

9 Taking account of organisational and human factors (OHF) in nuclear safety and radiation protection

Issues and background

ASN considers that people and organisations are fundamental factors in safety and radiation protection and that significant progress is still to be made in taking account of these factors in nuclear activities.

Experience feedback analysis shows that 80% of incidents occurring in operational nuclear installations have at least one cause directly linked to organisational and human factors (OHF). Similarly, the investigations carried out by ASN further to the serious radiotherapy accidents declared in 2005 and 2006 by various hospitals in France (Grenoble, Lyon, Epinal) showed that they are to a very large extent attributable to organisational and human shortcomings: use of a software in a configuration that had not been completely tested, error in transmission of spoken instructions, or error in setting treatment parameters.

Safety and radiation protection must not be the sole responsibility of the individual. Those in the front-line are rarely the sole cause of accidents, which often reveal latent and deep-seated flaws in the organisation, weakening the socio-technical systems and leading to vulnerabilities in the human and organisational lines of defence.

During the course of day-to-day operations, people and organisations make a determining and positive contribution without which the installations could not function. The purpose of taking OHF into account is not simply to “reduce human error” but also to encourage and promote specific human capabilities and skills (intelligence, adaptability, creativity, ability to anticipate and to recover, etc.) and strengthen the human and organisational lines of defence. In this context, organisations have a crucial role to play in creating and guaranteeing conditions conducive to improving human performance.

A systematic approach to risk management based on inclusion of OHF could help nuclear professionals optimise the design of the installation interfaces, improve working conditions by incorporating an assessment of the associated risks, reinforce the human and organisational lines of defence and learn lessons from operational feedback.

ASN’s objectives and action principles

The objective of ASN is for the licensees of nuclear installations and establishments carrying out small-scale nuclear activities, to explicitly and thoroughly incorporate OHF into their risk management process, throughout the life of the installations for which they are responsible. The demonstration provided by the licensee concerning nuclear safety and radiation protection must be based on people and organisations just as much as on the technical systems used in the installation. ASN considers that incorporating OHF into a integrated risk management approach should be the priority area of work for the nuclear industry stakeholders and small-scale nuclear activity professionals.

The actions carried out by ASN rely on the principle of the responsibility of the licensee: with regard to the general safety objectives, it is up to the licensees to define and improve their organisation, to take the steps necessary to incorporate OHF into the design and operation of the installations and to ensure that their staff are trained and their skills managed. ASN analyses and, where applicable, approves certain provisions, but it does not specify any particular standard organisation for the nuclear licensees. However, it does encourage the licensees to take appropriate steps to develop the extent to which OHF are incorporated.

ASN supervises the steps taken by the licensee and assesses the results, in particular during inspections. In addition to actual equipment, ASN is paying greater attention to personnel training and skills management, the definition and working of organisations, incorporating human aspects into experience feedback analysis and safety management.

Regulation by ASN

Regulation is carried out by ASN at during the design of a new installation or a new technical system. ASN therefore asked those in charge of the EPR project to set up a human factors engineering programme for the design of the new plant. In 2003, it stated its position regarding the definition and implementation of this programme for computerised control and for interventions outside the control room. In 2004, to-



A control room on the AREVA NC site at La Hague

gether with its technical support organisation, ASN carried out an assessment of computerised control of the EPR project. Similarly, the Jules Horowitz irradiation reactor project was examined from the OHF viewpoint.

Regulation also concerns modifications made by the licensee to an existing installation and which are important from the safety viewpoint. In 2004, together with the IRSN, ASN thus examined the methodology employed by EDF for incorporating OHF into technical and documentation modifications made to its nuclear power plants. Another example is the fact that analysis of the OHF file was a determining factor in ASN's decision concerning the increase in the capacity of the Melox plant, based solely on a change in staff work rates. The licensees of research installations were also asked by ASN to give more space to OHF in the safety studies. The studies conducted for the periodic safety review of the CEA's Masurca critical mock-up at Cadarache are an illustration of this.

Generally speaking, ASN observes that the licensees have taken steps to improve the installation design and modification procedures, primarily focused on systems ergonomics. ASN however considers that considerable progress could still be made through a more systematic ap-

proach implemented as far upstream as possible in the design and modification projects. In the absence of any ergonomic analysis during the design process, unidentified impacts on operator activity would lead to errors following commissioning of an item of equipment, and will be subsequently more difficult to correct.

Quite apart from design and modification issues, ASN's regulation also concerns the steps taken by the licensees of nuclear installations and small-scale nuclear establishments to improve how OHF are taken into account in the day-to-day running of the installations.

In 2006, BNIs were therefore subject to inspection of the extent to which OHF had been incorporated into operational procedures. The declared policies of the licensees in this field were checked, along with the organisation and resources put in place, the improvement actions taken with respect to the individual aspects of operation (skills, working environment and tools, human performance), the collective aspects (operational communication, interfaces between teams or departments) and the incorporation of OHF into experience feedback analysis.

The inspections conducted in the nuclear power plants showed the efforts made by EDF to take

account of OHF, even if progress is still needed with regard to action in the field. The situation is more contrasted in the other installations. With regard to the fuel cycle installations, ASN considers that on the whole, AREVA NC has taken on board the importance of OHF for installations safety. An "OHF network" has been set up within the AREVA group, with a correspondent on each site. Action is being taken although this nonetheless needs to be extended to the various OHF related areas. With regard to research facilities and installations being dismantled, the inspections carried out show that OHF are not as yet part of a systematic approach. ASN considers that this point is a priority area for action by the licensees concerned.

In the field of small-scale nuclear activities, following the declaration of serious radiotherapy accidents highlighting the key role of OHF, ASN launched a risk management approach in 2006 including identification, analysis and processing of OHF. A guide of good practices currently being prepared at the initiative of radiotherapists should for example include the prevention of organisational and human shortcomings in this

field. ASN has also triggered an action plan concerning radiotherapy patient safety jointly with the Ministry for Health and Solidarity and the health agencies. This plan aims for greater importance to be given to OHF, in particular through the ergonomics of man-machine interfaces, operator training when new medical equipment is installed, analysis of experience feedback from past events and organisational optimisation.

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Incorporating OHF into risk management is both a recent topic in industrial history and one that is extremely complex to deal with. ASN considers that OHF are a promising source of nuclear safety and radiation protection improvements and expects the nuclear industry and nuclear sector professionals to make commitments commensurate with the issues and stakes involved in this field.

More generally speaking, ASN intends to expand its supervision of how OHF are dealt with and believes that this is a priority for the coming years.