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TRENDS AND CHALLENGES IN REGULATORY ASSESSMENT OF NUCLEAR SAFETY CULTURE

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Abstract

The paper gives an overview of the current practices in the area of regulatory assessment of safety culture in nuclear organisations and of the associated challenges. While the assessment and inspection procedures currently in use by regulatory authorities worldwide are directed primarily at verifying compliance with the licensing basis, there is a recognised need for a more systematic approach to the identification, collection and review of data relevant to the safety culture in licensees' organisations. The paper presents a proposal for using the existing regulatory inspection practices for gathering information relevant to safety culture and for assessing it in an integrated manner. The proposal is based on the latest requirements and guidance issued by the International Atomic Energy Agency (IAEA) on management systems for nuclear facilities and activities, particularly as regards the attributes needed for a strong nuclear safety culture.

Keywords

nuclear safety, safety culture, management systems, safety culture assessment, nuclear regulation

1.0 Introduction

Since the introduction of the concept by the International Nuclear Safety Advisory Group (INSAG) [1], there have been many definitions proposed for safety culture over the years [2]. The definition of safety culture used in this paper is that proposed by the International Atomic Energy Agency (IAEA): "the assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance" [3].

Although not directly covered by the traditional approaches to the regulation of nuclear facilities and activities, safety culture has become one of the main areas of interest for nuclear safety authorities worldwide, particularly in what regards the regulatory capability for assessing safety culture and the means for influencing it. This paper presents the regulatory oversight process developed by the National Commission on Nuclear Activities Control (CNCAN), the nuclear regulatory authority in Romania, using the attributes for a strong safety culture promoted by the IAEA.

2.0 Regulatory assessment of safety culture

It is recognised that the prime responsibility for ensuring the safety of a nuclear installation rests with the licence holder. This is an established principle in international conventions, such as the Convention on Nuclear Safety, and in national legislative systems worldwide. The role of the nuclear safety authorities is to verify that the licensees take the necessary measures to keep risk to the public as low as reasonably achievable, and to apply enforcement actions in response to indications of licensees' failure to meet their prime responsibility for safety.

The traditional regulatory approach to nuclear safety oversight consists of setting requirements, through regulations and licence conditions, and verifying compliance with them, with enforcement actions taken in case of deviations. With safety culture being at least as important as the technical aspects of safety, but infinitely less tangible, there is a significant

challenge to the regulators trying to address it in their requirements.

The extent to which regulatory requirements cover aspects particularly relevant to safety culture is generally limited to those concerned with the management systems and the safety policies of the licensees, the training of staff with safety-related duties, the use of operational experience feedback, etc.

It is interesting to note that the study undertaken by the Reactor Harmonisation Working Group (RHWG) of the Western European Nuclear Regulators Association (WENRA) to benchmark the national safety requirements against a set of reference levels based on IAEA safety requirements and guides showed that only one third of the participant countries had formal legal requirements that addressed the licensees' responsibility for issuing a nuclear safety policy, communicating it to all site personnel, implementing it and reviewing its implementation [4]. The reference levels concerning the licensees' self-assessment of the implementation of the management systems, justification of changes in the levels of staffing and internal reporting of abnormal events and near misses, are also among those subject to less coverage by the formal regulatory requirements.

The regulatory authorities of several countries (e.g. Canada, USA) have reported on having dedicated assessments of licensee's safety culture. However, there is widely shared opinion that it is not possible to evaluate safety culture in a quantitative manner, particularly from a regulatory perspective, and that "the regulator can evaluate the outward operational manifestations of safety culture as well as the quality of work processes, and not the safety culture itself" [5].

The challenges associated with the regulatory assessment of information relevant to safety culture include the lack of access to the underlying assumptions, the inherent subjectivity of the reviewers, the fact that the safety culture of a whole organisation cannot be readily inferred from a sampling approach to inspection, etc. Another important challenge for the regulators is to timely recognise the signs of a declining safety culture in licensees' organisations. Some examples of indicators of declining safety performance are provided in references [5] and [6].

3.0 A structured approach to the assessment of information relevant to safety culture

Common to all regulatory jurisdictions is the acknowledgement of the importance of the management system in supporting a strong safety culture. With the issuance of the safety guides on management systems for nuclear installations [7, 8], the IAEA has provided a framework for the assessment of safety culture, based on a set of 37 attributes, grouped into 5 areas corresponding to safety culture characteristics:

- Safety is a clearly recognised value;
- Leadership for safety is clear;
- Accountability for safety is clear;
- Safety is integrated into all activities;
- Safety is learning driven.

The data relevant to safety culture encompasses all information that could provide an input to the assessment of the safety culture characteristics and of the fulfilment of the respective attributes. The main means for gathering data relevant to safety culture consist of review of documentation, interviews with licensees' staff and observation of activities in the field as well as in common meetings between regulators and licensees. Ideally all these means should be used in an integrated manner, in order to get an overall view of how the characteristics and attributes of a strong safety culture are exhibited across a whole process or in the context of a particular activity.

A few examples of generic data sources, which are applicable regardless of the technical area of inspection, are provided below:

- policy documents emphasising priority to safety;
- procedures that describe safety-related processes and activities;
- self-assessment guidelines;
- self-assessment reports and safety performance indicators for various processes (e.g. training, maintenance, etc.);
- results of (quality) management system audits and reviews, reports from external reviews;
- previous inspection reports;
- records of past events and corrective actions implemented;
- interviews with licensee's staff at various levels (managers, supervisors, workers) during the inspections; observations during common meetings;

- observation of activities in the field (e.g. corrective maintenance work, preventive maintenance work, chemistry activities - sampling/analyses; surveillance/testing; nuclear plant operator rounds; new fuel receipt and inspection; shift turnover; control room and simulator evolutions; system/component clearance activities; Hold Point activities; training – initial / refreshment; maintenance planning meetings; outage planning meetings, etc.).

While not all the 37 attributes outlined in the IAEA safety guides can be readily observed as part of the routine regulatory activities, there are some which are more suitable for assessment through the normal review and inspection processes. The 20 attributes mentioned in the following paragraphs have been selected bearing in mind the accessibility of the information by the regulatory body and have been grouped by the primary means employed for the gathering of data.

Examples of attributes that can be assessed through the review of documentation (with suggestions for specific categories of documentation to be reviewed):

- The high priority given to safety is shown in documentation, communications and decision making (e.g. policy statements, procedures describing the operational decision-making processes, operating policies and principles, etc.);
- Leadership skills are systematically developed (e.g. training curricula for managers and supervisors);
- Management ensures that there are sufficient competent individuals (e.g. justification of the organisational baseline and of the staffing levels, periodic reviews conducted to assess the availability of sufficient staff in all areas of competence, long-term staffing plans, etc.);
- Safety implications are considered in change management processes (e.g. the formal process for identifying, categorising, assessing, implementing and monitoring organisational changes);
- Roles and responsibilities are clearly defined (e.g. management system documentation outlining the responsibilities and levels of authority, definition of responsibilities for the implementation of safety related processes and activities, etc.);
- There is a high level of compliance with regulations and procedures (e.g. records of past regulatory inspection activities and of non-conformances identified, records of incidents involving non-compliance with internal procedures, etc.);
- Consideration of all types of safety, including industrial safety and environmental safety, and of security is evident (e.g. the framework for the integration of these elements as described in the management system manual, in safety assessment reports, in the procedures governing the design change process, in training programs and documents, etc.);
- The quality of documentation and procedures is good (this can be ascertained both through direct review of procedures and by reviewing trends in non-conformances related to various aspects relevant to the quality of procedures);
- Open reporting of deviations and errors is encouraged (e.g. the procedures / guidelines applicable to the reporting, collection and assessment of safety significant events, including low level events, near-misses and relevant events from external operating experience; examples of reports submitted by plant staff and contractors, trends in the number of reports for low level events);
- Internal and external assessments, including self-assessments, are used (e.g. records of improvement opportunities and corrective actions identified based on each of these review processes);
- Organizational experience and operating experience (both internal and external to the facility) are used (e.g. the procedures applicable for the collection, analysis and dissemination of operational experience; evidence of incorporating operating experience into the training programs and evidence of design and procedural changes to improve plant safety based on insights from operating experience);
- Safety performance indicators are tracked, trended, evaluated and acted upon (e.g. self-assessment guidelines containing specific performance indicators available for various processes and / or activities)
- There is systematic development of individual competences (e.g. the training policy, the documentation describing the systematic approach to training and its implementation for the different categories of staff).

Examples of attributes that can be assessed through interviews:

- Individuals are convinced that safety and production go hand in hand;

- Individuals have the necessary knowledge and understanding of the work processes;
- Good working conditions exist with regard to time pressures, workload and stress;
- A questioning attitude prevails at all organizational levels.

References [3] and [9] include in the appendixes questions that could be used as inspiration for the regulatory inspectors conducting interviews.

Examples of attributes that can be assessed through direct observation:
- There is visible leadership showing the involvement of management in safety related activities;
- There is cross-functional and interdisciplinary cooperation and teamwork;
- Housekeeping and material conditions reflect commitment to excellence.

It should be noted that the findings resulting based on this approach will inevitably reflect the subjective opinion of the reviewer, the relevance of the attribute in the specific area of technical assessment or inspection and the means for gathering the information. While a specific finding could not provide a view on the safety culture of the organisation as a whole, evidence of certain attributes not being met for several functional areas and processes would provide a clear indication of a problem that would warrant increased regulatory surveillance.

4.0 Experience with the implementation of this approach

In 2008, Romania received a recommendation, based on the peer review in the framework of the Convention on Nuclear Safety, to develop dedicated diagnostic tools in order to improve the effectiveness of regulatory assessment of safety culture. This action has been addressed, with support from the IAEA, through an Extra Budgetary Programme (EBP), funded by CNCAN and the Norwegian Radiation Protection Authority. [10]

In the period 2010 - 2011, CNCAN defined a Safety Culture Oversight Process (SCOP), building on the existing regulatory inspection and review processes, and produced SCOP guidelines based on the structured approach outlined above.

Detailed SCOP guidelines are provided for assessing each safety culture attribute and include, as applicable:
- regulatory expectations relevant to the attribute;
- documentation to be reviewed; questions to be asked; observations to be made;
- elements necessary for considering an attribute fulfilled;
- warning flags.

The implementation of the SCOP proved that all the routine regulatory reviews and inspections reveal aspects that are of certain relevance to safety culture. Interaction with plant staff during the various inspection activities and meetings, as well as the daily observation by the resident inspectors, provide all the necessary elements for having an overall picture of the safety culture of the licensee.

Systematic planning of regulatory inspections to cover all areas important to safety should ensure that safety culture aspects are timely observed. However, a large number of review and inspection activities are required, over a relatively long period of time, to gather sufficient data in order to make a judgement on the safety culture of an organisation as a whole.

Training of the reviewers and inspectors is essential for achieving consistency in the regulatory approach to safety culture oversight. It was found that Edgar Schein's model of organizational culture is useful for promoting a common understanding of safety culture both within the regulatory organization and in the relation with the licensees.

Future development of the SCOP guidelines is envisaged, to take account of the latest IAEA publications in this area [11], as well as of the "Traits of a Healthy Nuclear Safety Culture" promoted by the Institute of Nuclear Power Operations [12].

5.0 Concluding Remarks

While it is difficult to ascertain to what extent the safety culture attributes are met by an organisation as a whole, the means for identifying areas where expectations are not met are already provided by the traditional assessment and inspections processes employed by regulatory authorities in their reviews of areas such as management systems, training, operational experience feedback. The establishment of a link between the safety culture attributes outlined in the IAEA publications and the functional areas and

processes reviewed as part of the regulatory oversight programmes could provide a better basis for the implementation of a performance based approach to regulation.

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