~~[a]~~ 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 corrections			X	This is the correct citation of the original text.
37.	UKR16	8.10.	8.10. In addition to the specific training required in para**.** 9.49 of SSR-4 [1], the training on prevention and mitigation of fires and explosions that could result in a release of radioactive material should be provided. Such training should cover: (1) a **H_2** explosion in a reduction furnace in a conversion facility; and (2) a lubrication oil fire in a uranium enrichment facility. In addition, personnel should be	Editorial correction. Missing point. Missing subscript.	X			

			provided periodically with basic training in nuclear and radiation safety.					
38.	USA04	8.11	Complementary training of safety and security personnel and their mutual participation in exercises of both types should be part of the training programme to effectively manage the interface between safety and security. There should be a focus on coordinated command and control interfaces and communications (interoperability) to address execution and exercise strategies.	An effective interface can be accomplished through training that focuses on coordinated command and control interfaces and communications.		X		Additional and more specific provisions were added to this paragraph to cover the comment.
39.	UKR17	8.33.	8.33. 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 conversion facility or a uranium enrichment facility should include a standard process for all modifications (see para. 3.18). The work control system, quality assurance procedures and	Editorial correction			X	This is the correct citation of the original text.

			appropriate testing procedures of the facility should be used for the implementation of modifications.					
40.	FIN08	8.34 (The comment relates to paras 8.50-8.51)	8.34. The risks of exposure of members of the public should be controlled by ensuring that, as far as reasonably practicable, radioactive material is removed from ventilation exhaust gases to prevent its being discharged to the atmosphere. 8.35 The monitoring results from the radiation protection programme should be compared with the operational limits and conditions, and corrective actions should be taken if necessary. Furthermore, these monitoring results should be used to verify the dose calculations made in the initial environmental impact assessment.	Dividing the paragraph into two would make it clearer as there are two completely different requirement or recommendation.	X			
41.	UKR18	8.37.	8.37. In accordance with para. 4.31(d) of SSR-4 [1], the safety committee is required to review the proposed modifications. Suitable records of their	Editorial correction. Missing point.	X			

			decisions and recommendations should be kept.					
42.	UKR19	8.46	8.46. The requirements for radiation protection in operation are established in Requirement 67 and paras. 9.90-9.101 of SSR-4 [1] and in GSR Part 3 [15]; recommendations are provided in IAEA Safety Standards Series No. GSG-7, Occupational Radiation Protection [31]. The operating organization should have a policy to optimize protection and safety, and is required to ensure doses are below national dose limits and within any dose constraints set by the operating organization (see para. 9.91 of SSR-4 [1]). The policy should address the minimization of exposure to radiation by all available physical means and by administrative arrangements, including the use of time and distance during operations and maintenance activities.	Editorial correction. Excessive point.	X			

43.	FIN09	8.48, bullet 3	… checks should be undertaken to ensure that no hydrogenous material is present in the cylinder (e.g. water, oil, rubber or plastics);	materials rich in hydrocarbs are equally important in controlling criticality as water		X		The text was modified, see the corrected sentence.
44.	UK01	8.48	Remove or reword final sentence	This sentence might give the impression that emergency arrangements are only required for criticality incidents, whereas Para 8.90 lists a range of potential conditions that might require emergency arrangements. It is not clear that the sentence adds any value, other than stating that high external dose rates may be encountered.	X			
45.	JAP10	8.65.	The industrial and chemical hazards present in conversion facilities and uranium enrichment facilities may be summarized as follows: ~~(a) Chemical hazards due to the presence of UF_6, hydrogen fluoride (including hydrogen fluoride produced through hydrolysis of UF_6), fluorine, nitric acid, ammonia and uranium compounds;~~ (~~b~~a) Chemical hazards due to the presence of UF_6, hydrogen fluoride (including produced through hydrolysis of UF_6 in contact with air	Since the original (a) and (b) are almost the same repetition, (a) should be delete and (b) (c) (d) should be changed to (a) (b) (c).	X			

			moisture), fluorine, nitric acid, ammonia and uranium compounds; (~~c~~b) Explosion hazards due to hydrogen, ammonia, ammonium nitrate, methanol, solvents and oxidants present in diffusion cascades; (~~d~~c) Asphyxiation hazards due to the presence of nitrogen or carbon dioxide.					
46.	UKR20	8.90.	8.90. The requirements for emergency preparedness and response are established in Requirement 72 and paras. 9.120–9.132 of SSR-4 [1], in GSR Part 7 [23], and recommendations are provided in GS-G-2.1 [24] 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 emergency at a conversion facility or a uranium enrichment facility may include large releases of UF_6, hydrofluoric acid, fluorine	Editorial correction. Excessive point.	X			

			and ammonia and also, depending on national requirements and facility specific considerations, criticality accidents, large fires (e.g. in the solvent extraction units of a conversion facility) or explosions.					
47.	IRA01	8.91	"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~~."	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.	X			
48.	IRA02	8.91	"…and national ~~emergency~~ response organizations should be established." "…that the ~~emergency~~ response organization can respond effectively …"	Considering the definition of "**response organization"** in IAEA Safety Glossary and using this term in GSR Part 7, it is suggested to change "**emergency response organization"** with "**response organization".**	X			
49.	IRA03	8.92	"8.92. 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~~	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. Not only nature of hazard is important, the extent of hazard is important too.	X			

			~~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."					
50.	IRA04	8.93	"8.93. 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: "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	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. .		X		Reference to GSR Part 7 provided.

			fact that the initiator of the nuclear or radiological emergency may not be known early in the response.” ~~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.”					

51.	USA05	8.93	These strategies should also include the roles and actions of security forces and emergency response personnel, with a focus on coordinated command and control interfaces and communications (interoperability). The response to such events should be jointly exercised and evaluated by…	Coordinated command and control interfaces and communications (interoperability) should be included in the strategies	X			
52.	UKR21	8.95.	8.95. Requirements on feedback of operating experience are established in paras. 9.133–9.137 of SSR-4 [1]. Further recommendations on the operating experience programme are provided in SSG-50 [12].	Editorial correction. Excessive point.	X			
53.	GER03	Annex I		The pink arrows are barely visible. Please use a darker color (see Appendix II, pink arrows). Some of the arrows might be unintentionally shifted (see pink arrow above ADU precipitation).	X			
54.	FIN10	Ref[2]	SSG-27 is under review, if published before this one, the reference should be updated.		X			