

Nuclear Safety

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*Managing and Regulating Organisational Change
in Nuclear Installations*

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NUCLEAR ENERGY AGENCY
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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- to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as
- to provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

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The CSNI constitutes a forum for the exchange of technical information and for collaboration between organisations, which can contribute, from their respective backgrounds in research, development, engineering or regulation, to these activities and to the definition of the programme of work. It also reviews the state of knowledge on selected topics on nuclear safety technology and safety assessment, including operating experience. It initiates and conducts programmes identified by these reviews and assessments in order to overcome discrepancies, develop improvements and reach international consensus on technical issues of common interest. It promotes the co-ordination of work in different Member countries including the establishment of co-operative research projects and assists in the feedback of the results to participating organisations. Full use is also made of traditional methods of co-operation, such as information exchanges, establishment of working groups, and organisation of conferences and specialist meetings.

The greater part of the CSNI's current programme is concerned with the technology of water reactors. The principal areas covered are operating experience and the human factor, reactor coolant system behaviour, various aspects of reactor component integrity, the phenomenology of radioactive releases in reactor accidents and their confinement, containment performance, risk assessment, and severe accidents. The Committee also studies the safety of the nuclear fuel cycle, conducts periodic surveys of the reactor safety research programmes and operates an international mechanism for exchanging reports on safety related nuclear power plant accidents.

In implementing its programme, the CSNI establishes co-operative mechanisms with NEA Committee on Nuclear Regulatory Activities (CNRA), responsible for the activities of the Agency concerning the regulation, licensing and inspection of nuclear installations with regard to safety. It also co-operates with NEA Committee on Radiation Protection and Public Health and NEA Radioactive Waste Management Committee on matters of common interest.

The opinions expressed and the arguments employed in this document are the responsibility of the authors and do not necessarily represent those of the OECD.

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FOREWORD

The primary role of the Special Expert Group on Human and Organisational Factors (SEGHOFF) is to improve the understanding and treatment of human and organisational factors and to communicate insights to the NEA Committee on the Safety of Nuclear Installations (CSNI), the NEA Committee on Nuclear Regulatory Activities (CNRA) and interested government and industry bodies. In order to be able to do so, the SEGHOFF conducts special studies, workshops and generic assessments in areas of high safety and regulatory significance.

The technical opinion presented in this publication has resulted from the work of a small task force. Dr. Craig S. Reiersen (NII), to whom the NEA secretariat wishes to express its particular gratitude, was the key author of the paper. Mr. Yves Van Den Berghe (AVN), Mr. Jose Villadoniga (CSN) and Mr. Tom King (NRC) contributed significantly to the final editing phases of the work. Mr. Bernard Papin and Mr. Daniel Tasset provided valuable assistance in translating the text into French. The end product represents the consensus of the CSNI/SEGHOFF concerning the regulation and management of organisational change, for which the working group deserves acknowledgement as a whole.

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MANAGING AND REGULATING ORGANISATIONAL CHANGE IN NUCLEAR INSTALLATIONS

Introduction

This Technical Opinion Paper (TOP) represents the consensus of specialists in human and organisational factors in the NEA member countries on the current state of the art in regulatory approaches to dealing with licensees' organisational change. The objective is to present an opinion to decision makers in the nuclear community on approaches which regulatory bodies may consider taking when dealing with organisational change. As such, the intended audience is primarily nuclear safety regulators. Government authorities, nuclear plant operators, industry leaders, researchers and the general public may also be interested.

Background

Nuclear licensees are, like any organisation, subject to change. They are increasingly required to adapt to a more challenging commercial environment as electricity markets are deregulated. One of the costs that is often perceived as being amenable to control is staffing, and hence there is significant exploration of new strategies for managing this cost – for example, by reducing staffing levels, changing organisational structures, adopting new shift strategies, introducing new technology or increasing the proportion of work carried out by external contractors.

The diverse drivers for change and the alternative business strategies that can be adopted by licensees need to be acknowledged. It is a nuclear licensee's prerogative to manage its own affairs and to seek to operate a cost-effective business. It is also the licensee's responsibility to ensure that the means by which this is achieved do not compromise nuclear safety. As is the case with technical plant modifications, organisational changes do not necessarily present a threat to the safe operation of nuclear plants, and may indeed enhance safety. However, if changes to staffing levels or organisational structures and systems are inadequately conceived or executed they have the potential to affect the way in which safety is managed. Some consequences of inappropriate organisational

change might be revealed early, but others are likely to have long latency periods and may be confounded with the cumulative effects of other changes. It may be especially difficult for a licensee to recognise and recover from these latter problems which result from changes implemented some time ago. These factors suggest that nuclear regulators may wish to have confidence that change is being planned and implemented in such a way that it does not compromise nuclear safety. This Technical Opinion Paper sets out the factors which regulatory bodies should consider incorporating in the review processes which they use when considering licensees' organisational changes. There will be a range of approaches that may be appropriate for use by a regulatory authority when it assesses a licensee's effectiveness in dealing with organisational change. Selection of the appropriate approach, and the amount of regulatory scrutiny, will be dependent upon such factors as the legal bases for inspecting licensees' management systems; the use of permissioning as opposed to prescriptive licensing regimes; the perceived safety concerns versus benefits; and the availability of regulatory staff who are suitably qualified and experienced in these matters. These factors should be taken into account when considering the approaches presented in the following sections.

A structured review process

As observed above, it is the licensee's responsibility for managing its own business, but the regulator may wish to gain an early and accurate awareness of any proposed organisational change which has the potential to impact upon nuclear safety. This is likely to entail gathering information which enables a judgement to be made about the adequacy with which that change has been analysed and planned, and the provisions for implementing and monitoring the change.

It is clearly useful for the licensee if the regulator's position is stated clearly and applied consistently in order to reduce uncertainty which impairs the licensee's capability to manage its own affairs. The regulator could therefore state formally the process by which organisational changes will be subject to regulatory scrutiny and develop relevant, practical and transparent criteria for assessing organisational change.

The remainder of this TOP sets out the elements which the regulator may wish to see addressed by the licensee when dealing with organisational change.

Licensee management of change process

The regulator may not wish to examine all the licensee's change proposals. This would be time-consuming, would entail much nugatory or unproductive work and would impact adversely on the licensee's management processes. Instead, both regulator and licensee could acknowledge that organisational change can be treated in much the same way as modifications to plant and equipment (whilst noting the "human" dimension discussed in page 15). The regulator may therefore require the licensee to develop a process for managing change which is akin to the process for managing plant modifications. That process could set out the way in which change proposals are derived, assessed and implemented. A rigorous change process would include a number of key elements:

- reference to an organisational "baseline";
- statement of proposed change;
- categorisation of safety significance;
- assessment and review of change proposal in accordance with categorisation;
- implementation programme and use of performance indicators;
- review of change post-implementation.

These elements comprise part of a safety management system or quality system for organisational change management, and as such they should each be subject to periodic review and audit by licensee and regulator. Each of these elements is discussed below.

Baseline assessment

Licensees may be encouraged to analyse and document their current organisational structures and resources. This documentation, which can be regarded as a statement of how the company is able to ensure that nuclear safety is managed and delivered, can be described as a "Baseline assessment". It provides the starting point against which any proposed change to organisational structures and resources can be judged. An analogy can be made with modifications to plant and equipment, in the sense that such modification proposals would be expected to make reference to the current plant items to show how and why a change is needed and how the change will be carried out safely. The change, once implemented, then becomes incorporated as part of the company's updated Baseline assessment.

The Baseline assessment shows how the licensee has assured itself that it has appropriate structures and resources in place. The regulator can acknowledge that the level of analysis carried out to justify the adequacy of current structures and resources should be proportionate to the safety significance of the functions which are discharged by different parts of the organisation. Some regulators may also expect the licensee's Baseline assessment to identify vulnerabilities to loss of specific resource, for example where a single person is the principal source of knowledge on certain safety matters, and to identify contingency measures. Confidence that the licensee understands its resource and competence needs, and maintains an effective organisational structure, may be gained from evidence that the licensee has developed performance indicators which monitor safety performance and confirm that nuclear safety functions are being discharged effectively. Such indicators effectively serve to validate the assumptions which underpin the Baseline assessment and to identify weaknesses.

Statement of proposed change

The licensee's change process ideally starts with a statement of what the change entails, why it is being introduced and what it is intended to achieve. Clarity of management responsibility is important, and the process should identify who is responsible for proposing and managing the change, assessing the justification and agreeing to its implementation. The programme for introducing the change may be stated, and the provisions for subjecting it to peer review, or self-assessment, defined. Also the timing of, and interaction with, the regulator may be acknowledged. Some regulators may require the change management process to specify the need for regulatory agreement before major changes proceed.

Categorisation of proposed change

Modifications to plant and equipment are categorised in accordance with their nuclear safety significance. Modifications to organisational structures and resources can be treated analogously. The categorisation system needs to reflect the potential nuclear safety impact of changes that are inadequately conceived or executed. The resulting categorisation can then be used to define the scope and quality of justification. All changes can usefully be subjected to an initial "filter" in which the potential safety impact is assessed, the level of analysis needed is determined and decisions not to carry out a more detailed assessment for those changes which have little or no safety impact are documented.

The categorisation itself should, whenever possible, be subject to peer review and confirmation. Higher category changes may include a requirement for the change proposal to be subject to regulatory agreement. By adopting such an approach, the licensee and regulator can reach an agreement on those changes which warrant regulatory scrutiny and those where regulatory intervention is not needed because regulatory intervention would delay changes which have a positive effect or which have no appreciable safety impact.

Analysis and review of change proposal

Ordinarily, organisational change proposals would be justified by carrying out a level of analysis which is proportionate to the potential impact of the change on nuclear safety. The potential cumulative effects of a series of small changes should also be considered when considering an appropriate level of analysis.

It is likely that most change proposals will seek to demonstrate that there remain sufficient competent persons to deliver safety functions, that management responsibilities are clearly defined, and that training needs and procedural modifications have been recognised. However, if it is to offer insight, the analysis also needs to consider the specific risks associated with the change. This will in turn help to identify specific factors which need to be addressed in the justification of a change proposal. Some of these factors may have implications for long-term as well as short-term plant safety. For example, if a proposal entails the outsourcing of functions currently performed by licensee staff, the analysis could cover the following points:

- define those functions to be outsourced which might impact on nuclear safety;
- identify the way in which the change, if inadequately conceived or implemented, might compromise the delivery of these functions (e.g. loss of “intelligent customer” capability – the capability to understand the plant and to specify, manage and understand the work of contractors; loss of licensee knowledge-base; increased workload on contract management staff; loss of control and supervision of contractors);
- state the measures which are being put in place to counter these risks (e.g. demonstrate sufficiency of intelligent customer resource; identify how corporate memory will be sustained over future years; show how additional contract workload will be absorbed without placing undue pressures on licensee staff; describe measures to manage contractors in the workplace);

The analysis would ordinarily be subjected to peer review processes which are consistent with those performed for plant and equipment modifications and, again, which are proportionate to the category of the change.

Implementation programme

A programme for implementing the change needs to be developed. The programme should identify those elements of the change which need to be completed in order to enable subsequent stages of the change to proceed (e.g. preparation of revised procedures; training; relocation of staff; etc.). A formal project management plan may need to be drawn up to help the management of more complex or extensive changes. Responsibilities for implementing the changes should be set out, and contingency measures identified where the consequences of the change failing to work as intended are unacceptable (such measures may include, e.g. short-term use of contractors; bringing back staff who have retired; reinstating previous management structures etc).

The regulator will gain confidence that the change is suitably controlled if the licensee puts in place indicators to monitor the effects of the change. These indicators should be designed so that they present early warning signals of problems – for example, increased working hours; reduction in “right first time” maintenance; amount of peer review comment on safety cases etc. Reliance on general non-specific indicators may not be sufficiently sensitive, and targeted measures may need to be derived where possible by considering the risks associated with the change as identified in the analysis stage described above. The regulator may sample these indicators and expect prompt contingency action by the licensee where they suggest that safety may be challenged.

Review of change

The regulator may expect the licensee’s change process to specify the conduct of a formal review stage. This will ordinarily be the final stage of each change programme, although for more complex, extensive or significant changes, interim reviews might also be warranted. The review ideally confirms that the objectives of the change proposal have been met and that risks to nuclear safety have been properly identified and managed. The review should draw upon and interpret the findings of the performance indicators discussed in the above section and confirm that there have been no unexpected or undesirable outcomes.

Other issues

Communication between regulator and licensee

Ideally, the licensee's change management process is clear and visible to the regulator. For instance, it may formally acknowledge the regulator's role, and the timing of its interactions with the licensee. In turn, the regulator should express its own views clearly, and there must be an agreed end-point to the change programme.

The importance of good dialogue cannot be over-estimated. Dialogue helps to ensure a common perception of the importance of specific issues. Where job changes and personnel redundancy are being planned, licensee staff will be anxious about their job security and the timing of the changes. The regulator may therefore help the licensee ensure that this uncertainty is minimised – for example, by giving the licensee guidance on the type of information which should be included in the change proposal, and by giving clear and early feedback on licensee proposals.

Impact of regulatory actions

The regulator may be prepared to offer guidance which helps the licensee to understand the regulator's expectations. However, the regulator must be aware of the impact of its own actions on licensee behaviour – and be careful not to constrain unnecessarily the licensee's choice of action or to impose inappropriate demands. By focusing on defining the elements of an organisational change process, the regulator can allow the licensee freedom to propose and manage the detail of organisational change in its own way. It is important that the regulator's actions do not, either explicitly or implicitly, take responsibility for managing the change away from the licensee.

The regulator may wish to sample the application of the change management process to specific change proposals, and may require the licensee to make a formal provision for regulatory agreement before more safety-significant changes proceed. The licensees should understand the requirements at an early stage in order to facilitate its planning of the change and help it keep its staff informed about the change programme. Where a change proposal requires regulatory agreement, the regulator might seek early advice on the timing of the formal submission in order that it can allocate resource to assess the proposal promptly, and thereby minimise uncertainty for the licensee and its staff.

Regulator awareness and assessment of licensee approach to contractorisation

Organisational changes which involve outsourcing roles previously performed by licensee personnel can raise issues which warrant close regulatory scrutiny. The licensee must retain its competence and capability to assess the quality of work, and to apply the same standards to contractors as to its own staff, where applicable. The licensee must also retain adequate supervisory and management controls. The regulator may therefore consider it important that the licensee provides a rigorous demonstration that it retains the ability to act as an intelligent customer.

Succession management and corporate memory

Organisational change, particularly when that change is on a large scale, may have implications for the licensee's ability to maintain an adequate corporate memory – that is, to retain, understand and use intelligently information about the design, operation and maintenance of the plant and, eventually, its decommissioning. The regulator may expect the licensee's change proposals to include a suitable treatment of corporate memory issues. For example, the licensee could show how its succession management arrangements ensure that information and understanding are retained during and following a change. This may, involve capturing and documenting specific knowledge from experienced personnel, making arrangements to secure the continued availability of key personnel etc.

The regulator may need to decide how far into the future it expects a licensee's succession management arrangements to project. The regulator's judgement will be influenced by the adequacy of the baseline and the change management process. These factors could help the regulator to make predictive judgements about specific change proposals rather than to react to observed deficiencies which may be difficult to rectify (e.g. when staff have left the organisation).

Licensee approaches to morale and safety culture

Effective management of factors which influence staff morale, attitudes, motivation etc is central to the process of managing organisational change. It is reasonable for the regulator to seek confirmation that the licensee is actively considering these factors and taking steps to sustain morale and a positive safety culture. Open and regular communication with staff is likely to be an important feature of the licensee's change management process. Although the regulator

may engage in discussion with licensee staff, and may describe the regulatory process which the licensee must follow, it should be mindful of the need to maintain its regulatory detachment and not to undermine licensee management.

It is difficult to gauge the precise safety impact of issues associated with safety culture since methods for reliably assessing them are only starting to develop. Nonetheless, it is advisable to draw upon those methods which are available. The regulator needs to monitor and encourage developments in this area and to explore the potential for them to be exploited by licensees.

Licensee management of unplanned changes

The principles set out in this Paper apply to organisational changes which are planned by the licensee. It should be recognised that change can also be unplanned – for example, where a person leaves the licensee or where labour is withdrawn because of industrial relations problems (e.g. strike action, or refusal to work overtime). In such circumstances, the regulator would expect the licensee to have arrangements in place for ensuring the delivery of safety functions to cope without application of a formal change management process. If the unplanned event subsequently leads to a decision to change the licensee's organisational structures or its resource or competence requirements, then it would be logical for the licensee's management of change process to apply.

Conclusions

Nuclear safety regulators acknowledge that the nuclear industry is not insulated from commercial and other pressures which lead to organisational change. The regulators should also acknowledge that organisational change has the potential to impact upon nuclear safety and that there is a need for both licensee and regulator to adopt formal positions on this issue. The regulator may reasonably expect the licensee to develop and implement a system for managing change which is comparable with the approach taken to managing plant and equipment change, and encourage self-assessment as part of that system. However, the regulator should be careful not to take action which could take, or be construed as taking, responsibility for managing the change away from the licensee.

Licensees' change proposals need to be subjected to suitable levels of regulatory scrutiny, although the regulator needs to be aware of the potential for its actions to restrict the licensee's freedom to manage its own organisation. Particular attention needs to be given to the steps which the licensee has taken

to ensure that it retains effective control of its operations, and that it maintains sufficient knowledge, competence and resource to understand its own plant and to act as an intelligent customer for functions that are contracted out. The regulator will also wish to examine the indicators and measures which the licensee puts in place to monitor its continued delivery of nuclear safety functions.

Understanding and managing the potential nuclear safety impact of organisational change may present new challenges to regulators as well as to licensees. Regulators should seek to develop their own understanding and capabilities in the areas of safety management and wider organisational issues. As the regulators' experience of dealing with organisational change grows, it is anticipated that criteria and tools to inform regulatory judgement will continue to be developed. Although national differences may influence the detailed regulatory approaches that are adopted, dialogue between regulators is helpful to share practices, experiences and developments in this field.

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