SAFETY CULTURE
KEYS FOR SUSTAINING PROGRESS

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Principles of nuclear safety are now well known and being put into practice around the world, leading to a degree of international harmonization in safety standards. Recent experience, however — particularly in States with long-established nuclear power programmes — indicates that the long-term management of safety calls for approaches that go beyond simple adherence to established design standards and operating procedures. Continued improvement in levels of safety requires the development of a comprehensive "safety culture" at all levels of an organization, with visible and consistent leadership from senior management.

Such a safety culture can make a substantial contribution to the principle of "defense-in-depth". It can promote the vigilance needed to recognize actual or potential safety problems and the communication and commitment needed to address them. External peer reviews and self-assessment can be important elements in strengthening safety culture. This article reviews the main elements required for establishing and sustaining a good safety culture at nuclear installations that involves staff at all levels.

STAGES OF SAFETY CULTURE

The International Nuclear Safety Advisory Group (INSAG) defines safety culture as "that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance." Safety culture is also an amalgamation of values, standards, morals, and norms of acceptable behaviour. These are aimed at maintaining a self-disciplined approach to the enhancement of safety beyond legislative and regulatory requirements. Therefore, safety culture has to be inherent in the thoughts and actions of all the individuals at every level in an organization. The leadership provided by top management is crucial.

When considering safety culture as practiced around the world, it is apparent that nearly all organizations involved in nuclear activities have in common a concern for safety and how to improve and maintain it. Yet there is substantial diversity among organizations in their understanding of "safety culture" and how to act to influence it in a positive way.

This variation is represented in different developmental stages. Three stages seem to emerge, each of which displays a different awareness and receptiveness to the effect of human behavioural and attitudinal matters on safety. The characteristics of each stage, identified below, provide a measure for organizations to use as a basis for self-diagnosis. The characteristics also may be used by an organization to give direction to the development of safety culture, by identifying the current and the aspired positions. It is possible for an organization at any time to exhibit any combination of the characteristics listed under each of one of these stages.

Stage I. The organization sees safety as an external requirement and not as an aspect of conduct that will help the organization to succeed. The external requirements are those of national governments, regional authorities, or regulatory bodies. There is little awareness of behavioural and attitudinal aspects of safety performance, and no willingness to consider such issues. Safety is seen very much as a technical issue. Mere compliance with rules and regulations is considered adequate.

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Stage II. An organization at Stage II has a management which perceives safety performance as important even in the absence of regulatory pressure. Although there is growing awareness of behavioural issues, this aspect is largely missing from safety management methods which comprise technical and procedural solutions. Safety performance is dealt with, along with other aspects of the business, in terms of targets or goals. The organization begins to look at the reasons why safety performance reaches a plateau and is willing to seek the advice of other organizations.

Stage III. An organization at Stage III has adopted the idea of continuous improvement and applied the concept to safety performance. There is a strong emphasis on communications, training, management style, and improving efficiency and effectiveness. Everyone in the organization can contribute. Some behaviours are seen within the organization which enable improvements to take place and, on the other hand, there are behaviours which act as a barrier to further improvement. Consequently, people also understand the impact of behavioural issues on safety. The level of awareness of behavioural and attitudinal issues is high, and measures are being taken to improve behaviour. Progress is made one step at a time and never stops. The organization asks how it might help other companies.

MANAGEMENT ROLES & ACTIONS

Four main requirements for managing safety effectively can be identified. These are strongly interrelated, but it is useful to discuss them separately:

- A visible and consistent commitment to safety from senior management, at both the corporate and plant level;
- A work environment conducive to a good safety culture;
- A commitment at all levels to develop and maintain a good safety culture; and
- A "humble" attitude, meaning that good safety performance is never taken for granted.

Senior management commitment to safety can be demonstrated by, for example, publicizing safety objectives (and monitoring progress towards meeting them), creating safety related posts with an appropriate level of authority, and establishing advisory committees or other mechanisms to involve staff and maintain interest in safety issues.

It should be stressed here that actions as well as words are essential in promoting a real safety culture; policies and committees need to be supported by positive management efforts to set a good leadership example and to give proper recognition for good safety performance. It is equally important that senior management strive to avoid actions that could be seen as undermining this commitment, such as overriding safety-related decisions made at lower levels, or placing great emphasis on cost-cutting without reference to maintaining safety.

Good safety management requires a work environment in which staff are well motivated and where their concerns and suggestions are listened to and acted upon. Open and effective two-way communication on safety issues throughout the management chain and across disciplines is an essential feature of such an environment; safety information needs to flow from the "top down" but also, equally important, from the "bottom up". Good safety

Photos: A range of safety services provided through the IAEA help countries review and upgrade levels of nuclear plant safety.

culture depends upon workers identifying safety problems or opportunities for improvement and reporting these to supervisors. This is only likely to happen if the workers are encouraged to take an interest in safety issues and given the necessary training, and if they perceive some benefit in reporting such things (i.e. that there is a reasonable chance of their comments or suggestions being acted upon). On the other hand, it is most unlikely to happen if workers are simply blamed for problems that they report.

A good safety culture will be inherent in the thoughts and actions of individuals at all levels of an organization, creating a high quality defense-in-depth against technical, human, and organizational failures. Senior management should ensure that their organization has a safety management system that provides a structured and systematic means of achieving and maintaining high standards of safety performance.

Managers and supervisors need to motivate their staff to ensure that such a system is actually implemented on a day-to-day basis, and is not compromised by other pressures. Staff need to be aware of their responsibility for their own safety and that of their colleagues, not only in the way they perform tasks but also in identifying potential safety problems or improvements in their area of work.

A "humble" attitude implies constant vigilance on safety matters, avoiding complacency when performance has been good, and maintaining a willingness to invite — and, when appropriate, implement — suggestions for improvement.

Operational feedback of experience — from the plant, from other parts of the organization, and from outside the organization — and, perhaps more importantly, the use of such feedback in the planning of work are crucial processes that need to be maintained throughout the life of a plant. Peer review and self-assessment — discussed in more detail below — can also play a major role in meeting this requirement.

THE ROLE OF REGULATORS

Regulatory inspection and enforcement are essential tools for monitoring nuclear safety at installations. Although the responsibility for managing safety rests with the operating organization, regulators can either help or hinder the process, depending on their attitude towards inspection and enforcement. Regulatory approaches vary, but three general types can be observed. These could be seen, very broadly, as mirroring the three stages of safety culture discussed earlier.

"Compliance-based" regulation. This approach typically involves the regulator providing prescriptive standards and requirements — the same for every plant — for operators to follow. In this regime, inspection and enforcement are largely a matter of verifying compliance with these rules and penalizing non-compliance.

'Performance-based' regulation. In this approach, licensees are required to comply with safety objectives, but have some flexibility to decide how they achieve that. Safety performance indicators are used by the regulator to observe trends in safety, and inspection activities focus on these indicators.

A difficulty with this approach, however, is that the indicators used can be manipulated (i.e. efforts may be devoted to improving the indicators, rather than improving safety itself). Furthermore, it is difficult to find safety performance indicators that are predictive — i.e. that can be used to identify potential problems

before they develop into real ones — and therefore this approach remains essentially reactive. As an example, one consequence of improving safety culture may be an increase in the number of safety related "events" or problems reported, as the result of better reporting by staff. It is important that regulators (as well as managers) are able to distinguish a positive trend of this type from a negative one in which more problems are occurring because of deteriorating safety performance. This requires a more sophisticated approach to inspection than simple "incident counting", and more positive safety indicators may be of value.

"Process-based" regulation. This approach takes specific account of the fact that the safe operation of nuclear facilities depends on the effectiveness of the organizational processes established to operate, maintain, modify, and improve a facility. Briefly put, the process approach focuses on the organizational systems that the facility has developed to assure the ongoing safe operation from the perspective of the facility's internal logic. It recognizes that the design of organizational processes must remain flexible in order to allow the facility to create processes that are internally consistent, adapted to their history, culture and business strategy, and that allocate resources in the most rational way. A process-based approach attempts to allow this flexibility while forcing the facility to think very carefully about the logic of their processes. It demonstrates to the regulator that they have taken a very rigorous approach to the design, implementation, and ongoing evaluation of their key processes and that they are alert to opportunities to improve their systems.

A combination of the above three approaches can be used, since they are not mutually exclusive.

PEER REVIEW

Peer reviews are an important way of avoiding insular thinking on safety matters within an organization and broadening the range of "operational feedback". Reviews may be conducted by external organizations.

International peer reviews are offered by the IAEA, through such services known as OSART (Operational Safety Review Team), ASSET (Assessment of Safety Significant Events Team) and ASCOT (Assessment of Safety Culture in Organizations Team), and by the World Organization of Nuclear Operators (WANO). The Convention on Nuclear Safety, through its system of exchanging and reviewing detailed national reports, provides a further opportunity for international peer review of nuclear safety programmes and practices, at least at the national level.

SELF-ASSESSMENT

The process of self-assessment is a way of providing some formal structure to the development of safety culture. It enables critical comparison of existing activities and results with a documented, predetermined set of performance expectations. These expectations need to take account of regulatory requirements as a minimum standard, but should aim to go beyond them to targets based on the best practice at top performing plants or organizations. The targets should therefore be reviewed regularly to ensure that they continue to promote improvement.

Self-assessment is intended to promote improved safety performance through the direct involvement of personnel in the critical examination and improvement of their own work, and to ensure that line management is effective in monitoring operational safety performance and takes timely corrective actions to improve performance. Staff involvement in the process can result in a better understanding of safety culture (in relation both to their own jobs and the organization as a whole), a broadening of knowledge of the objectives to be achieved, and the means for achieving them. It can also help to promote good communications within the organization.

The process of self-assessment can be complemented by audits, carried out by competent people who are independent of the area or activities being audited (from other parts of the organization or from another organization). Again, there may be different "styles" of audit, ranging from simple compliance-checking to a much more wide-ranging and interactive review of the quality of the processes involved. Pre-audit meetings can help to ensure that the audit will be conducted constructively.

In view of the benefits it holds, the process of self assessment will soon become the key to continued progress in safety management. ❐