

**DS492 Human Factors Engineering in the Design of Nuclear Power Plants**  
**Step 10 - Date: 17 July 2017**

COMMENTS BY REVIEWER				RESOLUTION			
Reviewer: Valerie Bellens Page.1 of.1. Country/Organization: ENISS				Date:10/10/17			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	4.10.	Design considerations should provide for operator and organizational resilience by examining: — Whether automatic actions are properly allocated to respond to a postulated initiating event; — Whether HMI can support anticipation and response to an unexpected event; — Whether HMI provides information on incremental changes in anticipation of sudden disruptions or fault conditions (e.g. predictive displays); — Whether provisions and locations for additional tools and equipment are available; — Whether utility implementation of ‘stress tests’ for plant systems in a presence of severe accidents may provide insights for how operators and responders may use equipment differently to <b>protect fission products boundaries</b> possibly <del>achieve safety functions</del> ; — Whether equipment could be used out of its design function support, <b>for</b> a different strategy (e.g. use of fire protection system <b>for heat removal to</b>	Safety functions should be related to design basis accidents. Protection of fission products boundaries is more appropriate for severe accidents.	x			

		provide cooling).					
Reviewer: Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) (with comments of GRS ) Country/Organization: Germany				RESOLUTION			
			Date: 26. 09 2017				
1	2.14	The process for communicating outputs of analyses to the responsible engineering and Human Resource Management disciplines and ensuring that the outputs have been addressed should be documented.	It is also important that the information receives the disciplines which are responsible for the organization of the human resources (e.g. hire employees etc.).			x	While we understand what Germany reviewer is trying to achieve, we are not 100% sure that Human Resources Management is the right department. Usually what get communicated are the skills and qualifications necessary to carry out that task. This is communicated to personnel training rather than Human Resources. There may be an interface between training and human resources but HFE doesn't usually interface with Human Resources directly. This may be different for different countries though.
2	3.45.	Task analysis should contain an error classification that at a minimum captures the errors of omission, errors of commission, and including decision errors and communication errors.	In a former version communication errors has been included. Communication errors are as important as decision errors.	x			
3	4.27	f) Should present information such that	To bring into awareness	x			

		it can be rapidly recognized and understood by operators ( <u>e. g. take into account knowledge about human information processing and visual attention</u> );	that human information processing is limited and that knowledge about the strength and limitations has to be used in the human machine interface design process.				
4	10.13.	Mobile devices and their characteristics should be selected and be compatible with the users' anthropometry, environmental conditions and HFE design criteria, e.g. for lighting, grip, size, <del>and weight</del> , and <u>characteristics of human information processing.</u>	The aspect of human information processing (e.g. cognitive limitations and strengths) should be considered as an important input for mobile devices.	x			
Reviewer: Richard Sreeton / Robert Moscrop Country/Organization: UK – Office For Nuclear Regulation				Page 1 of 1 Date: 16/10/2017	RESOLUTION		
1	5.3	Delete Paragraph “5.3. <i>Verification and validation should be performed by persons or parties independent of the design.</i> ”	<p>ONR considers that the costs associated with creating a team of personnel, in addition to the design team, purely to administer validation trials are grossly disproportionate to any perceived benefit.</p> <p>ONR, via its regulatory assessment of other member state reactor designs (EPR, AP1000, and ABWR), is aware that this practice is not followed in the US, France, UK, or Japan, suggesting that this is practice is not the norm.</p> <p>It is requested that the suggested guidance be removed.</p>	x	We agree with ONR that this may be difficult to achieve but we have identified it as a “should” statement. This represents the ideal and is consistent with software verification and validation and systems engineering principles as well. However, if this is ONR’s only sticking point, then perhaps it is ok to remove it since they are correct, it is not the norm.		

Reviewer: Mr/ Moustafa Aziz Page.... of.... Country/Organization: Egypt ( Nuclear and Radiological Regulatory Authority ) Date:				RESOLUTION			
1	5.30 Line 1 Page 44	The means of collecting data should be documented in a HFE Verification and Validation	V&V Should be defined			x	Verification and Validation is already defined in the definition section.
Reviewer: Radim Dolezal Country/Organization: State Office for Nuclear Safety (SUJB Czechia)				Page 1 of 1		RESOLUTION	
Date: 11.10.2017							
1	2.19	The HFE programme should be carried by team with sufficient knowledge and expertise base. Knowledge management of this team should be described and ensure through the entire NPP life cycle.	I miss mention about HFE program team, its knowledge base (in this section, although I know that is a partially similar bullet in section 2.21) and importance of knowledge management thru whole life cycle of NPP.			x	We don't think to understand this comment. Does this comment have to do with ensuring continuity of HFE knowledge base over the course of the NPP lifecycle?
2	3.57	Performance shaping factors are ... (definition according to your own taste).	The only occurrence of otherwise undefined term "performance shaping factors".	x	Added definition: Performance shaping factors: The factors that can influence the performance of operators, including the level of stress, the time available to carry out the task, the availability of operating procedures, the level of training provided, the environmental conditions, etc. which are		

					identified by task analysis. [Source SSG-3]		
Reviewer: Country/Organization: Republic of Korea / Korea Institute of Nuclear Safety Date: October 10, 2017				RESOLUTION			
1	Page 14, 3.26, 1/2	Function <b>analysis</b> and allocation of functions ~	In the analysis phase, function analysis element is included, not function requirements.	x	Function analysis and allocation of functions should include requirements associated with the implementation of severe accident management guidelines.		Function analysis and allocation of functions should consider performance requirements and the level of automation required to safely meet these requirements.  Function analysis and allocation of functions should include requirements associated with the implementation of severe accident management guidelines.
2	Page 16, 3.36, 10/15	~ HFE design process (e.g. function <b>analysis</b> and allocation, <b>treatment of important human tasks</b> )	The analysis phase includes function analysis and treatment important human tasks, not functional requirement analysis and allocation, human reliability analysis, respectively.	x			
3	Page 16, 3.36, 12/15	<del>Data from other analyses that are → process (e.g. function analysis, →);</del>	Same sentence is repeated.	x			
4	Page 18,	~	The analysis phase includes	x			

	3.50, 7/8	- <b>Treatment of important human tasks</b> (e.g. treatment of important human tasks may ~)	treatment important human tasks, not human reliability analysis				
5	Page 47, 6.7, 11/15	~ - All HFE related issues in the issue tracking system have been adequately addressed;	[Recommendation not proposition] Issue tracking system is mentioned once in this safety guide. So, the explanation of issue tracking system needs to be described. Otherwise, it is necessary to explain the definition of issue tracking system and the type of issues in issue tracking system (e.g. design not met on standards, gap found in HFE verification and validation, etc.) on 2. HFE PROGRAMME MANAGEMENT	x	All HFE related issues <u>identified prior to HFE design implementation</u> have been adequately addressed.		
6	Page 52, 8.30~8.36	DEGRADATION AND FAILURES OF THE COMPUTERIZED PROCEDURES SYSTEM	[Recommendation not proposition] In the guide from 8.30 to 8.36, the transition guide to backup procedure is explained according to the failure of the computerized procedures system (CPS). However, the transition guide about operator action or task is not explained when the CPS is recovered. Therefore, it is necessary to provide transition guide to operator when the CPS is recovered. (e.g. operator should	x	New para 8.37: The transition guide to back-up procedures should consider failure modes associated with the computerized procedures system as well as specify required operator actions during and after the CPS has been recovered. These actions are to be described from the		

			proceed the step that the CPS is failure, or operator should perform the first step in the stage that the CPS is failure, etc.)		perspective of the operator.		
--	--	--	---	--	------------------------------	--	--