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EVALUATION AND ASSESSMENT CRITERIA FOR MANAGEMENT OF CHANGE

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Summary: This report summarises the findings from the two phases of LearnSafe with respects to the recommendations related to the management of change. The intention of this report is that it can support the nuclear power plants with their processes of modification and change by suggesting evaluation and assessment criteria. This report is the deliverable D7 of the LearnSafe project.

The report concludes that modification and change at the nuclear power plants are important processes by which continued safety can be maintained. Objectively they provide both a threat and an opportunity, but properly they work in the support of safety. The nuclear power plants have their own internal instructions for how these processes should be carried out. These instructions, together with the more general guidance from WANO, IAEA and OECD/NEA, represent the collected experience from the nuclear power plants throughout the world for carrying out modifications and change.

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1 INTRODUCTION

The LearnSafe project¹ was divided into two major phases of theoretical and empirical investigations. The first phase was devoted to the *management of change* in the belief that the adaptation to changed environmental conditions provides one of the major challenges to nuclear power plants today. The second phase was devoted to *organisational learning*, which is seen as an important process in the pursuit of continued improvement of performance measured in terms of both safety and efficiency.

This report summarises the two phases of LearnSafe with respects to findings and recommendations related to the management of change. The intention is that this report can support the nuclear power plants in the process of modification and change by the creation of evaluation and assessment criteria. This report is the deliverable D7 of the LearnSafe project.

2 MODIFICATION AND CHANGE AT NUCLEAR POWER PLANTS

Modification and change take place continuously at the nuclear power plants.² The main reason for this is that the plants often find new opportunities to improve safety and the economy of the plant. Some of these improvements are triggered by operational experience that has highlighted weaknesses in the technical systems or in the work practices. Other improvements are made possible by the technical development and other innovations. Finally some changes are forced upon the nuclear power plants by ageing and obsolescence of systems and equipment for example.

2.1 Modification and change in general

Carrying out modification and change at nuclear power plants is a delicate task.³ All modifications have to be reviewed very carefully to ensure that they do not violate any important safety principle or other design requirements. It is also important to plan, in detail, the modification process through stages of planning, review, implementation, testing, documentation and follow up.⁴ It is also evident that there is a large spectrum of modifications, which should take different routes depending on their target and scope.

Nuclear power plants have typically developed their own internal instructions for carrying out modifications. One important part of these instructions is to document evaluation and assessment criteria, which are used to select the assessment and review procedures during the modification process. In addition a typical practice is to review a suitable number of modification projects at regular instants to collect and document the experience gained.

¹ The project FIKS-CT-2001-00162 "Learning organisations for nuclear safety" funded by 5th Euratom Framework Programme 1998-2002, Key Action: Nuclear Fission by the European Commission. For additional information see the web-site <http://proxnet.vtt.fi/learnsafe/>, which is open for the LearnSafe partners. The project has also established an open web-site at the address <http://www.vtt.fi/virtual/learnsafe/>.

² IAEA (2001). Managing change in nuclear utilities, TECDOC-1225, July.

³ IAEA (2003). Managing change in the nuclear industry: The effects on safety, INSAG-18.

⁴ IAEA (2003). Maintaining the design integrity of nuclear installation throughout their operating life, INSAG-19.

2.2 Plant modifications

The need for plant modifications typically develop through the analysis of operational experience.⁵ The plants have their own specialised groups of people that analyse their own experience as well as the collected experience from all plants throughout the world. These groups generate list of issues that may be necessary to consider and these lists are further handled in normal decision making processes at the plants.

The approach towards modification varies from country to country depending on national regulation and company policies. Some plants are very proactive in their approach to deal with any problems, which have been detected in plant safety as well as plant availability and maintainability.

New regulatory requirements have initiated many plant modifications, such as for instance various provisions to prevent and mitigate severe accidents. Another large group of forthcoming modifications are connected to the modernisations of the I&C systems at the nuclear power plants, which are due to a growing obsolescence of analogue I&C.⁶

2.3 Organisational change

Organisational changes made by nuclear power plants may also warrant careful considerations.^{7 8} A number of management innovations utilised within conventional industries, have aroused interest within the nuclear industry. One such innovation is connected to process orientation in work processes, which aims at introducing a smooth flow of errands over organisational borders.⁹

Another is outsourcing of certain activities to allow a better focus on the core business. A recent study suggests that external contractors are used for 1) periodic, labour-intensive tasks, 2) tasks that requiring specialist know-how that external contractors are supposed to be able to maintain and develop more cost-efficiently, 3) tasks that are regarded as suitable for competitive bidding, and 4) various support tasks that are not at the core of plant operations (e.g. information systems support and development).¹⁰ These are two examples on how the nuclear industry is trying to use practices that have been used by the conventional industries. The track record shows however that these management innovations have reported both successes as well as failures.

It is evident that the nuclear industry has to adapt to new operational conditions, which implies renewal. Without such an adaptation process it is difficult for the industry to stay competitive. In response to various problems which were encountered the regulators in some countries now require notification in the case of major organisational changes.¹¹ Experience from countries where this requirement has been put in force show that it has sometimes been

⁵ Wahlström, Maimier, Jones, Rollenhagen (2003). Feedback and analysis of operational experience in the nuclear industry, PLEM – LearnSafe – W203.

⁶ IAEA (2004). Managing modernizations of nuclear power plant instrumentation and control systems, TECDOC-1389, February.

⁷ Jones (2003). Licence Condition 36: Control of Organisational Change, PLEM – LearnSafe – W201.

⁸ Wahlström, Rollenhagen (2003). Procedures for organisational change in Finland and Sweden, PLEM – LearnSafe – W202.

⁹ Wahlström, Andersson, Luhta (2003). Quality activities, operations management and process orientation; experience from a benchmarking exercise, PLEM – LearnSafe – W004.

¹⁰ Kettunen, Reiman (2004). Outsourcing and use of contractors within the nuclear industry (in Finnish, Ulkoistaminen ja alihankkijoiden käyttö ydinvoimateollisuudessa) VTT Research Notes 2228.

¹¹ NEA/CSNI (2001). Regulatory aspects of management of change; summary and conclusions, NEA/CSNI/R(2002)20.

difficult to agree on what such notification should contain and how the regulator should review it.

2.4 Adapting to changed operational conditions

An efficient operation of any industrial facility requires that there is continuous adaptation to changed environmental condition. This implies that the nuclear power plants are following their operation environment to detect early trends of change to be able to react in a pre-emptive manner. This monitoring is closely connected to the processes of strategic planning as exercised at the nuclear power plants.

A prudent approach to the strategic planning implies a continuous monitoring of the environment, including trends in the technical development, political support and opposition, skills and expectations within the work force, etc. It is also important to follow various mechanisms of deterioration such as wear and tear, ageing, forgetting, etc. According to data collected in the LearnSafe project one of the biggest challenges is related to human resource management. Only a proactive approach to changes in the environment can provide management with enough time for thoughtful responses.

3 ASSESSMENT CRITERIA FOR MODIFICATIONS AND CHANGE

Before a modification or change is implemented at a nuclear power plant, it is important that it thoroughly assessed. The criteria used in this assessment are typically safety impact, other impacts, scope, costs, needed resources, time schedules, etc. In this assessment the intent is to create a consensus that the modification is possible, necessary and worth while to carry out.

3.1 Safety impacts

In a selection of criteria for assessing modification and change, the possible safety impacts are evidently the most important. The need for a very comprehensive approach in this regard is understood by the fact that the plant and the work practices in use are the result of very deliberate design efforts. Design decisions typically build on each other, which means that a change in the design should go back to the point where this design decision was made. After that it is at least in principle possible to reconsider all down-stream decisions. In practice this is never possible and a more practical approach would be to use the plant design base to review possible design principles or requirements that may be violated by the new design. If such violations are not found the assumption is that the design modification is possible at least from a safety point of view and the modification proposal can be further assessed also from technical and economic points of view.

To support a graded approach to the modifications, they are usually classified with their expected impact on plant safety. Sometimes this classification is relatively easy to do, because systems and equipment are safety classified from the beginning. Other times the safety impacts are more difficult to assess.

3.2 Other impacts

Safety is on many occasions a guiding principle when modifications are made, but it is seldom the only one. The impacts on plant availability and maintainability are also important criteria that are used to weight the need for modifications. Plant availability and maintainability are furthermore often directly related to plant economics, which means that a cost benefit consideration can be used to assess the need for a specific modification.

In assessing the need for a modification it is important to state and write down the criteria used in the decision making as accurately as possible, because this is important information which will be used when the modification is reviewed at a later date to allow learning from experience to take place. Finally it is important to assess modification process itself, i.e. how the intended goal can be reached in terms of qualification of components and contractors, specification of installation, testing and commissioning plans, training of operators and maintenance staff, and updating of plant documentation.

4 SOUND PRACTICES IN THE MANAGEMENT OF CHANGE

Many sound practices for the management of modifications have been given in various connections. The instructions for carrying out modification at the nuclear power plants also have a collected body of experience. The instructions are typically somewhat detailed and are therefore not described in this document. The evaluation and assessment criteria given below are more generic with the intent of demonstrating the rationale behind the suggestions formulated in short statements.

4.1 Planning and implementation

The planning and implementation of any modification and change is the most important phase. It actually breaks down in more detail between several decisions in which the modification can be stopped if it is considered unfeasible. The planning and implementation also includes several assessments and reviews where produced documents are scrutinised in detail. Depending on the scope of the modification it will affect smaller or larger groups of people.

When planning for the modification it is important to start the process early and to involve people affected by the modification. It is good practice that modifications are integrated in a larger plan to ensure consistency between various modification projects. It is important that necessary documents are produced early in the modification project to ensure that they are available when needed. Sometimes it is necessary to plan the switch over from pre modification to post modification very carefully. Good planning of a modification cannot be overstressed, however, it is also necessary to understand that some planning has to be done during the modification process.

4.2 Follow up and review

In spite of all planning there are always things following a large modification that were not possible to take care of prior to the modification. When the modification is fresh in mind of people there is often a larger willingness to finalise the outstanding work. It is a good practice to systematically collect experience from modifications. This may in addition to more objective data collection also include interviews with key persons in the modification process.

A common practice at the nuclear power plants is to include an assessment of the modifications made in the periodic safety reviews that are made by the plants with an about ten year's interval. This also provides a possibility, not only to see at one modification at a time, but to see them in context as a logically evolving improvement strategy.

4.3 Some observations from modification and change

Modification and change at nuclear power plants always represent a potential threat to safety, but provided that a prudent modification process is used there should not be any problems avoiding possible pitfalls. In a general assessment of implemented modification project a

common observation is that they take time and effort.¹² Still it is seldom a good policy to try to rush through the modification projects or to cut their budgets to a minimum.

When organisational changes have been made there are some additional observations to be made. There are for example always those who will gain and those who will lose in the change.¹³ This means that there is often a small group of people, which oppose almost any change. It may in such cases be necessary to relocate people, so as not to let a single person have an impact on the entire organisational climate.

5 CONCLUSIONS

Modification and change at the nuclear power plants are important processes through which continued safety is maintained. Objectively they provide both a threat and an opportunity, but properly handled safety problems should be possible to avoid. The nuclear power plants have their own internal somewhat detailed instructions for how these processes should be carried out. These instructions, together with the more general guidance from WANO, IAEA and OECD/NEA, represent the collected experience from the nuclear power plants throughout the world for carrying out modifications and change.

¹² Wahlström, Rollenhagen (2003). Merging two organisational cultures, PLEM – LearnSafe – W005.

¹³ Wahlström, Rollenhagen, Wallin, Dunge (2003). The path to a new organisational structure, PLEM – LearnSafe – W006.