Seminar 1a – Nuclear installation safety assessment – Session 2

Chaired by E.-K. Puska (VTT) / M. Kund (GRS)

13:45 - 14:30 | Impulse speech

Impulse speech - Overview of IAEA activites on SMR and PSA activities

J. Luis-Hernandez (IAEA)

Seminar 1a – Nuclear installation safety assessment – Session 2

Chaired by E.-K. Puska (VTT) / M. Kund (GRS)

15:00 - 15:30 | No. 106

Resilience and Safety in Complex Systems – Evaluating Human Machine Interfaces in Nuclear Power Plants under modern Safety Paradigms

F. Gärner (GRS) and H. Mbonjo (GRS)

In the last 40 years the view on the concept of safety has shifted and the term resilience has emerged. As resilience engineering [1] the term taken up from materials science into developmental psychology has now also been adopted into technical fields like rail, process engineering or power generation.

This presentation explores how resilience engineering concepts can be applied in evaluation methods for human machine interfaces (HMIs) of nuclear power plants. This is a topic addressed in the GRS research project MEDIC (Method for Evaluation of HMI of Digital Instrumentation and Control) funded by the German Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (BMU). The project aims at developing analysis methods for evaluating technological measures against erroneous actions made when working with those interfaces. An aim is to classify those measures and develop a catalogue of quality attributes for those classes in order to provide a general basis for the evaluation of HMIs.

Regarding human machine interactions, the MEDIC project incorporates the established view that one cannot just expect humans to act flawlessly [2]. For the method development in MEDIC it is therefore important to know how HMIs should be designed in order to promote correct actions and what provisions should be made to prevent and enable recovery from erroneous actions. Answers to these questions can be found in general design guidelines [3] and standards from the nuclear field. But these questions are also addressed in resilience engineering.

The method development in MEDIC is presented under the viewpoint of resilience engineering. Concepts from, still emerging, definitions of resilience engineering [4] are introduced. It is considered, how knowledge from general design guidelines, recommendations and requirements for HMIs in nuclear powerplants and the field of human error already promote resilient design and how these aspects can be incorporated into the MEDIC method. On that basis, if and how recent results from the general and multidisciplinary field of resilience engineering itself can also be applied to the specific context of the method development in MEDIC is explored.

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[1] Hollnagel, Erik & Woods, David & Leveson [Eds.], Nancy. (2006). Resilience Engineering: Concepts and Precepts. Aldershot, UK: Ashgate.

[2] Reason, J. (1990). Human error. Cambridge university press.

[3] Norman, D. (2013). The design of everyday things: Revised and expanded edition. Basic books.

[4] Woods, David D. (2015) "Four concepts for resilience and the implications for the future of resilience engineering." Reliability Engineering & System Safety 141: 5-9.

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15:00 - 15:30 | No. 107

The main requirements for seismic stability of a nuclear power plant in the safety regulations of the Russian Federation

I. Lobodenko (SEC NRS)

The report will focus on the main requirements for seismic stability of a nuclear power plants (NPP) at all stages of their life cycle. The report will provide a classification of buildings, facilities and their bases of constructions, systems and elements of a NPP by the category of seismic resistance, which is applied in the regulatory documents of the Russian Federation. Special attention will be paid to clarify the seismotectonic conditions of the nearest area of the NPP and the NPP site, the necessity of taking into account the ground conditions when determining the seismicity of the NPP site. The ground conditions, geology, seismotectonics (active faults, paleo earthquake and recent earthquake parameters, induced seismicity etc.) have been taken into account within deterministic/probabilistic seismic hazard assessment. The report will also consider the initial data for seismic design, including the parameters of design basis earthquake, maximum design earthquake, beyond-design earthquake, as well as possible combinations of seismic loads and impacts on building construction, buildings and facilities of the NPP.

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15:30 - 16:00 | No. 108

4th periodic safety review in France

A. Portier (IRSN)