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Managing change in nuclear utilities



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FOREWORD

The nuclear power industry has undergone change since inception, but never so much as now. The rewards for proactively changing in anticipation of emerging demands are great, but the cost of failure is also great. Today nuclear plants are being shut down by socio-political and economic processes. The survival of the technology as a clean energy source for the future depends on the demonstration of long term safety to the public, protection of the environment, and economic superiority to competing energy sources. The overriding influence on these factors is strong management of the business with effective regulation. In particular it is necessary for both utility and regulator to believe that enhancing safety is part of being successful. This publication has been developed for all levels of management who are developing and implementing changes within their areas of responsibility.

The safety conscious, continuous improvement, management culture, which has proven successful in today's nuclear business, has taken time to develop. Many utilities have difficulty sustaining this culture during the transitions that are intrinsic to change. Properly managed however, changes can enhance nuclear safety, plant reliability and cost competitiveness, from the design stage to decommissioning.

Change has no respect for timing and regardless of the level of experience managers may have in its management, large scale change is confronting every nuclear utility world wide. These take the form of government policy changes, open market demands, privatization with the demand for increased shareholder returns, regulatory and social pressures, and economic and political transition. The danger from such issues for the nuclear company executive and the regulator is that they are powerful distractions, particularly for those executives who are not experienced in the unique managerial requirements of the nuclear business.

This report gathers the experience of Member States into an array of important factors to consider when undertaking changes in a nuclear business. For the nuclear executive, the most important considerations are:

- Is there a policy on change management, that gives priority to safety, that is aligned to the vision, goals and objectives of the utility, that is communicated to stakeholders?
- Is there a systematic, transparent and rigorous change management process applied to all types of change?
- Are appropriate resources provided to support the process of change?
- Has sufficient analysis been performed to ensure the changes are adequately justified and are in fact the correct option? What risk analysis and independent reviews have been performed to ensure any potential encroachment on safety levels has been identified and compensatory measures developed? Have these reviews been performed by individuals with commensurate nuclear knowledge and experience?
- Do the senior managers have a mechanism to review progress regularly? Is the information received sufficient to enable them to exercise their responsibilities as guardians of nuclear safety? Have specific performance indicators been established to monitor the effects of the change.

- Does the communication plan keep all staff informed of progress and performance and provide for feedback? Does this communication also reach other stakeholders including the regulators, the public and trade unions?
- How has the utility assessed the cumulative impact of a number of changes in a business area?
- Following completion, did the change achieve the improvement targets originally established and if not do I understand the cause and do we have a plan to correct the situation? Have we organized a post change peer review to ensure we are continuing to improve in both performance and safety with respect to the rest of the industry?

The contributions of senior managements of nuclear utilities in Member States, who assisted the Secretariat by providing relevant information and source materials, are acknowledged. The IAEA officers responsible for this publication were C.R. Clark of the Division of Nuclear Power and J. Cook of the Division of Nuclear Installation Safety.

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1. INTRODUCTION

1.1. Background

The nuclear industry faces an ever-changing environment. There are opportunities for improvements as well as increasing pressure due to changes in many other industries. Within the nuclear industry this need for change is being brought about by a number of external and internal drivers such as:

- Deregulation of the electricity supply industry.
- Aggressive global competition leading to privatization, acquisitions and mergers.
- Technological and analytical changes.
- Regulatory requirements.
- Changes in political and economic system
- Early termination and decommissioning.

Many nuclear utilities are dealing with these pressures to change. When changes are planned, the utility should ensure that they are in line with their vision mission goals and values. Properly managed, these changes can enhance nuclear safety, plant reliability and cost competitiveness from design stage to decommissioning.

Utilities are responsible for the safety of their nuclear power plants, therefore it is essential that a systematic approach to managing change is adopted in order to maintain and preserve goals and objectives (i.e. the activities and strategies put in place to meet their goals) and to provide confidence to stakeholders which would include regulatory body. Utility management should recognize that change is a continuous process that requires a long term perspective. Managing changes requires communication, knowledge of the culture, and recognition of the impact on the morale of the people involved to be effective.

As a consequence there is a need for an effective change process to identify, evaluate, plan, implement, monitor and learn to ensure that all changes have no detrimental effect on safety and performance, and to ensure that the change achieves its objectives.

1.2. Objective

The objective of this publication is to provide a description of the basic principles for managing change in nuclear utilities that is based on the practices being used in many Member States by senior management and regulators to implement effective change whilst remaining focused on safe and reliable nuclear operation. This publication gives practical guidance for senior management to manage changes effectively in their utility.

1.3. Scope and users

The guidance contained in this publication is relevant to all changes from both external (e.g., the take-over of the company or deregulation) and internal sources such as reorganization. However, because nuclear industry has a mature process to established and mature engineering design change process, this area of change is not addressed by the guidance contained in this publication. The process described can be used on varying magnitude of change.

The methods and processes described in this publication are based on practical experience within Member States. Additional or alternative methods may be acceptable if they adequately ensure both worker and public safety as well as product quality.

The intended users of this publication are:

- All levels of management, from senior executives to section managers, who are developing and implementing changes within their areas of responsibility.
- Regulators involved in assessing changes at the utility, to ensure that the changes are properly planned and executed so that safety and reliability are enhanced or at least maintained.

1.4. Structure

This publication is divided into a number of sections corresponding to the major process steps in the change process described in this publication. Sections 1 and 2 provide the introduction and overview of the change process, in Sections 3–7 the detailed description of the activities in each step are provided. Since management oversight is a critical activity that is necessary throughout the change process it is contained in the last paragraph within each section.

2. THE PROCESS OF MANAGING CHANGE

The management of change process described in this publication is shown in Figure 1. It is derived from a typical change process applicable to any industry. While no suggestion is made that this is the best process available, it provides a suitable framework for change management and in this publication emphasis is given to the special considerations needed for its use in the nuclear industry, especially reflecting the need to maintain a strong focus on the safety aspects of managing and operating nuclear power plants. Utilities should develop a formal process, such as the framework described, for effective change management to promote continuous learning and apply best practice to the evaluation of new changes.

There are a number of drivers for change described in Section 1.1, and they can be characterized in terms of whether those drivers arise externally or internally to the utility. In general, internal changes tend to result from an organization seeking improvement in economics, safety etc. (sought changes) whereas external changes tend to be imposed by Government, Regulators etc.

Sought changes result from a process, described in Sections 3–7 of seeking and choosing change options to meet needs. Sought changes will tend to be many and small. As such, the change process needs to be able to cope with a flux of changes of varying degrees and importance, all at different stages and possibly interacting.

Imposed changes may not be regarded by the utility as particularly desirable. Human, social and safety cultural aspects involved with imposed changes have been shown to be more difficult. These changes will tend to be substantial (e.g. privatization, divestments, mergers) and few. Utilities should seek to mitigate these additional difficulties: their planning and implementation needs to be even more careful.

At the level of individual changes, there needs to be a systematic and transparent project management process whose rigour is proportionate to the significance of the change. While at the higher level, looking at overall integration of change activity, tools need to be available for dealing with the oversight of very significant imposed changes and of the flux of, possibly

interacting, smaller changes. Such oversight necessitates the participation of senior management. In some Member States this activity has been accomplished by a Change Management Board or a safety oversight committee.

Accordingly, monitoring and assessment of change should be carried out at appropriate levels in a utility, at all process steps of each change and be an ongoing activity. Some Member States have benefited from their regulatory bodies actively overseeing the process; concentrating (but not exclusively) on significant changes [1].

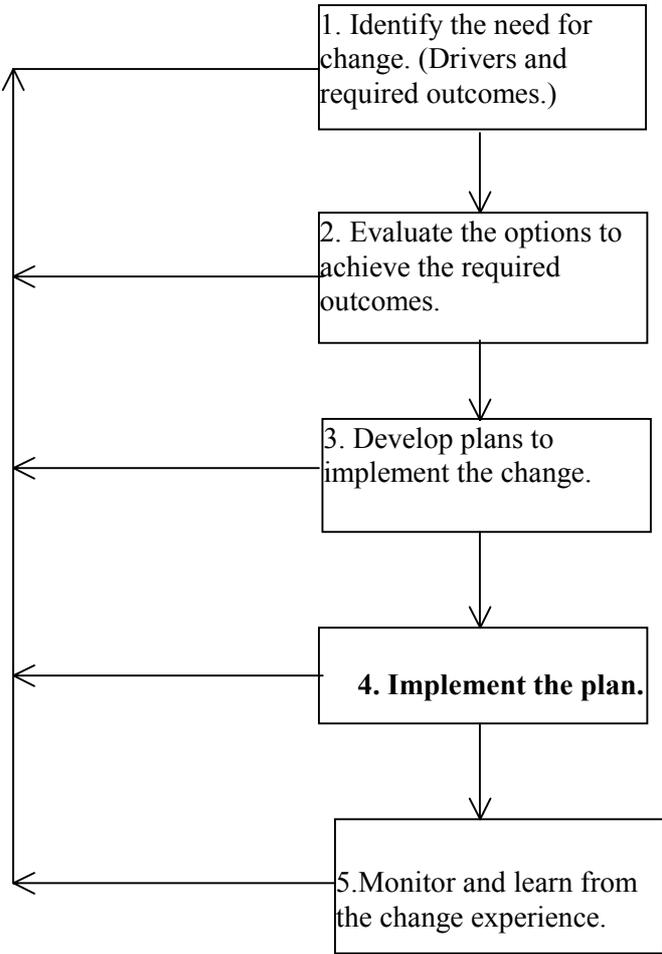


FIG. 1. The change process.

Senior management should oversee review activities and take an active involvement in promoting learning and improvement of the change process throughout the utility. The nuclear industry has significantly benefited from the lessons learned in using operational experience, both internal and external to utilities. It is important to recognize that using such experience during the process steps described in this publication will strengthen the effectiveness of changes accomplished during this process.

Senior management should encourage the active and positive involvement of all staff in change management to achieve a common and clear direction. This requires that management effectively communicate with staff and timely intervene if things go wrong. Other stakeholders, too, need clear understanding of intentions.

Each change should have identified contingency plans to deal with problems. Should a particular change require the implementation of the contingency plan or if there is a need for another reconsideration at any process step, it is recommended that a review of the activities carried out at earlier steps be made, to learn from the experience.

3. IDENTIFYING THE NEED FOR CHANGE

3.1. Introduction

As previously noted there are many drivers for change in the nuclear industry. These drivers include internal factors such as change to support the corporate vision and strategy or performance improvements identified by the utility. These internal factors establish the utility's goals and in learning organizations, change initiatives may originate as a result of a continuous improvement culture. External factors such as competition, regulatory or political change, and deregulation also drive change. By the very nature of the industry, it is also necessary to share and learn from each other. The evaluation of industry experience is crucial to improving performance and preventing events.

Nuclear utilities need to understand these drivers, continually monitor and analyse information, and develop strategies that enable them to manage both the present and future, and proactively introduce change. The change should drive towards improved goals and objectives, performance and the management of nuclear safety must be considered with every change initiative.

It is important to communicate the basis for changes to affected levels of the utility and to stakeholders, so that those involved can understand the change and its importance in meeting the utility goals and objectives. Since change is continuous, therefore, communication must also be continuous.

Each utility should issue a policy for promoting and managing change that links the vision and values of the corporate level to what is expected and why. This policy on change management must:

- give priority to safety
- address all types of changes
- introduce the change management process
- promote effective communication.

The following sections will discuss:

- the necessity for management to set goals and objectives which embody its expectations for the present and the future that can be measured against
- the evaluation of the utilities performance and capabilities
- the analysis of the current performance to the desired goals and objectives
- identification and selection of needed improvement.

3.2. Setting the goals and objectives of the utility

Once the need for change is identified, management has to integrate the needed changes into the corporate vision in a way that challenges line management and working teams. Independent of the current status of the utility (addressed in Section 3.3), the needed goals and objectives must be an ambitious picture of the future of the utility, especially with regard to nuclear safety. For the other areas of performance (availability, costs, industrial safety, releases and communication with stakeholders) the goals and objectives must also reflect a strong willingness for continuous improvement.

3.2.1. Environmental scanning

Environmental scanning is used by many organizations. It continually reviews the business, societal and governmental influences on the organization. The review process identifies and examines the effect of external influences to determine their impact on the strategy of achieving the corporate vision and values.

Expectations may be initiated by:

- the opinion and expectations of the general public. This may require significant external communication,
- the safety authorities, for example challenging technical results, level of safety culture, lifetime of operation,
- the electricity market, for lower production costs,
- any scientific or technical advances and other issues important for the company.

Environmental scanning gives an impetus to change, and is essential for a pro-active approach to change and adds meaning to continuous improvement. For example, emerging regional or national policy changes deemed to have sufficient probability of occurring by the company leadership could stimulate a proactive organizational response. Similarly, utilities may begin a change initiative in response to the actions of competitors, fundamental shifts in market dynamics (patterns of customer demand for electricity), or the behaviour of primary suppliers or contractors.

Changes can be triggered by or as a consequence of new knowledge such as scientific and analytical advances and technological developments. Such technological analytical and scientific changes can have a major impact in the way the utility operates. These changes may be nuclear industry specific or have developed within other industries.

Understanding the scientific and technological changes is not enough. The management of the plant and utility needs to understand that the impact of such changes can completely change the way they do business.

3.2.2. *Setting goals and objectives*

Once internal factors have been analysed and environmental scanning carried out, goals and objectives should be established inside the utility. This will provide the direction for the nuclear power plant to contribute to fulfilling the corporate vision and values, and to meet external and internal expectations. The goals and objectives should include both ambitious short and long term goals with specific time frames for completion.

Establishment of goals and objectives is a primary role of senior management. They provide the overriding direction for the utility and should establish a high threshold for nuclear safety. All levels within the utility should understand direction set and feel personally accountable for meeting the goals and objectives. As a minimum, the goals and objectives of the utility must insure regulatory requirements continue to be met.

Utilities with a more highly developed safety culture and a well established strategic business planning process will identify goals and objectives that adopt and effectively implement continuous improvement as identified in IAEA Safety Reports Series No. 11 [2].

The goals and objectives should be widely communicated inside the utility. It is important for the entire utility to know and take ownership for the goals and objectives.

3.3. Measuring the current state

In the nuclear industry it is an accepted practice that all technical aspects are comprehensively analysed whenever a need for change is identified or a change is implemented. However, the same cannot be said when it comes to other aspects of change such as process, organizational change or human factor. These often go unanalysed and undocumented.

Having an accurate history of changes that have occurred is important as the utility evolves from construction to operations, from operations to decommissioning, or when the ownership of the facility changes.

The starting point for the control of changes the determination of current the adequacy of the size and structure of its utility. This baseline will then provide a reference basis against which future can be compared and judged. The baseline is closely analogous to the SAR, which demonstrates that the technical aspects of the plant delivers safety.

The baseline will state the structure and size of the utility and should be substantiated by a record of the competence of identified staff. As changes take the place the baseline is maintained as a living document, being the sum of the initial state and all the changes, which have taken place.

Much of the information required should exist within utilities. Therefore the compilation and management of the baseline need not be a resource intensive or bureaucratic task. In this endeavor senior management in developing the utility vision, goals and objectives will have carried out a similar assessment.

Operational Safety Performance Indicators for Nuclear Power Plants (IAEA-TECDOC-1141) [1] and Self-Assessment of Operational Safety for Nuclear Power Plants (IAEA-TECDOC-1125) [3] provide additional useful guidance for conducting assessments to recognize that the utility as a whole is performing satisfactorily in accordance with current goals and objectives. An assessment in comparison with internal, external, and international standards for the nuclear industry as well as other industries is desirable.

Self-assessments and external assessments are useful ways to gather the facts and measure the current state of the utility. In doing this, the utility should attempt to involve as wide a cross

section of individual stakeholders as possible to ensure a rigorous assessment. For example, contractors, working level employees, and members of the community should be considered for participation.

3.4. Analysis

In earlier sections of this publication the importance of setting the goals and objectives and measuring their current status was discussed. This section will discuss analytical techniques, which can be used to compare the current status with the desired status in order to identify areas for change.

Throughout this activity the management of safety has priority, the nuclear utility should ensure through its policies and practices that safe operation remains the focus of the utility. In particular it is important to take into account the considerations and limitations of human performance during and after the implementation of the changes.

3.4.1. Gap analysis

A simple way to analyse which changes are necessary is to perform a gap analysis. In other words, once a utility knows the goals and objectives (desired state) and the current situation (present state) it is possible to measure the gap between these two points.

A root cause evaluation of why the gap exists should be performed. Actions to address the root cause can then be developed and solutions implemented according to the priorities of the utility. The utility must avoid complacency when gaps in performance are identified, even small gaps, and changes to improve performance should be vigorously pursued.

The gap analysis entails five steps:

- Desired state — Determining performance improvements associated with this change in terms of specific results or outcomes (performance deliverables).
- Present state — Identifying current utility performance in relation to the specific results and outcomes.
- Measuring the gap between desired state and present state.
- Determining the root cause for the gap. Determine what changes are required to address the root cause.
- Developing a change plan to accomplish these changes.

3.4.2. Performance trending

Another valuable technique to identify the need for change is to monitor trends in the performance indicators of operational safety and overall performance. Trend monitoring involves periodically measuring performance of a specific indicator over a period of time. The absolute value of the indicator is not as important as whether or not the indicator's trend is going in the right direction. For a nuclear utility, this may reveal trends indicating that a change is necessary. As with the gap analysis, a cursory review of the trends is not sufficient and may lead to wrong conclusions. Therefore, it is necessary to determine the root causes of any adverse trends in order to identify changes that will have a beneficial effect.

3.4.3. Benchmarking

Benchmarking is another way to identify areas to improve performance. Benchmarking techniques can be used to compare one utility to another that performs well. Benchmarking

provides a proven methodology for learning from the best performers by use of a methodical process involving careful research and an understanding of existing processes, products and services. This process helps gain the information needed to determine what needs to be improved, to obtain critical management support for improvement, and to incorporate what we have learned to change our performance for the better.

Benchmarking activities should focus on safety and other aspects of the business, which are crucial to its success. The comparisons are not just limited to costs and outcomes, but to identifying the underlying ways the other organization actually achieves its superior performance.

Utilities can benchmark competitors, non-rival utilities, and within its own organization in order to identify those that excel at a specific processes. Before starting to benchmark, it is essential to understand the organization's existing processes and performance. At this stage, it is important to define critical issues, analyse differences and feed the information back into the processes of the utility, adapting the procedures to maximize the benefits of the new knowledge. While there is no question that it is useful and beneficial to study the practices and processes of other companies, the goal is not to see what other companies are doing and simply introduce the same practice into your utility but to learn how the companies are doing what they are doing and then to use this information in a creative way creativity to identify new ideas that fit your utility. To do this, the following questions need to be asked:

- What is the underlying principle behind what the benchmarked company is doing (in other words, why are they doing it)?
- Is it a "good" principle?
- Can this principle be adopted in other national or company culture?
- How specifically can this principle be implemented in your utility?
- How will improvements in the process be measured?

A properly conducted benchmarking exercise will identify where a process, product or service can be changed within the utility in order to improve it.

3.4.4. Assessment (IAEA, WANO, INPO, Audits)

In the nuclear industry we have the benefit of several organizations and agencies that perform independent assessments, sometimes using experts from similar facilities. These comparative assessments can be made against regulatory standards or the best international practice. Assessment results can be used to identify where a change is necessary.

Management of the utility has to systematically evaluate the results of all assessments, including both external assessments (IAEA, WANO, INPO, regulatory, etc.) and internal assessments (audit, surveillance, inspection, reviews and self-assessments). The review needs to ensure that the actions being taken in response to the assessments are focused on the root cause of the problem and that actions from assessments are well integrated with the vision, goals and objectives of the utility and with other improvement activities.

3.5. Generating the options

The analysis mentioned above leads to the final phase of the identification stage of the process; a listing of the options that should be evaluated for consideration. As many options as possible should be identified and evaluated.

While it is generally recognized that the range of options to be evaluated for externally imposed changes may be limited, the use of this process can aid in selecting those options that optimize the benefits to the utility which are consistent with appropriate goals and objectives.

3.6. Management oversight and involvement

The most overriding influence on the success or failure of a nuclear utility as it makes changes is the ability of the senior management of the business to understand the drivers for change, to define the goals and objectives which include safety goals, to believe in and demonstrate their capability when leading change.

In order to illustrate the responsibilities and leaderships of senior management a series of questions are suggested in each of the process steps to enable them to maintain a management oversight and to monitor and support changes as the business is transformed to meet the challenges of the future.

The following questions have to be considered for the identification stage:

- Is there a policy on change management, which is aligned to the vision, goals and objectives of the utility, that gives priority to safety, which is communicated to stakeholders?
- Is there a systematic, transparent and rigorous change management process applied to all types of change?
- Are appropriate resources provided to support the process of change?

4. EVALUATING THE PROPOSED CHANGES

The evaluation process contains those elements which are required to properly assess and manage risks associated with making changes and as such, help to insure that acceptable levels of safety are continuously maintained.

It is necessary to review what changes have been considered and to understand and record why some changes have been excluded. Understanding why some changes have been excluded may prove valuable in later stages. Finally, it should be clear which is the preferred change and why.

The relationship of these elements are shown in Figure 2.

4.1. Grading proposals

Consideration should be given to including the concept of grading within the 'management of change' process utilized by the utility. This should result in proposed changes being classified according to their safety, business, and environmental etc. significance in order to ensure that appropriate controls are established and implemented. An example of these controls would be varying the approval level for changes of different significance. By this means the more significant proposed changes can receive additional managerial or safety scrutiny, utilizing independent review if applicable. In addition the grading methodology should consider the consequences of the change being inadequately conceived or implemented — thus changes intended to augment safety would have a higher grading if they have the potential to go wrong.

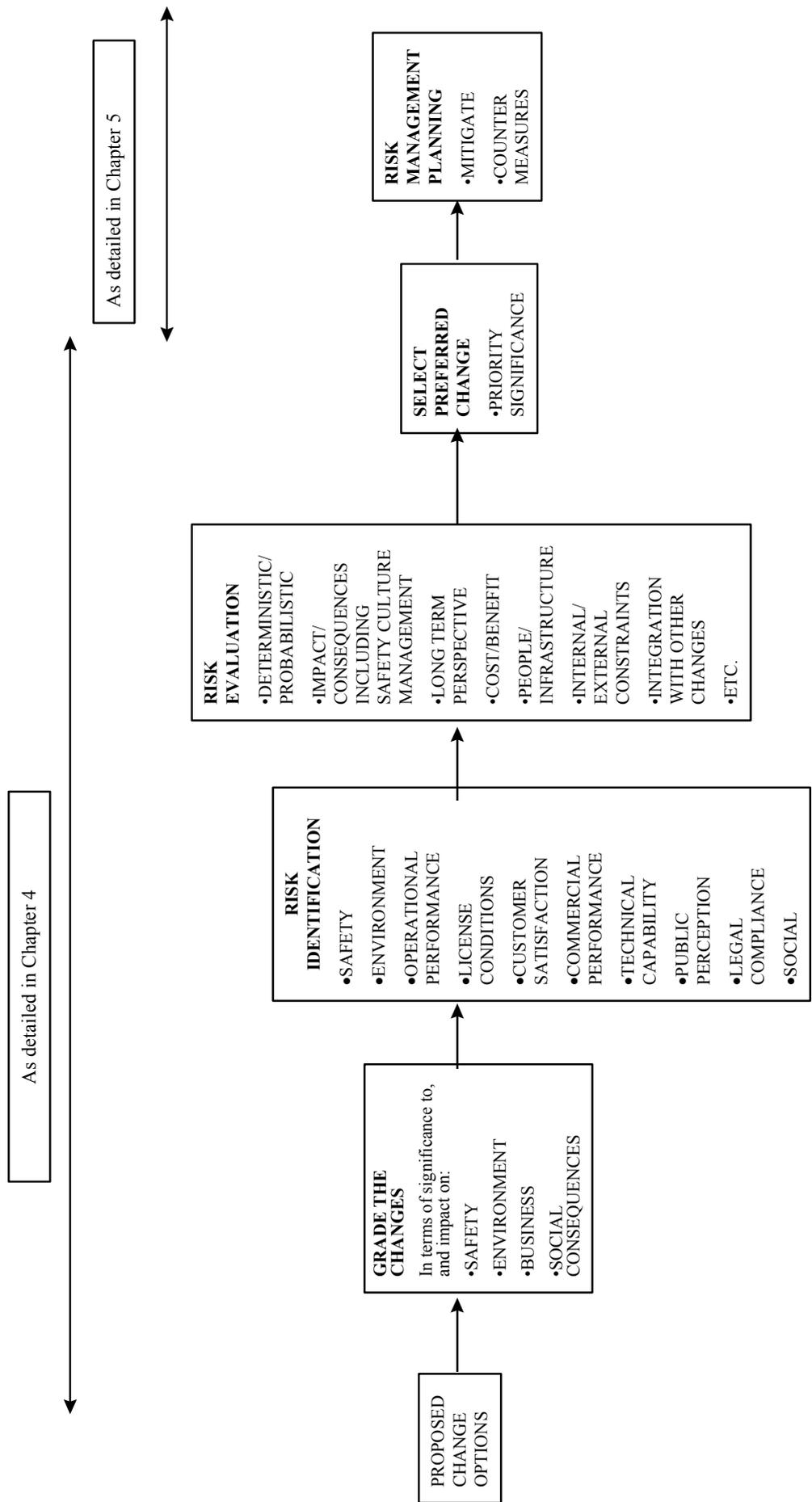


FIG. 2. Flow chart showing the various stages in the evaluation of proposed changes.

The following considerations are relevant when developing the concept of grading in the process of managing changes:

The grading of each change and the decision on safety significance needs to be documented and reviewed independently of the line management responsible for the change.

- The impact of a change may have both long term and short term effects;
- A major change should not be reduced to a number of smaller, lower category changes;
- The overall effects of a number of low grade changes are not compounded to produce a change of greater significance;
- The most significant changes may require some involvement by the cognizant regulatory body.

An example of applying grading to managing change is contained in Annex, Example 9 of IAEA-TECDOC-1125 [3].

4.2. Risk identification and evaluation

For each change option proposed, the risks to the goals of the utility have to be identified and evaluated to include safety, environmental and business risks. Risk management is a process in which appropriate analysis and controls can be brought to bear as a management tool to assure that appropriate safety, environment and business considerations are comprehensively identified, evaluated and controlled.

Risks should be identified by competent staff within the utility with the necessary level of management oversight, involvement and support. The initial identification and evaluation may be carried out by those initiating the change, it may be followed (either at the evaluation stage, or later at the stage when an option has been chosen for implementation) by a more detailed evaluation of the risk by those with the best knowledge of its effects.

Changes which pose the most significant risk should be reviewed by independent persons or review groups or individuals at a proportionally higher level in the utility to ensure that a comprehensive evaluation has been prepared. Nuclear utilities may have an independent safety organization in place, in which case this would be a natural body to carry out safety reviews of the risks associated with proposed changes.

Regulators may review the evaluation of the risks for a proposed change and may impose regulatory holds on changes they feel are safety significant.

A utility's objectives, its internal organization and the environment in which it operates are continually evolving — as a consequence the risks it faces are continually changing. A thorough assessment of the nature and extent of all risks associated with the change options identified is necessary to help manage and control each risk. The identification and evaluation of risks is essential to enable risk informed decisions to be taken.

The risks should be identified and evaluated in terms of:

- Risks facing the utility for the proposed change
- Risks which are acceptable or not acceptable
- The likelihood of the risk occurring
- The impact on the utility of the risk
- The ability to influence and manage risks as they materialize

- The costs of implementing particular controls relative to the benefits obtained in managing the risks.

Risk evaluation should use appropriate generic industry information relevant to the reactor type and operating experience and for some changes could possibly use deterministic or probabilistic (PSA/PRA) methodologies to make risk informed judgments.

The risk evaluation should focus on safety performance of the utility and the change between the new proposal and the existing manner in which the change is managed. The documented risk evaluation should include:

- The reason for the change
 - Inputs for the proposed change
 - Interfaces
 - Performance evaluation.
- Description of the outcomes of the change
 - The major points of the proposed change
 - Detailed description of the changing process, and organization (including flow charts if applicable)
 - The tasks, responsibilities and the elements of the proposed change.
- Evaluation of the proposed change, the implementation strategy and the expected benefits/outcomes such as the impact on:
 - Safety
 - Performance
 - Responsibilities and accountabilities
 - Processes
 - Decision making
 - Internal interfaces
 - Priorities
 - External challenges
 - Financial performance
 - Cost bases
 - Competitiveness
 - Human Resources.
 - ⇒ Optimization of staff numbers
 - ⇒ Working locations and conditions
 - ⇒ Personal accountability
 - ⇒ Communications — participation in decision making at all levels
 - ⇒ Personnel competencies.
- Lessons learned from the operating experience review programme (internal and external)
- Analysis of responsibility transfer associated with the proposed change
 - Responsibilities to be transferred
 - Definition of the process
 - Control of the transfer.

- Changes to relevant documentation
 - Identification of documentation to be changed
 - The documentation change process
 - Control of the changes to documents
 - Distribution and notification
 - Relevant training of the personnel.

The output of the identification and evaluation of risks should be:

- A listing of all the types of risk
- An indication of probability and consequences
- And the outline measures that will be used to manage the risk
- And the detailed risk management for the proposed change.

Guidance that can be used to help with this aspect of managing changes related to Nuclear Power Plant activities is contained in IAEA-TECDOC-1144 [4] (Probabilistic Safety Assessments of Nuclear Power Plants for Low Power and Shutdown Modes).

4.3. Identifying and evaluating internal or external constraints

Before being able to evaluate the proposed option(s) against the prevailing constraints, it is necessary to fully understand the internal and external constraints. External constraints can be found in statutes, regulations, licenses, standards, experience, knowledge as well as in local or national government requirements. Internal constraints can be found in the corporate mission, vision statement or policies, strategies etc. as well as in trade union agreements/labour management programmes and the practices and processes of the utility.

To provide practical help to the person carrying out the evaluation, it is useful to develop a model for systematic consideration of the proposed changes. One such model, which has been found useful by some sectors of the nuclear industry, is the Sociotechnical Model illustrated in Fig. 3.

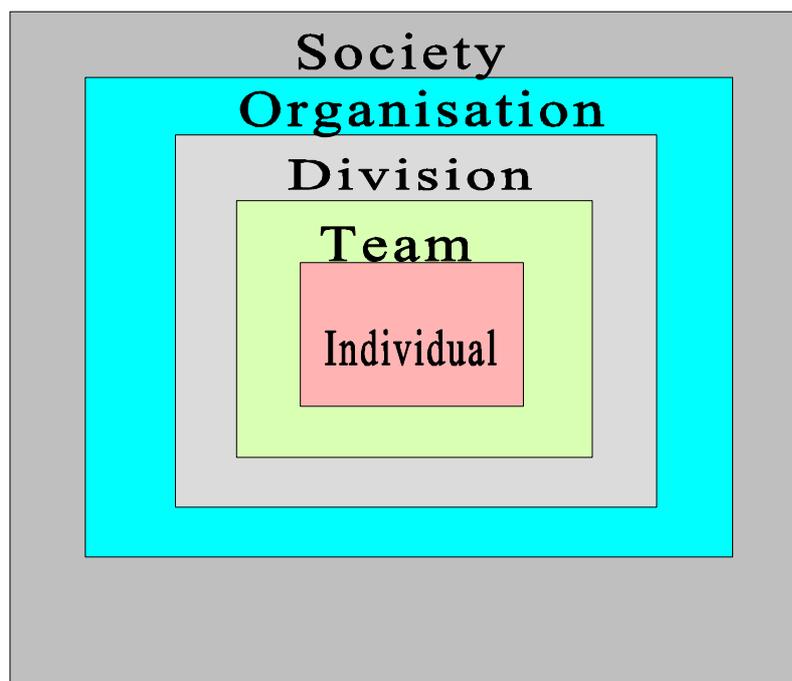


FIG. 3. The Sociotechnical Model.

Constraints, both formal and informal, which should be taken into consideration, exist within each ring in the model. For example, Society obviously imposes formal constraints on what a utility can do, and therefore how it can be organized, through its laws. It can also impose constraints through its willingness to accept (or not) certain organizational styles and management philosophies, which, although perhaps not specified in law, have an impact on the commercial aspects and therefore the viability of utilities.

Within the utility there are internal rules of governance, customs and practices, and cultures, which can impose constraints on the change process. Because they are internal to the utility these constraints are more open to being influenced by senior managers but the implications of initiating such changes must be fully understood. Similar comments can be made for successive domains (divisional, team and individual) within the utility. It is recommended that when considering the potential impact of the options that a set of diagnostic questions be developed and directed at each ring in the model. For example:

- How does the option impact on our obligations under the law?
- How will the option impact on the interface between the various Sociotechnical levels and the next (inner and/or outer)?
- What are the consequences of the option to each level?

It is further recommended that the results of this questioning phase be then evaluated using a plus, minus and interesting (PMI) approach. Each option can then be compared not only for its potential advantages (pluses) and disadvantages (minuses), but also the interesting points that emerge which can lead to refinement and development of otherwise unconsidered issues within that option.

4.4. Impact on safety culture/management

Safety culture, as described in INSAG reports 75-INSAG-4 [5] and INSAG-13 [6], emphasize that safety culture is both attitudinal as well as structural and relates to both organizations and individuals both within the utility and its suppliers/contractors. As such, the skill, competence and morale of the people doing the work dominate the quality of operation and its safety culture.

Some changes have the potential to affect the attitudinal aspects of safety culture and as such their impact should be identified and evaluated [6]. Structural elements that impact on safety management should have been identified and evaluated during risk identification and evaluation phase of the change process.

Communication throughout the project needs to address implicit messages that may be reflected in actions taken such as:

- Reduction in the number of cleaning staff could lead workers to feel that management has lost interest in plant condition. The result could be a reduction in the material condition in areas beyond those associated with the normal cleaning.
- The perception of the staff is as important as the reality of the change. Management needs to mould the perception to match the reality.

4.5. Impact on people and infrastructures

It is commonly recognized that changes have an impact on people. A key factor and responsibility in evaluating contemplated changes is the impact on the collective knowledge, skills, and abilities of the utility. Consideration must be given to the potential loss of

important institutional knowledge and the potential downstream or future effects of this loss. A chief task of leadership is the perpetuation of organizational success, hence, to the extent possible, second order and third order effects as well as potential unintended consequences should be explored. In summary, human resources must be viewed as critical for successful nuclear power plant operation.

Some changes may involve a reduction in the number of people involved in an activity with a possible reduction in acceptable levels of safety. Such changes need to be carefully developed and implemented to ensure that acceptable safety levels are preserved.

4.6. Cost–benefit

All changes including those externally imposed should be evaluated by comparing the projected costs of the change against the benefits.

This evaluation would provide relevant information to enable both external and internal stakeholders to take into account the balance between costs and benefits when they decide which changes they will pursue. The analysis should consider the costs and benefits from a long term perspective and include the costs involved in mitigating the probability of risks occurring. In some Member States cost–benefit analysis has been used to changes imposed for regulatory reasons.

Experience has shown that some enforced shutdowns with costly recovery programmes have occurred because of a failure in part to perform realistic cost–benefit analysis to support implemented changes affecting the manner in which the power plant is operated.

The cost side of the evaluation should therefore take into account the longer term costs from actions such as institutional shutdown and recovery operations. The benefit side of the evaluation should also take into account human resources, material condition and working environment issues. An example of this would be the benefit obtained from material condition improvements on morale and worker ownership of the facility.

4.7. Integrate with other changes

A change should not be approved without considering and evaluating the cumulative effect of the other changes that are also being introduced to the utility, as it is possible that several changes which are implemented at the same time could overwhelm the utility. Especially during periods of change, nuclear power plants must continue to operate safely. Simultaneous implementation of an excessive number of changes could distract the operating staff and cause erosion of an acceptable level of safety. In addition, pursuit of an excessive number of changes could result in most of the changes being poorly implemented because inadequate attention was given in preparing and implementing the change.

If a number of changes are being implemented at the same time the impact and effect of one change should harmonize with and even enhance the other changes that are taking place.

4.8. Long term perspective/sustainability

The evaluation of proposed changes should take into account the longer term perspective and sustainability of the NPP. Short term, intensive changes should be infrequent and reserved to fix serious acute problems. When the utility is called upon to institute an excessive number of short term changes a negative attitude may develop where the project is not accepted because it is viewed as not addressing the underlying issues or concerns.

When instituting a change, consideration of the following aspects is recommended:

- Is the issue important enough that long term action is required?
- Are resources available to continue the activities in the long term?
- Will the operating staff maintain involvement and focus in the long term?
- Does the change integrate well with long term plant activities?

The nuclear business has a longer term business time frame and when managed well can provide a healthy, reliable long term return. Within this context, any proposed change must be evaluated to ensure it will not jeopardize, but improve the long term prospects [7].

Items to be considered include the impact of the change on:

- Life optimization/management.
- Maintaining core nuclear knowledge and the capability to obtain adequate and competent human resources.
- Continuous improvement initiatives.
- Contractor/outsourcing and the globalization of vendor resources.
- Potential need for excessive future capital investment (i.e. a reduction in preventive maintenance could be more costly in future).
- Attitudes towards the workplace, i.e. reduction in restorative painting leads to reduced human performance.
- Decommissioning activities.

4.9. Independent oversight

Where appropriate, proposed changes should be closely and independently assessed before the change(s) take place. This is because there is a risk that the intended improvement can lead to a reduction in acceptable levels of safety as a result of inadequate planning and implementation. As part of defence in depth used for safeguarding against the introduction of inadequate or deficient conditions at a utility, and thus precluding unsafe conditions, some utilities resort to independent oversight. This oversight can be performed by multidisciplinary review groups constituted by individuals that come from within the utility or by external individuals.

The use of independent oversight may be linked to the grading applied to the change. No matter what threshold levels may be established for the involvement of the independent oversight review group or persons to evaluate the potential benefits and risks involved with the change proposal, industry experience has demonstrated that this type of oversight can identify concerns needing attention prior to implementation. The benefits of the independent and multidisciplinary nature of the oversight review group involve the conduct of a less biased (as compared to the line organization) review of diverse considerations, such as technical or human factors, and organizational aspects of the change.

4.10. Output from evaluating change

At the end of the evaluation phase it should be evident what change has been chosen to be taken forward for implementation. Introducing a change into a utility or the operation of a nuclear power plant should be considered as a project. Major changes should have a comprehensive plan with project management and scheduling processes and techniques

applied. An outline of the next actions to be taken in a simple ‘what’, ‘who’ ‘when’ matrix should be developed as an input to the next step in the process.

4.11. Management oversight

Senior managers are responsible for being aware of risks associated with change both from the point of view of business and safety during the change process. Senior management will ensure that appropriate processes are in place to evaluate risks and verify that they are acceptable.

The following questions need to be considered for the evaluation stage:

- Has sufficient analysis been performed to ensure the changes are adequately justified and are in fact the correct option chosen? What risk analysis and independent reviews have been performed to ensure any potential to encroach on safety levels has been identified and compensatory measures included? Have these reviews been performed by people with commensurate nuclear knowledge and experience?
- Do the senior managers have a mechanism to review progress regularly? Is the information received sufficient to enable them to exercise their responsibilities as guardians of nuclear safety?
- Do the senior managers have the capability and experience? Do they receive sufficient information to enable them to make a responsible assessment of risk and recognize any erosion of management processes and safety levels?
- Have specific performance indicators been established to monitor the effects of the change and are they reported to senior management on a regular basis?
- Have the human performance professionals reviewed the potential human factors impact of the change?
- Do the senior managers meet with the senior regulatory officer and trade unions to discuss the changes, their implications for safety and the measures to ensure safety is not compromised?

5. DEVELOPING PLANS FOR THE CHANGE

This section contains practical guidance for those persons who are just embarking on developing a process of managing change. It is recognized that some utilities may already have a mature and well-deployed project management process. This section should not be considered as a comprehensive guide to project management, but is included for completeness and to illustrate some of the attributes required to effectively manage a change as a project.

5.1. Terms of reference for the change project

It is beneficial to establish some ‘terms of reference’ for the change project to ensure all stakeholders such as the sponsoring manager, the management team and the project leader all have a common understanding of the expectations. Developing terms of reference will form the basis for discussion and ensure that those with the main responsibility for development and subsequent implementation are aligned, understand the target outcomes, understand the reasoning behind the proposed change and are aware of the reasoning behind the choices made to date. The project leader should also establish whether there is a formal budget for the change project and how the project relates to the utility's objectives.

The terms of reference should be a summary document. A sample template for a terms of reference includes:

- *Title* — What the activity or project is called.
- *Sponsor* — The senior manager who has ultimate authority for, and budgetary control over implementation.
- *Project leader* — The person with day to day responsibility for implementation.
- *Background* — Brief description of the background for this particular activity or project.
- *Objectives* — Description of target results.
- *Cos-/benefit/risks* — An outline of the costs, benefits and risks involved.
- *Countermeasures* — countermeasures that have been developed in the event adverse effects on change are identified
- *Resources required* — Resource levels (person days) and skills required to deliver the project.
- *Scope* — The extent of the implementation process i.e. what is and what is not covered.
- *Deliverables* — The specific outputs or desired state from this change.
- *Constraints* — Any specific restrictions, e.g. timing, cost, resource limitations.
- *Milestones* — Specific project decision/hold points.
- *Critical success factors* — A description of the critical success factors facing the project.
- *Sign off* — Signatures of the sponsor and project leader to indicate agreement and authorization to proceed to the next stage.
- *Reviews* — independent, internal or external reviews to be carried out.

5.2. Planning for change

A project plan for the change should be developed and approved before implementation. This project plan should follow the project planning conventions that are normal for the utility. The project plan has to:

- Allocate personnel to each activity.
- Deal with budget, duration and resources for each activity (considering that staff and resources have to be allocated, even for a staff reduction project).
- Identify performance measures for activities.
- In a large project, show hold points and major milestones.
- Show task dependencies and interdependencies.

In the planning for significant change, a formal exercise has to be conducted to examine the previous experience in the utility, and in other comparable organizations, in making similar changes. If it is necessary that lessons learned from this experience be factored into the planning process for the change. This is particularly important in situations where previous efforts to implement similar charges have not been successful.

Of particular importance in the plan is the management of dependencies. It is important that predecessor activities, which are also known by some as ‘enablers’ (see below) or precursors

for change — activities which need to be completed before a change or an element of the change can occur — be identified. The difference between most projects and those managing change is that in an engineering project many activities simply cannot start until a predecessor is complete. In a management of change project it may be possible to proceed before a predecessor is complete, and accept a decrease in the capability of the utility. This course of action should be avoided, even prohibited by the process, as it could result in uncontrolled erosion of capability. This is the very concern that the management of change process is aiming to avoid.

The simplest example of an enabler might be associated with staff reductions — another member or other members of staff taking over responsibilities may need training for the task or in order to become competent — before their predecessor(s) can be released for termination. A reduction in workload, achieved in a number of ways, may also be an enabler. Contingencies are alternatives to enablers to be utilized if an enabler does not deliver expected effects.

There is also a subset of enablers, which involve actions in another part of the business and may require formal agreement across the two departments on the nature, timing and criteria for completion. Such cross-department enablers are the most difficult to control. Co-ordinating arrangements are usually required to help manage these aspects. A general principle should be adopted: that irrevocable change actions which depend upon the completion of an enabler should not take place until the enabler has been delivered. In this sense an enabler can be seen as a kind of hold point. Regulators who provide independent oversight may wish to pay particular attention to the way in which a utility manages enablers, for example to ensure that utilities are not likely to denude themselves of safety knowledge or expertise and may wish to make use of hold points for regulatory control.

The implementation plan has to:

- Identify the enablers and those responsible for meeting them;
- Address the impact of the proposed change on other procedures, instructions and processes within the utility and suppliers and contractors;
- Monitor through the use of appropriate indicators, for example, the meeting of prerequisites and the countermeasures and contingency plans developed to mitigate against potential risks;
- Identify hold points to be monitored including any required by regulatory bodies;
- Identify and maintain the record requirements for each change and for the change process;
- Identify all targets of the project; any sub-projects required need to be defined;
- Define any processes that need to be developed or changed;
- Include any human resources issues;
- Identify any procedures and documents requiring change and the time-scales for changing them;
- Define any transfer of responsibility time-scales.

5.3. Responsibilities/ownership

The change process, by its very nature, has been shown to cause confusion within many organizations. Workers easily forget which processes and organizations are being changed and

which are not. For this reason it is important that the parties involved in the change be clearly defined. Responsibilities have to be described in a level of detail sufficient to account for the dynamic conditions during the period of change and what is required during times of stability. There should be no confusion as to who is responsible for each activity at all times during the change. Responsibilities must be formally transferred. Work associated with a responsibility being transferred should not be terminated until the person being assigned the responsibility has accepted it and is competent to carry it out (i.e. the enabler has been delivered).

People who are assigned responsibility for a portion of the change need to exercise strong ownership and leadership for their area of responsibility. They have to ensure that the change is well communicated in the utility and frequently interact with stakeholders to learn of any problems with implementation. Owners of the change have the responsibility to solve any implementation problems that are encountered.

5.4. Approval of change

It must be clear who has authority to approve changes that will be implemented. The controls applied need to ensure that for each change it is possible to identify the persons or posts within the utility authorized to approve change, based on the grade assigned to each change. Preferably, one person should approve each change with the endorsement of those whose areas of responsibility are most affected. This is particularly important when enablers cross organizational boundaries. Where a proposal leads to a safety impact, a written safety substantiation has to be requested and an endorsement sought from the utility's safety organization. The approval will indicate where an independent review has been carried out and how the recommendations, if any have been addressed.

5.5. Risk management planning

Once the risk for the preferred change is identified, it is necessary to develop a risk management plan to identify how these risks will be managed during the change. The plan identifies how risks with a negative impact are managed to mitigate the effect (countermeasures and contingency) and how risks of a positive nature are managed to ensure the risk materializes in a beneficial way.

The plan reflects the priority and significance of each risk with appropriate countermeasures developed for each risk.

The plan identifies:

- What action is to be taken,
- The nature and extent of any ongoing monitoring activities including the use of performance indicators,
- Who is responsible for carrying out those activities, and
- The time-scales.

5.6. Cultural issues planning

It is extremely important when planning changes to keep clearly in mind the impact that the prevailing organizational culture will have on the change process and, conversely, how the planned changes will impact on the organizational culture, including the safety culture. It is also important to realize that culture requires time to adapt and change; typically 3 to 5 years elapse before a new sustainable cultural position is arrived at and during that time, continuous effort is required.

The process of cultural change therefore requires commitment and dedication from all managerial levels, with regular and frequent checking to ensure that the desired effects on the organizational culture are in fact happening. This requirement must be built into the change plan. Whenever there is a potential for a change to impact safety culture, it is important that the plan consider the development of a cultural baseline to be established, if it does not already exist. The IAEA has a Safety Culture Enhancement Programme (SCEP) to aid in the establishment of the cultural baseline through (a) training, (b) self-assessment by the utility and (c) peer review to aid in the development of safety culture and improvement initiatives [2].

5.7. Communication planning

During any change it is important to ensure that a strong commitment to communication exists and to evaluate the need for communication of proposed changes. This commitment should be based on an honest approach of openness with staff, between groups, with the regulator and the public.

Communications in any organization are best managed when an effective plan is developed to provide guidance as to the appropriate path for successful interface and implementation of change at the corporate and site level. The responsibilities for implementing this plan should be established. The internal stakeholders should be involved in the development of the plan, including staff and the public as appropriate. It is often advantageous to include the regulator in both the planning of communications and the communications themselves.

Whether the change has been put into the line for implementation or set up as a discrete project, it is important to ensure that everyone impacted by the change is aware of the change.

At this stage the communication should be simple, to the point and designed to reach the widest audience. The initial communication would have two purposes:

- To communicate the existence and objectives of the new change project, together with relevant information and dates.
- To answer potential questions that the audience might raise.

The choice of the medium will be consistent with the utility's internal communication process.

Initiating open and trusting communications with employees at all levels is critical. The attitude and support shown by the senior management team is a key enabler. Starting a dialogue with the staff, the regulators and the public on a routine basis will enhance trust between them. Open dialogue between staff and management can aid in fine tuning the project and highlight opportunities for improvement. Communication with the regulator in an open and structured fashion is a way to facilitate the accomplishment of regulatory issues and avoid delays in the change process bearing in mind both safety and business.

It will be necessary to develop a communication plan for each change as it is implemented that is aimed at professionals within the utility and at relevant external stakeholders (e.g. regulators, the public, local government).

5.8. Output of the planning step

The 'developing the plans' step is a change plan that addresses all the actions necessary to enable the change to be taken forward and implemented.

5.9. Management oversight

It is imperative that once senior managers have identified the changes and evaluated all risks that are approved, a comprehensive plan be developed to implement the necessary programme.

The following questions need to be considered for the planning stage:

- Does the change plan include compensatory measures such as additional training, temporary assistance from trusted advisers, or independent oversight ensuring that competency is maintained at all levels?
- Does the communication plan keep all staff informed of the progress made and performance recorded and does it provide for feedback? Does this communication also reach other stakeholders including the regulators, the public and trade unions?
- Where appropriate, senior managers need to request a presentation on a change plan before the work commences, in order that they may personally challenge the safety implications.
- Senior management has to receive feedback on the specific performance indicators established to monitor the effects of the change especially on people performance.

6. IMPLEMENTING THE CHANGE

Changes are not to be commenced without approval from the appropriate levels of the utility management and, if appropriate, the regulators, to confirm that all the prerequisites identified in Section 5 have been completed.

6.1. Implementing the change

As discussed earlier, the change is managed as a project using the utility's approach and standard project management practices.

During the change process the project (and subproject) teams should hold meetings on a regular basis. During these meetings, the team needs to focus on:

- Safety implications
- Project performance evaluation comparing the targets
- Short term tasks
- Problems during the implementation, and the necessary corrective actions
- Past corrective actions follow-up
- Dependency (enabler) completion.

6.2. Monitoring change

During implementation, senior managers have to support the change through their actions and communications, paying particular attention to any possible adverse effects on acceptable levels of safety. Management needs to closely monitor the development and implementation of any change to ensure that safety aspects are designed into the change and preserved throughout the implementation of the change and that the focus on safety is not lost.

In addition to the internal review of the change process, a utility has to adopt, as part of its implementation plan, performance monitoring activities. These provide for the establishment of realistic and relevant performance measures and indicators to supply feedback on the assumptions underlying the decision to implement a change. By this means, the utility is able to determine, as soon as practicable, any deficiencies in the implementation plan as it progresses and take timely remedial or contingency action. Performance monitoring should also indicate any effects on performance outside the change area that may be affected by the change.

Relevant and appropriate performance indicators have to be developed specifically for each change (to suggest an extreme example, a high level indicator such as the number of reactor scrams is unlikely to reveal deficiencies in changes in the staffing and organization of a power station's stores department, unavailability of spare parts might be more appropriate). Performance indicators need to monitor safety levels and culture, where appropriate. Independent review of the outcomes of change are to be considered where appropriate, such a review would examine the changes in performance indicators and their applicability and veracity.

During the implementation of the change a reporting system needs to be established. The reports, to senior management, cover:

- Safety implication
- Actual status of the implementation
- Problems and non-conformances
- Corrective actions
- Decisions needed from the upper level
- Self-assessment results
- Handover of responsibilities.

Performance indicators relating to the communication plan provide a means for the senior management team to evaluate the effectiveness of communications. These indicators have to measure feedback from staff regarding the methods used to communicate the change that is taking place.

6.3. Transfer of responsibilities

In certain cases changes will involve the transfer of responsibilities, tasks and physical assets: in such cases a crucial part of the process is to control these steps. It is necessary to identify the tasks, responsibilities, resources and information to be handed over such as:

- Job descriptions
- Training plans
- Accountabilities
- Authorities
- Corrective audit and surveillance actions
- Safety tasks
- Responsibilities of procedure writing

- Regulatory findings, required measures
- Physical assets
- Financial assets.

The transfer process should be documented. A special transfer sheet will indicate which tasks, assets and responsibilities are transferred, along with the names of the persons handing over and receiving them, respectively. The new responsible superior approves the transfer sheet in order to acknowledge that the new task or responsibility has been properly assigned. At the end of the transfer, the project manager is advised of the status of the transfer and is briefed on any pending items needing managerial action.

6.4. Shadow working

In order to assure the smooth transfer of responsibilities, a period of ‘shadow working’ may be necessary, particularly for major structural changes. This is a process by which the new persons appointed to perform a task and the persons formerly responsible should work together for a period to ensure a smooth handover. The shadow working should focus on:

- Safety implications
- Requirements and deadlines of the task
- Performance practices
- Documentation to be considered
- Definition of interfaces and participating parties (internal, external) during the performance of the task.

The duration of any shadow working should be pre-planned to include the task, persons involved and the expected result. If shadow working is neither feasible nor necessary, other measures should be considered early in the implementation stage to ensure staff are competent to assume any new or revised roles. These measures could include:

- Implementation of a classroom (using appropriate simulator and virtual reality technology if necessary) training programme
- On-the-job training in similar organizations, if applicable
- Implementation of an effective self-assessment process
- In the early stage, regular managerial control over performance
- Comprehensive communication.

6.5. Human, social and cultural issues

In implementing change, it is important to recognize the importance of social and cultural aspects and their impact on safety. Processes and techniques which are appropriate in some cultures may be inappropriate in others.

In addition, significant structural changes in a utility may require changes in culture in part or all of the organization and this cultural change needs to be carefully nurtured by senior management. Moreover, it may take a considerable time to materialize.

Regulators need to consider the way in which they deal with major changes in licensee organizations to avoid contributing to staff apprehension about change.

Introducing change often necessitates shifts in responsibilities and in many cases the release of personnel from the utility through redundancy or redeployment. The latter, if handled poorly, can be extremely distracting and destructive to the utility and the performance of those who remain. It is necessary to eliminate uncertainty as quickly as possible and to focus the attention of those who will remain on the improvements to be derived from the change both to them and the business.

It is important to identify as soon as possible, for those people who will remain, their future roles, and the training they will receive to help them in their new roles.

Those people who will be leaving should leave the utility as quickly and as amicably as possible with the fairness shown to them being made visible to those who are to remain. In many strong trade union utilities, the rights of seniority and the rights of employees can be a hindrance to the speed of the severance process, which can introduce considerable uncertainty amongst all employees. It is highly preferable for management and trade unions to have planned this process jointly beforehand to minimize the difficulties in executing the release process and to ensure that any prerequisites (enablers) are completed by individuals prior to leaving.

During any change process, training opportunities provide a source of information and support for the personnel affected by the change, whether large or small. Training can sometimes provide a forum for senior management to answer questions and provide feedback about concerns that may be raised from staff.

6.6. Project closure

One of the ways of reducing management workload is to ensure that change projects are formally closed when the activity or change becomes part of normal daily work. It is helpful to formalize this process. If actions are inconclusive or people are left wanting, they will invariably return to the management agenda. Regulators may wish to scrutinize records and reports before the team is disbanded.

Once it is determined that the project is complete, the project team should be disbanded when the following activities have been carried out:

- An appraisal has been conducted of all implementation team members.
- The success of the project has been celebrated and communicated.
- Team members have been given appropriate reward and recognition.
- The team members have been reassigned to other work.

In closing the change project down, a final report should be prepared for the sponsor to clarify how staff are being reassigned, what the final impacts on safety and the budgetary figures are, and to confirm that all the necessary documents have been produced and filed. A post-implementation review is conducted with the sponsor to secure sign-off for the change. Attention to detail will prevent matters from reemerging.

In addition to celebrating success within the change project, it is necessary to communicate the achievements of the project to all stakeholders.

These activities will aid the next step in the process: that of extracting the lessons learned from implementing the change. For projects involving local government, the public and other external stakeholders, a closing meeting should be held to inform them that the project is closed and to extract any lessons learned for all parties involved.

6.7. Management overview

Change implementation must be characterized by the active and positive involvement of all staff in a common and clear direction. Senior management must ensure that this direction is clearly communicated to stakeholders and that the process of oversight is rigorous in order to allow timely intervention if things go wrong.

The following questions are considered for the implementation stage:

- What do the results of the reviews on safety levels indicate following the implementation of the change?
- Are the resources necessary to preserve the fundamentals for operating the plant provided for at all times?
- Are regular reviews carried out on the performance indicators during the period of change?
- How has the utility assessed the impact of a number of changes in a business area?
- Can the utility establish not only that the procedures are being followed, but that the arrangements are adequate to meet its policy aims?
- Has an assessment of the effectiveness of the communication programme been carried out?
- Have the necessary handovers been completed?
- Has the change project been closed down?
- Have arrangements been put in place to learn from each change project?

7. MONITORING, REVIEWING AND LEARNING FROM THE CHANGE PROCESS

The process for managing change is illustrated in Fig. 2. as a series of steps with multiple monitoring and review loops. At the stages of identifying, evaluating and planning, the review is mainly involved in assessing safety. Such assessments will, depending on significance, include independent reviews performed by the utility.

During implementation, the review process centres on the use of performance indicators for continuous monitoring, with reviews at identified hold points. Reviews of the process as a whole and integrated reviews are discussed in this section.

The lessons learned and the change itself may affect the utility's strategic plan describing how the vision, goals, objectives structure and culture will be sustained. Any change to this plan should be further developed and communicated to the staff.

7.1. Review against expectations

When individual changes were being developed, the expected results should have been identified. These expectations should have predicted the impact of the change to plant safety, the environment, financial and performance areas as well as to the goals and objectives of the utility. A review is conducted when the change is fully implemented to measure to what extent the change achieved the anticipated results. On completion of the planned changes a management review of the strengths and weaknesses, the successes and failures and the cost–benefit to the utility is conducted.

This is an area which is frequently overlooked. However, it is important not only because it brings a sense of closure to the current project, but because it also serves to set the stage for the next. Change is a continuous process, but that does not mean that there cannot be milestones of achievement to be recognized along the way. Dedication of staff has to be acknowledged: recognition will have the effect of communicating and underscoring the importance of the work done and the efforts invested by all those who played a part in bringing about the change.

7.2. Ongoing monitoring

There is much merit in ensuring that change projects are disbanded as soon as practicable. Nevertheless, for many changes, the effects will continue for some time after completion. It is therefore necessary to continue monitoring performance indicators even after a project is terminated. Arrangements for ongoing monitoring should be put in place. Sometimes this is done by incorporating change related monitoring into normal monitoring. However, care should be taken that precautionary monitoring does not become accepted practice. The eventual termination of change related monitoring should be taken when appropriate.

7.3. Integrated reviews

Utilities should conduct integrated reviews at a regular frequency (e.g., annually) in which the interaction and effect of all changes carried out during the period are examined. The baseline of the utility should be reviewed periodically and could be considered for inclusion in any Periodic Safety Review.

7.4. Change process improvement

The management of change should be considered as a process that requires improvement and as such needs to be reviewed for effectiveness and efficiency on a suggested cycle of three years.

7.5. Management overview

Senior management should ensure that review and evaluation takes place at all stages of a change and of the process of change itself. By these means senior management should actively lead the promotion of learning and improvement throughout the utility.

The following questions have to be considered for the monitoring and learning stage:

- Did the change achieve the improvement targets originally established and if not, do we understand the cause and have a plan to correct the situation?
- Have we organized a post change peer review to ensure we are continuing to improve in both performance and safety with respect to the rest of the industry?
- How do we intend to recognize/reward staff for successfully implementing the change plan?

8. REGULATORY ROLE IN THE CHANGE PROCESS

8.1. General

The regulators in some Member States are becoming increasingly concerned that introducing a change, if it is not properly considered and analysed, could lead to a detrimental effect on

safety. To address this concern, some regulators are imposing regulatory requirements for utilities to effectively manage change.

Regulators are expected to fulfil their mandate regarding the change process, with respect to both the licensed facility and the organizations whose activities support the licensee, to ensure there is no detrimental impact on safety. Regulators have to respect and not unnecessarily interfere with licencees' legitimate business practices, but licencees should be aware that the primary responsibility for safety rests with them. The regulators' role is to oversee the safety of licencees activities including, where appropriate, those activities associated with change management.

A strong safety authority is an important element in keeping the nuclear business focused on safety when contemplating and executing change. Strength in this sense does not necessarily come from a prescriptive or dictatorial approach. Strength comes from demonstration by the authority that it is strong and forthright in holding the nuclear utility accountable to living up to its safety obligations, that it has the competence to judge the safety aspects of organization change, and that it will act decisively if safety is challenged.

8.2. Mutual understanding through communication

It is necessary that senior regulatory officials meet on a regular basis with senior executives from licencees. Informal meetings need to explore the long term plans of licencees. The regulator need to use these meetings to draw conclusions on the commitment of the executives of the licensees to safety while changes are implemented as part of being successful, and to seek confidence that the utility is adequately addressing safety in its change management.

In addition, regulators need to communicate with government departments and other regulators (particularly market regulators) in such a way as to avoid, where possible, inconsistency of requirements which might be detrimental to safety.

Regulatory bodies should institute a regular and open dialogue with the public in which the issues arising from changes to be conducted in utilities can be discussed.

8.3. Measuring and monitoring by licencees

Regulatory bodies have to oblige licencees to demonstrate that safety is maintained, and preferably improved, during and after the implementation of changes, and may want to review any independent assessment carried out for the licencee.

Regulatory bodies also need to pay attention to the selection and monitoring of relevant indicators to ensure that safety and operational capability is maintained at all times. Such indicators include appropriate measures of safety culture.

8.4. Measuring and monitoring by regulatory bodies

Regulatory bodies need to have their own monitoring activities to oversee safety during change and detect deterioration. In particular, they have to focus on long term outcomes of changes that licencees are not seduced by short term benefits in efficiency to the detriment of safety and the licencees' technology base in the long term.

8.5. Safeguarding ongoing operations

Regulatory bodies may need to increase their scrutiny of licencees when they are carrying out significant changes. This scrutiny will seek to ensure that management is not losing focus on the configuration control of plants because their attention has been diverted to driving the change.

8.6. Licencees' competence and capability

Regulatory bodies should make a judgment on whether a proposed change will threaten a licensee's competence and capability.

Licencees need at all times to retain a sufficient competence to understand and control the hazard. The outsourcing of expertise is an example of such a threat and a utility will need to retain the capability to oversee and accept the outcome of received advice.

Additionally, such outsourcing can erode corporate memory and knowledge: regulatory bodies may require that licencees address this issue.

Regulatory bodies may require of utilities a substantiation of their organizational size, structure and their staff's competence and capabilities. Such a baseline substantiation should be used in the management of the change process in the same way as design basis is used in the evaluation of engineering change.

Regulatory bodies may also expect a periodic review of this baseline substantiation.

8.7. Inspecting and enforcing

Regulatory bodies may adopt into their inspection plans ways of inspecting against a licensee's change process and test the effectiveness and veracity of the process by inspecting the outcomes of individual changes.

Some regulators, as exemplified in Annex 1, Licence Condition 36, have been given stronger powers to regulate the change process, for example to oblige licencees to have a management of change process and to prevent changes which, in their opinion, may produce an unacceptable degradation to safety.

Regulators should be prepared to act decisively in such circumstances.

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- [4] INTERNATIONAL ATOMIC ENERGY AGENCY, Probabilistic Safety Assessments of Nuclear Power Plants for Low Power and Shutdown Modes, IAEA-TECDOC-1144, Vienna (2000).
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Annex I

REGULATORY LICENCE CONDITION ON MANAGING CHANGE: NUCLEAR INSTALLATIONS INSPECTORATE, UNITED KINGDOM

Licence Condition 36: Control of Organizational Change

- (1) The licensee shall make and implement adequate arrangements to control any change to its organizational structure or resources, which may affect safety.
- (2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.
- (3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.
- (4) The aforesaid arrangements shall provide for the classification of changes to the organizational structure or resources according to their significance. The arrangements shall include a requirement for the provision of adequate documentation to justify the safety of any proposed change and shall where appropriate provide for the submission of such documentation to the Executive.
- (5) The licensee shall if so directed by the Executive halt the change to its organizational structure or resources and the licensee shall not recommence such change without the consent of the Executive.

Annex II

SELF-ASSESSMENT EXAMPLE, MANAGEMENT OF CHANGE: BRITISH ENERGY GENERATION LTD, UNITED KINGDOM

MANAGEMENT OF ORGANIZATIONAL CHANGE

Background

As part of the process of splitting up and privatising the electricity industry in the UK private utilities were formed to manage Advanced Gas Cooled and Pressurised Water Reactor plant in England and Scotland. These utilities have undergone ‘re-badging’, and are now respectively named British Energy Generation Ltd (the English utility) and British Energy Generation (UK) Ltd (the Scottish utility). Post-privatisation the ‘organizational efficiency’ of the utilities was reviewed extensively and a strategy was conceived to standardise organizational structures across power stations and to streamline centralised support functions. It was recognised that the changes to organisations and staffing levels that would result could have a direct impact on safety as well as commercial viability. In response a formal process was developed to ensure that organizational and/or staffing changes were reviewed and graded for their safety significance. The process then included a risk assessment and the identification of planned activities to manage risk (‘enablers’), safeguards to apply if enablers were not met or were not effective (‘countermeasures’), and performance measures on which to monitor the effect of the change. This process was embodied in a Company procedure first issued in 1996.

Development of the Procedure and the Involvement of the Government Regulator

The Government Regulator in the UK (the Nuclear Installations Inspectorate) clearly recognised the potential impact of organizational change on nuclear safety issues, and took a close interest in the Company process for the management of such changes. They took the position that the issue was too important to leave to the discretion of the nuclear utility alone and consequently placed a legal requirement on them to have formal arrangements in place to control organizational change. This was implemented through the NII issuing an additional condition to the Nuclear Site Licences (Licence Condition 36) under which the utilities operate their nuclear plant. The new condition was fully implemented in April 2000.

The Company procedure was amended in response to this to reflect its status as the formal arrangement for complying with LC36. This resulted in a narrowing of the scope of risk assessment to focus on nuclear safety issues. A cornerstone of the process remained an assessment and grading of the potential nuclear safety risk, but the new process introduced a new grade of ‘A*’. This applies to the most safety significant of changes and demands agreement by the NII prior to implementation.

The Company Procedure (‘Management of Changes Relevant to LC36’, NEL/P/QD/006) is provided as an example of a self-assessment process.

Company Procedure

British Energy Generation Ltd

Management of Changes Relevant to LC36

Issue 2 December 2000

Authorised by: GEC Jenkins
Executive Director Operations

Date:

Revision/Review Register

Custodian	Author/Contact	Reason for Issue/Change
G Buckley Quality Manager	A McMahon	New Document for compliance with Nuclear Site Licence Condition 36
		Issue 2 Modified to accommodate NII requirement for involvement

1 PURPOSE

This publication sets out the procedure for compliance with Licence Condition 36; ‘Control of Organisational Change’, which may affect nuclear safety within both British Energy Generation (UK) Limited (BEG(UK)L), and British Energy Generation Limited (BEGL).

2 SCOPE

This document outlines the requirements for controlling changes which may affect nuclear safety and concern:

- organisational structures and responsibilities,
- organisational resources and their deployment,

as set out in nuclear Site Licence Condition 36.

All changes should be considered for their potential impact on nuclear safety — see Figure 1.

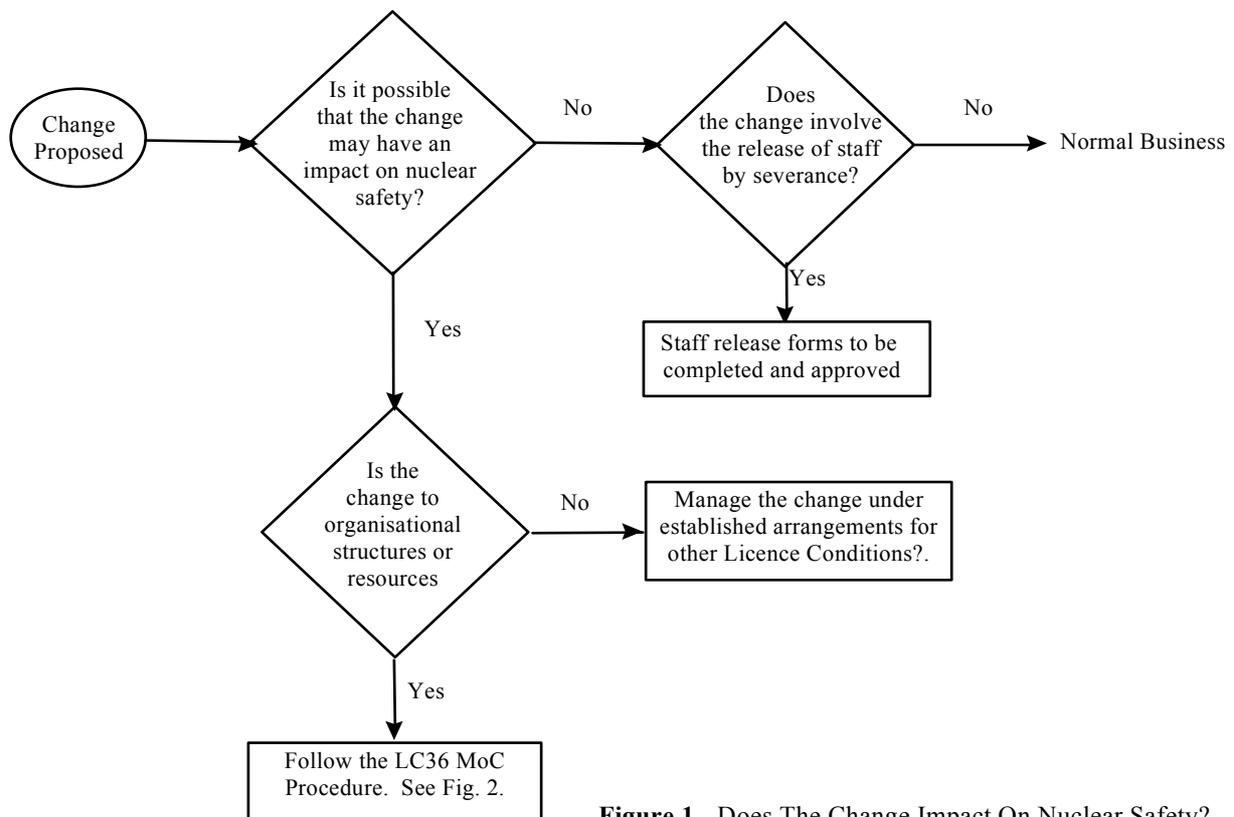


Figure 1 - Does The Change Impact On Nuclear Safety?

Do You Need to Use This Procedure?

Changes that have no impact on nuclear safety or which will be managed wholly through established arrangements, such as the LC22 Engineering Change arrangements or succession management are outside the scope of the arrangements described in this document and do not have to comply with the following process, see Figure 1. It should be noted that Staff Release Forms are required for staff being released on severance, irrespective of the category of the change.

3 RESPONSIBILITIES

The following roles have been identified to carry out the key steps in the process for the control of change.

Proposer

Ensures that this procedure is initiated and drives the change through all stages to implementation.

(Guidance on the application of this process for the proposer is contained in Appendix F).

Assessors (HSED)

Provide an independent assessment of nuclear safety related changes, (Guidance on the application of this process for the assessor is contained in Appendix F).

To monitor the application of this process, through inspection, review and audit, as part of its normal business.

Approvers

Ensure the adequacy of the proposal and that appropriate resources and responsibilities are allocated to manage the change.

Quality Manager

Is responsible for the review and revision of this procedure and the monitoring of its application through the normal arrangements for audit.

4 LC36 MOC PROCEDURE

4.1 Management of Change General

The key steps to be followed for any change proposal within the scope of this procedure are set out in the process map provided in Figure 2. The following amplifies the steps for nuclear safety related changes of Grade C or above:

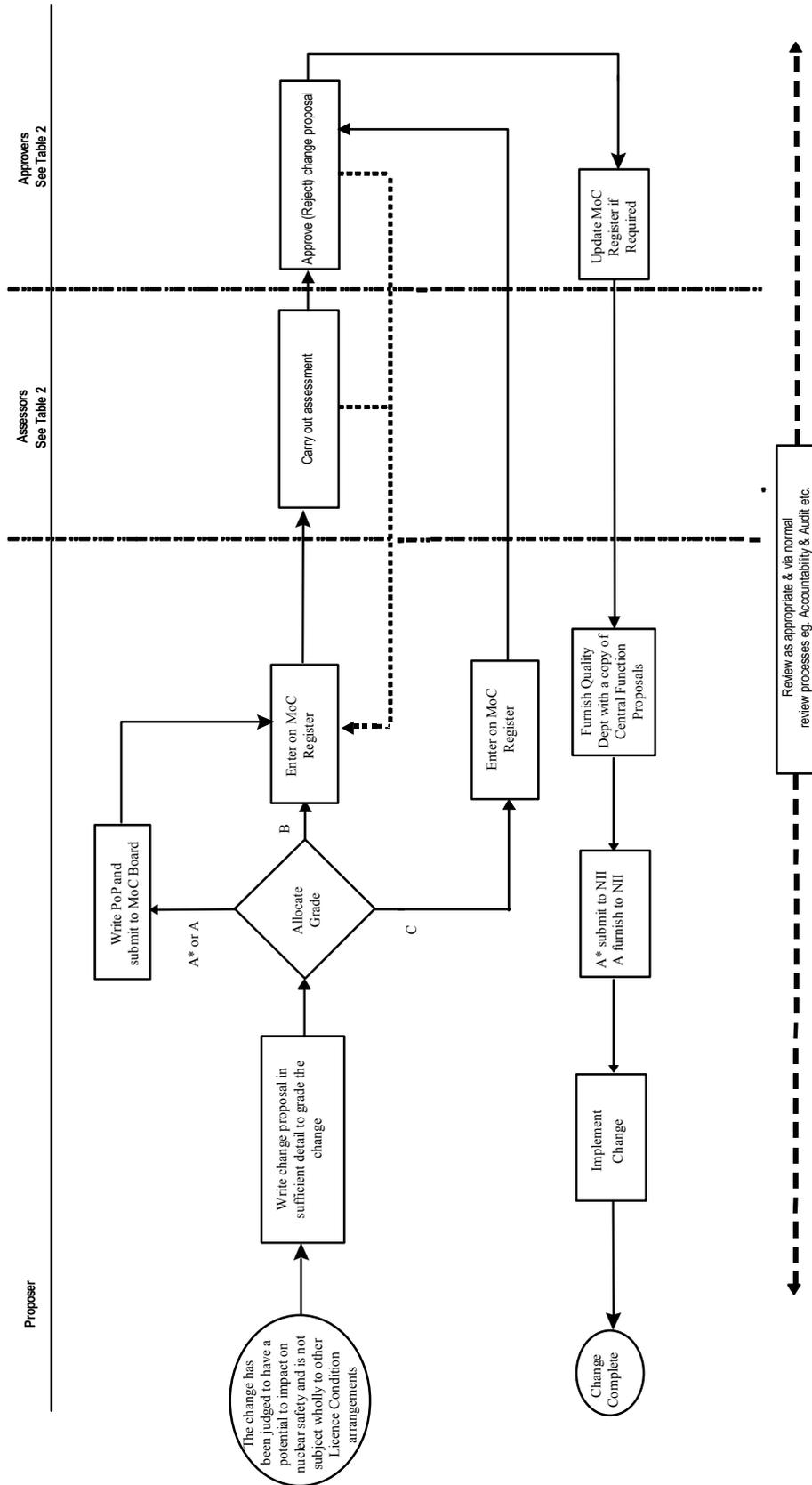


FIG. 2. Flow Chart of LC36 Management of Change Procedure.

4.1.2	Grade the proposal using the criteria in Table 1.	Proposer
	If Grade A* or A submit a Paper of Principle to the MoC Project Board for Consideration and Advice. If Paper of Principle accepted, enter onto all relevant change registers.	
	If Grade A*, A or B, enter onto all relevant change registers at least 28 days before planned implementation.	
	Grade C changes must be entered onto all relevant change registers before planned implementation.	
	The proposer will assist during the assessment through the provision of a clearly stated change proposal, validation statement and implementation plan and responses to assessors inquiries.	Proposer
4.1.3	If the proposed change falls within the scope of LC22, ‘Modifications or Experiments to Plant’, then it is also appropriate to consider the impact of the change through the modification process.	Proposer
4.1.4	Assess the change proposal (Assessors defined in Table 2 – HSED).	Assessor
4.1.5	Approve the change proposal (Approvers defined in Table 2).	Approver
	If Grade A*, HSED to submit change proposal to NII, seeking agreement that safety has been adequately considered and the change may now be implemented.	HSED
	If Grade A, furnish to NII formally, at least 28 days before implementation.	
	If Central Function change, furnish Quality Dept with a copy of proposal.	
4.1.6	Update details of the change on the relevant change register and if required, notify details to affected nuclear licensed sites for updating of the station MoC Schedules.	Proposer
4.1.7	Review to confirm that the relevant enablers have been adequately deployed prior to the implementation of the change.	Proposer/ Approver
	For Grade A* or where the NII so specify, implementation of the change will not take place until they are satisfied that nuclear safety has been adequately considered.	
4.1.8	Implement the change.	Proposer
4.1.9	Review performance measures, during and following implementation. Revise/approve change proposal or implementation plan as necessary, or when counter measures are deployed.	Proposer/ Approver

4.2 Staff Release/Transfer

4.2.1 Staff release / transfer is a special case of change, due to the potential to Proposer lose key skills or corporate knowledge.

Follow the steps given in 4.1.

Further guidance is given in Appendix E.

Where the staff release is severance, in addition raise a staff release form.

Table 1. LC36 Change Grade Definitions

Grade A*	A change which both meets the definition of Grade A, below, and involves changes to organisational structures or resources or roles of functions, such as to represent significant change to the Licensing basis.
Grade A	A change to organisational structure or resources which, if inadequately conceived or executed, may seriously reduce the capability of the organisation to maintain safe operation and compliance with the site licence.
Grade B	A change to organisational structure or resources which, if inadequately conceived or executed, may lead to a significant but not serious reduction in the capability of the organisation to maintain safe operation and compliance with the site licence.
Grade C	All changes within the scope of this document for which a change proposal is judged necessary to demonstrate that it has no significant impact on nuclear safety.
All other changes do not require justification under this procedure as they are considered to be normal business.	

Note: There are no absolute definitions of grade, they are based upon the judgement of the Proposer and accepted by the Approver. Guidance is provided in Appendix C.

Table 2. Assessment and Approval Routes

Grade	Assessor	Approver	Involving NII
A*	Director, Health Safety and Environment.	Line Director And Executive Director Operations (after MoC Board Consideration and Advice)	Formal Submission for Agreement required after Approval and before Implementation
A	Director, Health Safety and Environment.	Line Director And Executive Director Operations (after MoC Board Consideration and Advice)	To be furnished with Proposal, formally after Approval and 28 days before Implementation
B	Director, Health Safety and Environment or his/her nominee	Line Director or Head of Function.	Informal information. Change on register 28 days before Implementation
C	Not applicable	Line Manager	Informal information as appropriate
<p>Note: If the change is within HSED itself, appropriate third party assessment should be sought.</p>			
<p>Note: Guidance on the associated nuclear safety risks which need to be considered is contained in Appendix B. Guidance on the role of Assessment is given in Appendix F.</p>			

5 DEFINITIONS

An enabler is a specific planned activity, which is required to be completed to ensure delivery of the change and/or avoidance of an identified potential risk.

A countermeasure is an activity, which might need to be deployed if a potential risk manifests itself during or after implementation, and is an identified potential backstop, not to be used as an alternative enabler without careful rethinking of the original proposal.

Changes relevant to LC36 are changes to organisational structure or resources that may affect nuclear safety or site licence compliance.

MoC Board is the sub-committee of the BEGL and BEG(UK)L Boards known as the Management of Change Board.

Staff Release is where a member of staff leaves employment with BEGL or BEG(UK)L or is transferred to another job and there is an associated loss of a post.

6 RECORDS

Change Proposals/Validation Statements and Staff Release forms will be maintained by the originating Station or Business Unit in a Change File.

Central Function and Station Grade A*, A, B, and Grade C changes relevant to LC36 will be recorded in the Management of Change Schedule / Change Register of the affected Licensed Sites.

Central Function Grade A*, A, B and C changes will be recorded in the Change Register maintained by Corporate Quality Department. A copy of approved proposals are to be forwarded to the Corporate Quality Department.

A copy of the records of Grade A* and A Changes will also be notified to the HSED Director.

7 GUIDANCE

A suite of guidance notes will be maintained in response to user demand, including training materials, good practice guides and descriptions of documentation/records/registers, etc.

APPENDIX A CHANGE PROPOSAL, IMPLEMENTATION PLAN AND REVIEW REQUIREMENTS

The following should be included in change proposals. The level of detail and format of the documentation may vary depending on the significance, but should be sufficient to justify the Grade and assist any Assessor.

A Change Proposal/Validation Statement

- **Title and Unique Reference Number.**
- The assigned **Grade.**
- **The Start Point** – Current Position.
- **The End Point** – The organization or overall working arrangements at the completion of the change.
- **Change Description** – What is actually changing?
- **The Reason for the Change** – Including reference to the safety and business case objectives and how the change is integrated with other Change Proposals.
- **Approval of the Change** – Identification of the Approver.
- **Risk Areas** and assessment against criteria – Guidance is contained in Appendix B.
- **Enablers** to be completed to ensure delivery of the change and mitigate the risks, (if any).
- **Countermeasures** to be deployed if a potential risk manifests itself during implementation, (if any).
- **Performance Measures** – Identification of the performance measures that will be used to assess the success of the change.
- **Accountability** – Identification of the person accountable for the change, (proposer to identify).

B Implementation Plan

Key Steps to Reach End Point; Could Include:

- Performance measures (monitoring: delivery of enablers; early warning of manifestation of risks; benefits and results of change);
- Identification of key stakeholders and stakeholder management plans including regular briefings of NII by HSED and proposer as appropriate;
- Implementation programme (including hold points/reviews of delivery of enabler programme/performance measures);
- Updates to affected procedures, instructions etc. resulting from the change.

C Review Prior to and During Implementation

Proposer and Approver of implementation plans should review delivery of relevant enablers before a specific change is implemented.

Where it is found that an enabler is not complete to programme, the normally expected countermeasure is to delay the specific change dependent on that enabler. The Change Proposal will be subject to reassessment if there is a change to the proposed final arrangements.

Post-Completion Review

A post-completion review should be undertaken where appropriate to confirm that the objectives of the change have been met and that subsequently, performance indicators are satisfactory. Where the outcome of the review is unsatisfactory appropriate action should be undertaken.

APPENDIX B. CRITICAL RISK CRITERIA

The following risks should be considered when preparing and assessing change proposals/validation statements.

Risk	Current Arrangements to meet Risk
1 Company Policy and its implementation through Nuclear Safety targets and objectives not met.	Health and Safety Policy, Safety Management Prospectus, Environment Policy, Quality Policy.
2 Lines of accountability for Nuclear Safety not well defined and documented throughout the process.	Company Quality Programme, SN QP1, or Manual and Division / Department Procedures / Manuals. Post and Competence Profiles.
3 Legal requirements for Nuclear Safety not met directly or defined by Company policies and standards under self-regulation.	Site Licence conditions and compliance principles / arrangements, Company Standards (e.g., Safety Rules, and Safety Codes of Practice, etc.).
4 Regulatory commitments not met or renegotiated.	Safety Management Prospectus and supporting re-licensing documents, correspondence with NII.
5 Necessary workload not defined or adequate and competent resources not in place or contractually available to meet it.	Business Plans, Post and competence profiles, contract specifications, Training and Development plans.
6 Sufficient nuclear safety expertise not provided or secured to ensure: a) the production, peer review, independent assessment of nuclear safety cases, b) the inspection and audit of nuclear safety performance	Safety Management Prospectus defines the areas considered important to licensing, i.e. the key technical competencies available either at stations or centrally. Division/ Department Procedures Manuals. The Company audit and inspection programmes.
7 Inadequate arrangements for obtaining and reacting to operational experience from BEG stations and those of other UK and overseas nuclear operators.	Operational Experience Feedback arrangements (NUPER, CFU, HSE and WANO)
8 Effective emergency arrangements not maintained at each site and centrally	Stations' Emergency Plan and Handbook, CESC arrangements, training plans, demonstrations
9 Unfavourable benchmarking of the Company organization and level of resource against International standards or expectations.	IAEA Safety Standards, WANO objectives and criteria (these define a minimum set of activities, such as health physics control, appropriate for the safe running of a nuclear installation).

Risk	Current Arrangements to meet Risk
10 Changes to arrangements for liabilities or decommissioning under Nuclear Installations Act not agreed/accepted by HSE.	Re-licensing submissions on scope of segregated decommissioning fund and decommissioning strategy.
11 Threat to the operation of the plant within the site licence conditions, design constraints and the safety case with particular focus on: – Sufficient motivated suitably qualified and experienced people – the maintenance schedule – QA arrangements.	Station Specific / Generic Station Arrangements: Company Manual, Site Licence Compliance Principles / Arrangements, Company and Station QMS Documentation.
12 Non observation of the conservative decision making principle.	Station OR's & IORs/IOIs, Operating Procedures & Manuals, SOI's, TOI's, Mod Procedures, Safety Committees, use of SQEP's & DAPs, Panels (IOR's, SOI's, MITS, Criticality, T&I etc), Dept & Section Procedures, rigorous JIs & WIs etc.
13 Increase in the likelihood of trips.	Event Reporting, Inquiry system, T&I Panel, NUPER, WANO, Trained Operators & Regular Simulator Training, KPI reporting..
14 Inability to retain an understanding of the basis of the plant design and safety cases.	Documentation systems, Station Lifetime Records, CDMS, Tech Library, RSSs, NSC papers, CMS records, Station & PP mods records, EQS, Plant history & maintenance records.
15 Inability to ensure consistency of design with safety case and operability requirements.	Eng. Divn. SQEP register ensures appropriately trained and supervised people for specific design functions. This combined with the rigorous assessment processes required by the Mod procedures and the procedures of the various Panels (12 above), together with the majority of the arrangements listed under 12,13 and 14 above, render it virtually inconceivable that any significant "inconsistency" would go undetected.
16 Inability to discharge technical obligations under Licence Compliance Arrangements.	The LCAs, for each technical obligation identified, define what written procedure(s) apply to meet the obligation, and the post holder in the Company responsible for ensuring its correct implementation. In carrying out these procedures, the use of only appropriately qualified and supervised personnel, (as required by our procedures) ensures the obligations are discharged correctly.

Risk	Current Arrangements to meet Risk
17 Inability to investigate, analyse and implement solutions for plant problems.	This is primarily met by Eng. Divn.'s expertise which is ensured through the SQEP register, the ongoing training of the specialist personnel identified on it, and the relationship identified in it between the various post functional requirements and the named SQEPs who can meet these. For operational problems The Station staff lines of responsibility and register of SQEPs & DAPs for specific functions, perform a similar function.
18 Inability to retain and understand the history of the plant.	Station Technical Records, Maintenance records, Plant history records, CMS, Station Mod records, Eng Divn Tech Library, CDMS, Cimage etc provide the means of retention. Understanding comes from proper interrogation of these sources by SQEP personnel or suitably trained people working under supervision of a SQEP.
19 Inability to maintain essential nuclear technology	<ul style="list-style-type: none"> • On the design side, the use of SQEP'd personnel in accordance with the SQEP register requirements, together with an ongoing training programme (AV1,2,3 etc) ensures the design capability aspects are maintained. • On the operational side, the formal training of station personnel (eg regular operator simulator training), of maintenance staff etc on the tasks to be undertaken, reinforced by the SQEP & DAP systems together with detailed procedures, JI's & WIs for all significant tasks ensures the operational capability aspects are maintained. • This is augmented, for both of the above, by ongoing personal development training of the same people, and their attendance at relevant key meetings/conferences/seminars and specialist courses when appropriate.

APPENDIX C. EXAMPLES OF CATEGORISATION FOR SAFETY RELATED (LC 36) CHANGES

See MoC Good practice Guide Number 3 for further Guidance

Grade A*

Appropriate	Explanation
V2000/R21	Was Grade A (serious potential impact) And Significant change in structure and roles at Company level
Demerger of NEple into NEL and Magnox	Would have been Grade A if current procedure had applied And Significant Change in Structure and Roles at Company level
Outsourcing all technical support to a divested engineering agency (hypothetical example for BEG)	Would be Grade A And Would be significant change to Role of Executive Director, Engineering
Taking on contractors in managerial roles on a Licensed Site so as to challenge who is the "user" of the Site (hypothetical example for BEG)	Would be Grade A And Would Challenge who is the "user" and would imply a significant change in Station Director Role
Placing responsibility for operation and control activities on one of a Licensee's Sites with another company acquired by that Licensee (hypothetical example for BEG)	Would be Grade A And Would be a significant change to Company level structure and roles, as defined in the Company Manual
Downgrading the Head of safety in a Licensee so their authority/influence is degraded (hypothetical example for BEG)	Would be Grade A And Would be significant change to Company level structure, as defined in the Company Manual

Inappropriate	Explanation
Combining Posts of Chairman and Managing Director (ProTem) (Grade B)	Changed roles as defined in Company Manual But Was Graded B (significant but not serious)
Business Support Review - Overview and Procurement	Is Grade A (serious potential impact) 8.7.1.1.1. But No significant changes to Director Roles or Company Manual
V2000 AGR structure Operations Department (Principles/Generic)	Would have been Grade A if current procedure had applied 8.7.1.1.2. But Did not change structure or roles at Director level
Vanguard 2 Work Management Project Overview	Would have been Grade A if current procedure had applied 8.7.1.1.3. But Did not change structure or roles at Director level
Establishment of New Contracts for the Provision of Nuclear and Radiological Services Currently provided by BNFL/Magnox	Is Grade A But Does not change roles at Director level such as to require change to Company Manual

Grade A

Appropriate	Explanation
V2000 / R21	<p>Affected all business units</p> <p>Could leave Company without adequate SQEPs to maintain safety cases for all stations</p> <p>Could leave Company without adequate SQEPs to operate or maintain power stations safely</p>
Business Support Review Overview	<p>Affects many business units, including all stations</p> <p>Included a large number of changes ranging from normal business to Grade A, whose overall effect could be more severe than any one change</p>
BSR Procurement Changes	<p>Affects many business units, including all stations</p> <p>Could leave the Company without adequate SQEPs to ensure adequate quality of safety related goods and services</p>

Inappropriate	Explanation
<p>Combining Posts of Chairman and Managing Director (ProTem)</p> <p>(Grade B)</p>	<p>Whilst this could affect the whole business, including resources for safety, their are ongoing mitigators in the presence on the Board of an experienced "Chief Nuclear Operator", the existence of the Director HSED on the Exec team and the role of the SHEC. This changes the risk from "serious" to "significant".</p>
BSR HR(Training)	<p>Changes to the training resource could eventually leave the Company without adequate SQEPs for safety across the tranche. However, the particular changes proposed are to only part of the process and unchanged parts of the process contain checks, such that early warning would be given of deficiencies which could be corrected before severe consequences. This changes the risk from "serious" to "significant"</p>
Vanguard 1 (PMIS)	<p>Changes to how training needs and achievements are recorded could lead to inaccuracies in SQEP knowledge and putting to work of people "out of ticket", and hence failures of compliance with Site Licence conditions. However, this is mitigated by the ongoing knowledge of team leaders, such that non-compliances would be unlikely to be common across the whole tranche – significant but not serious.</p>

Grade B

Appropriate	Explanation
BSR Facilities Outsourcing of Active Laundry & Workwear Requirements	Failure to provide sufficient clean active workwear could prejudice the timely completion of essential maintenance work. However, alternative sources of laundry are available in an emergency. Laundry inadequately done could be source of contamination spread. However consequences and likelihood likely to be small. Just possibly a significant risk across whole tranche; certainly not serious.
BSR Establish Revised HR Organisational Framework	Failure to maintain an effective HR organisation could prejudice the maintenance of suitably qualified and experienced staff to carry out safety-related duties. However, line management already demonstrate ability to monitor this, so risk is significant but not serious

Inappropriate	Explanation
BSR Finance (Grade C)	Possibility existed that loss of non-safety related posts would lead to transfer of work to safety related staff. Proposal justifies this not significant.
BSR Communications (Grade C)	Possible risk to support to emergency scheme. Proposal justifies that support enhanced by increasing PR staff for rota.

Grade C

Appropriate	Explanation
Planned release on severance of a staff member of no safety significance, without loss of his/her post	Severance implies a loss of post somewhere. Demonstrate there is no nuclear safety significance in relation to the post being eventually lost in the 'Chain'.
Revised staffing levels in proposed HSED Environment Branch	There is a need to justify that the changes do not have significant impact on work related to radioactive waste management and decommissioning

Inappropriate	Explanation
Reduction in number of IT hardware and software Licences, following reduction in number of staff (normal business)	Obvious that there is no nuclear safety significance in adjusting provision in response to changing need; Non LC36.
Non Appointment of Communications Director (normal business)	No effect on BEG organisation, roles, reporting lines to Corporate, or service provision; Non LC36.

APPENDIX D
(This Form is an example only: The definitive version is in Part C of the Site MoC SCHEDULE)
MANAGEMENT OF CHANGE REGISTER

BUSINESS UNIT: _____

This register contains a summary of all changes that fall under the Company Management of Change Procedure.

Number	Date raised	Title	Grade LC36	Originating Bus. Unit	Proposer	Approval Date	Completion Date
XXX 001	04/00	A Business Unit Change with no significant impact on nuclear safety.	C	Station	A.N. Other	April 1 st , 2000	04/00

Note: Grade A*, A, B and Grade C LC36 related changes originated at any business unit must be recorded in the change register of the affected Licence Sites.

Grade A*, A and Grade B LC36 related changes must be on this register for at least 28 days before implementation.

APPENDIX E. GUIDANCE FOR STAFF RELEASE / TRANSFERS PROPOSALS

Staff release/transfer is a special case of a change, due to the potential to lose key skills or corporate knowledge.

Changes that result in a vacant post being created without backfill need to be considered and justified. The vacant post may be due to severance, loss of post or staff move outside a Division / Station / Business Unit.

Changes involving complex/multiple staff moves, not necessarily resulting in a vacant post, may also need to be considered and justified.

The following additional guidance should be considered when initiating a Change Proposal (planning phase):

Enablers:

When identifying the enablers, consider:

- workload – reducing / stable / transient
- specialism – availability of expertise in house or external
- flexibility – possibility of re-training or multi-skilling
- technology – options for automating manual tasks
- age profile – career development potential
- training – training needs to replace key staff
- emergency scheme roles – impact on rotas.

For staff severances. Part A of the following Staff Release Form should be completed at this stage which identifies the key enablers for the release. Such changes may be part of an overall change proposal, in which case the enablers may be included in the overall programme, with references only needed on the forms. If the post or staff change is stand alone, then the release forms may encompass all of the requirements.

REVIEW PRIOR TO IMPLEMENTATION

Well in advance of the release on severance of nuclear safety related staff, taking due account of staff notice entitlements, the Proposer and Approving Director must conduct a review to confirm that pre-release enablers identified as part of the change proposal have been delivered. If any enablers are outstanding, release should be deferred unless suitable countermeasures have been implemented. The review of enablers and countermeasures must be documented in sufficient detail to allow for independent review as necessary (Part B of the following Staff Release Form).

HSED will also conduct an independent review of the documentation of enablers and countermeasures to confirm that the safety aspects have been adequately addressed prior to staff release. In addition, HSED will monitor compliance with this procedure on a sample, inspection and audit basis as part of normal business.

Staff Release Form (To Be Completed As Part of Planning Phase of Change)

Staff Release Form – Part A (Change Proposal)

PERSONAL DETAILS

Name: _____ **Post:** _____

Length of Service: _____ **Change Ref:** _____

RELEASE DATE _____ **Change Grade** _____

Change Description, and Implementation Plan (or reference). [See NEL/P/QD/006]

Enablers Identified

1. _____
2. _____
3. _____
4. _____

Signed: _____ Date: _____
Responsible Manager

HSED / SITE INSPECTOR ASSESSMENT

Signed: _____ Date: _____

DIRECTOR APPROVAL

Signed: _____ Date: _____
Director

Staff Release Form – Part B (Pre-release Director’s Review)

(To be completed at the time of confirmation of release, to confirm that enablers have been delivered.)

EMPLOYEE NAME: _____ **EMPLOYEE NUMBER:** _____

DEPARTMENT: _____ **OCCUPATION:** _____

RELEASE DATE: _____ **REF No:** _____

CHANGE REF No. _____

PRE-RELEASE ENABLERS (use an additional sheet if required; refer to staff release form Part A attached)

COMPLETED Y / N

- 1. HR Staff Release Arrangements Completed.....
- 2.
- 3.
- 4.

IF ANY ACTIONS ARE OUTSTANDING, PLEASE QUOTE ALTERNATIVE ARRANGEMENTS HERE:

.....
.....
.....
.....

I have conducted a review of enablers and confirm that the conditions for release of the above named individual are satisfactory and conform with the Management of Change Process:

SIGNED
MANAGER **Date:**

APPROVED
DIRECTOR **Date:**

I have reviewed the documented enabler review and confirm that the safety aspects have been adequately addressed: (Mandatory for Grade A*, A & B (LC36) Safety Significant changes only)

REVIEWED
HSED **Date:**

APPENDIX F. GUIDANCE ON THE ROLE OF ASSESSORS/PROPOSERS

ASSESSORS

- Responsibility for proposing, validating and managing the implementation of change lies clearly with Line Management, and the role of assessment does not diminish this in any way.
(It is not the responsibility of the assessor to decide if the change is a good idea or not.)
- The role of the assessor is to provide assurance to the Proposer and Approver of the change:
 - a) that the MOC process has been followed;
 - b) that the end point is sound with reference to legal requirements and regulatory expectations;
 - c) that in the planning phase the key enablers are stated clearly, any risks and countermeasures are identified, and adequate review points and performance indicators are included in the implementation plan;
 - d) that in the implementation phase a review of enabler delivery has occurred before relevant aspects of the change are implemented, or where countermeasures have had to be called on, there has been adequate review and assessment of the original plan.
- In seeking to provide this independent assurance the assessor will resolve any concerns in consultation with the Proposer, with as little bureaucracy as possible consistent with the process being auditable.

Assessors should consult the relevant experts in support of their assessment or to ensure that such consultation has taken place during the production of a change proposal.

PROPOSERS

Proposers need to ensure that the relevant experts (including ED and OD) are consulted in drawing up their change proposals.

Proposers need to address staff morale in their Change Proposals / Implementation Plans for all changes and seek expert advice (via the Director of HR) where appropriate.

Proposers need to keep assessors informed of reviews during implementation to satisfy them that enablers are being delivered or countermeasures are invoked.

When addressing the potential nuclear safety risks, proposers should identify direct and indirect risks. This is particularly important where the change is in a Business Area that may also have an indirect impact on a Nuclear Safety Critical Area risk and hence bring the change within the requirements of LC36.

THESE DETAILS NEED COMMUNICATING/ADDRESSING BY PROPOSERS AND ASSESSORS. THIS WILL BE DONE VIA TRAINING.

Annex III

MANAGEMENT OF CHANGE: EDF NUCLEAR GENERATION GROUP, FRANCE

Management of change origin

To face an everchanging world, seven success oriented values were created at EDF company level in 1999:

- customer: our engine to improve
- performance: every where, for everybody
- commitment: succeed with the whole staff
- diversity of people and knowledge
- acknowledgment of staff members
- solidarity: service offered to customers and people
- quality of life: environment protection by everybody.

In application of this company strategy, the nuclear generation group defined, as other groups did, a New Leap Forward, based on a safe, clean, cheap and on time energy generation.

Selected management principles:

Eight management principles are stated for nuclear generation group:

- (1) Results oriented approach: balanced results (safety, radiation-protection, capability factor, costs), Stake holders satisfaction (customers, contractors, staff, public), safety first
Example: Performance assessed on all stakeholders satisfaction
- (2) Customer oriented approach: our customers settle our future
Example: Nuclear operation matches grid needs
- (3) Leadership and vision constancy Managers maintain a coherent and clear vision – day after day – and show it.
Example: Company ambition is implemented and explained at all levels of organization
- (4) Staff involvement and learning
Sharing EDF values, mutual confidence, empowerment, initiative and creativity.
Example: Performance oriented team-building project. Manager: supports and controls
- (5) Learning, innovating and improving process
Sharing knowledge in a continuous improvement culture to higher performance.
Example: Team self-assessment of practices and team solutions
- (6) Partnership approach winner-winner
Confidence, sharing projects, and common objectives, connect stakeholders
Example: Multi services contractor, Training institute
- (7) Responsibility with respect to community. Ethical approach wider than regulation compliance
Safe operation 'is' this principle:
Example: training of young people, dose and waste reduction
- (8) Process & facts based management
Processes managed, facts documented, from stakeholder wishes to their satisfaction for permanent improvements
Example: "Waste control process" from operation activities to outside shipment.

Management of change implementation

Deployment at all management levels within 3 years (comprehension & contribution – individual and team)

“Management par la Qualité”, is starting from now, for everybody and for a long time, local and national review of what is going on, Identification of links with TQM principles, Contract draw local / corporate implementation...

Speed up implementation by seminars and practical training, experiment sharing and coaching

Safety management coherent with human resource management, who is in charge/decides about safety, positive control culture, bottom-up alert and debate promoted on requirements vs. ambition.

Starting application

For implementation efficiency, ten priorities were stated during summer 2000 with for each of them:

- a sentence on the strategic objective
- expected and desired results
- responsibilities for the implementation
- responsibilities for the control of improvements.

These ten priorities are the basis of the contract clauses between local and corporate levels and address:

Management of change implementation, safety efficiency, quality in operation, environment and radiation protection, skill (performance improvement and recognition) change of operation organization, on time electricity generation, cost reduction, performance oriented technical support, technical anticipation.

Conclusion

This management of change approach is comprehensive, consistent at all levels of management and supported with a strong internal communication. Short term improvements are expected in the results, but this human investment is based on a long term approach for better results and better ways of achieving them.

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Consultants Meeting

Vienna, Austria: 10-12 July 2000, 6-8 December 2000

Advisory Group Meeting

Vienna, Austria: 4-6 December 2000

