Challenges in the nuclear industry as seen by senior managers and safety experts[1]

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Abstract

The paper discusses present and emerging challenges as seen by senior managers and safety experts in Finland and Sweden. This information has been collected in discussions, structured interviews, group exercises and using questionnaires in recent international projects at VTT. The paper includes a preliminary account of data collected in an EU-project during the spring of the year 2002.

1 Introduction

The nuclear industry today is faced with many challenges, which have their roots in changes in the political and economic environment, changing regulatory requirements, a changing work force, changing technology in the plants, and the changing organisation of nuclear power plants and power utilities. Nuclear utilities and plants have tried to cope with these changes by initiating their own change processes, which in turn have shown to bring in a number of new safety issues connected to organisation and management to be resolved.

VTT has initiated and has participated in several projects that have been investigating the relationships between nuclear safety and organisation and management. These projects have included the ORFA project [1] "Organisational factors; their definition and influence on nuclear safety" funded by the European Union and activities in the NKS/SOS-1 project "Safety Assessment and Strategies for Safety" [2] funded by the Nordic Nuclear Safety Research (NKS). In these projects there has been an ongoing discussion between researchers on one hand and senior managers and safety experts from the nuclear power plants on the other, regarding challenges that have to be responded to on a medium term.

These discussions and perceived needs for more in-depth research [3] led to the forming of a new international consortium, which sought and obtained funding from the Nuclear Fission Safety part within the Fifth Framework Programme of the European Union. This project "Learning organisations for nuclear safety", LearnSafe[2] was started 1.11.2001 and will run for 30 calendar months. It involves a total of 14 partners from five European countries and one international organisation. The first phase of the LearnSafe project [4] will concentrate on *management of change* and the second on *organisational learning*.

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[2] EU Proposal Nº: FIS5-2001-00066 and Contract Nº: FIKS-CT-2001-00162.

2 Research in nuclear power safety at VTT

2.1 The position of VTT within Finland

VTT celebrated its sixtieth birthday in the year 2002 and has with its personnel of 3000+ persons an important position in carrying out applied technical research in Finland. VTT has operations at more than ten locations in Finland of which each of the units have a national mission. The total turn over of VTT is more than 200 M€ of which about one third is coming from the state budget and two thirds from projects awarded in competition with other organisations. Of the approximately 3000 person years of effort about 5% is devoted to the safety of nuclear power.

VTT was heavily involved in the building up of nuclear competency in Finland when the presently operating four reactors at the Loviisa and the Olkiluoto sites were built. VTT has over the years been engaged in several projects supporting both the nuclear power plants and the regulatory authority in Finland. During recent years an increasing amount of consulting in the nuclear field has taken place outside Finland. Today VTT has a function of a Technical Support Organisation (TSO) in the nuclear field. Over the years VTT has seen as one of its important roles to maintaining nuclear competency within Finland [5].

VTT has been involved in human factors research for nuclear safety since the mid-seventies. Early work was connected to the full scope training simulator installed at the Loviisa plant more than twenty years ago. Recent work has involved assessment of nuclear regulatory practices [6], benchmarking of safety activities [7] and studies of organisational factors [8].

VTT went through a major reorganisation in the beginning of the year 2002. The aim with the reorganisation was to form larger organisational units that could better meet the challenges on an international market for applied research. A secondary aim was to build new contacts between the research groups to more efficiently utilise opportunities for multi-disciplinary research. During the reorganisation the nuclear research activities also were brought closer to each other through a portal [9] providing a one window approach to the services in the nuclear field of VTT.

2.2 Nuclear energy research in Finland

The total volume of nuclear energy related R&D is currently about 30 M€ per year of which the nuclear power utilities fund more than one half and the public sector about one third. This funding is now expected to increase, due to the decision in principle in the Finnish Parliament at 24.5.2002 to build a new reactor in Finland.

The publicly funded part of the nuclear R&D has been funded through programmes, which typically have been running for four years. The present FINNUS programme [10] has been running from the year 1999 and it will end at the end of the year 2002. The total volume of the programme is for its duration about 15 M€, which corresponds to an effort of about 120 person-years. The programme has addressed a broad area including risks, ageing and accident phenomena. One of the projects within the FINNUS programme has addressed working practices and safety culture in nuclear power plant operation. This project has recently been looking at safety culture of the regulator [11] and safety culture in maintenance [12].

The planning of a new programme to follow the FINNUS programme was initiated at the beginning of the year 2002 and it is expected that the necessary decisions will be taken in due time for the programme to start from the beginning of the year 2003.

2.3 International co-operation

Finland is a small country and therefore international co-operation becomes a very important strategy in developing and maintaining nuclear competency. Early international co-operation took place within the Nordic Nuclear Safety Research (NKS) and its predecessors [13]. This co-operation has continued over the years and has recently highlighted current developments of safety management within the nuclear energy area on a broad basis, such as safety indicators [14], safety culture [15] and quality systems [16].

In the present programme of NKS that was initiated in the beginning of the year 2002 and will run until the end of the year 2006, VTT is again involved in many projects.

Other international co-operation involves working groups and projects of IAEA and OECD/NEA. These groups have shown to be very important in forming an international contact network through which the preparation of research projects can be initiated. Since Finland joined the European Union in 1994, VTT has actively been in participating in the fourth and the fifth framework programmes of the European Commission. VTT is also involved in the activities, fuel, material and man-machine research of the OECD Halden Reactor Project [17].

3 The LearnSafe project[3]

3.1 The consortium

The consortium has created a unique partnership (cf. Table 1). The group of partners represents a broad experience in nuclear activities that have joined an international consortium aimed at research in issues connected to organisation and management. The research has a large potential for improving both safety and efficiency of the plants. The formation of the consortium indicates a break with a tradition of emphasis mainly on technical aspects of nuclear safety.

Table 1. LearnSafe partners

1	Technical Research Centre of Finland, VTT Industrial Systems (VTT)	Finland
2	Berlin University of Technology – Forschungsstelle Systemsicherheit (TUB)	Germany
3	Lancaster University (ULANC)	UK
4	The Research Centre for Energy, Environment and Technology (Ciemat)	Spain
5	SwedPower AB (SWP)	Sweden
6	UNESA	Spain
7	World Association of Nuclear Operators (WANO)	
8	Teollisuuden Voima Oy (TVO)	Finland
9	Forsmark Kraftgrupp AB (FKA)	Sweden
10	Kernkraftwerk Grafenrheinfeld (KKG)	Germany
11	Kernkraftwerk Krümmel (KKK)	Germany
12	British Nuclear Fuels plc (BNFL)	UK
13	OKG Aktiebolag (OKG)	Sweden
14	Ringhals AB (Ringhals)	Sweden

Some of the partners co-operated successfully in the earlier ORFA project. Due to the emphasis on the nuclear utilities the partners in the ORFA project representing regulatory bodies did not find a position in the present consortium. This does not mean that regulatory bodies are disclosed from an access to generic project results, but they will on the contrary be invited as discussants to LearnSafe seminars. Access to generic project results is also given through a public web-site [18].

The R&D organisations involved in the project have a long interest in issues of organisations and management for safety in nuclear power. Some of them are involved in consulting to the

[3] Learning organisations for nuclear safety, Contract Nº: FIKS-CT-2001-00162 within the 5th Euratom Framework Programme 1998-2002, Key Action: Nuclear Fission of the European Commission.

nuclear industry and have in that position good possibilities to support the technological implementation of project results. The participation of universities also give the possibility to include early results of the project into the curricula for an immediate support of preserving knowledge in the field of safety management of nuclear power. The broad emphasis on safety and efficiency is assumed to provide students with relevant introduction to business activities of the nuclear industry.

3.2 Assumptions of the project

The LearnSafe project is concerned with *organisational learning* within the nuclear industry. LearnSafe partners are aware of that this theme has been studied within the management sciences and that it has been applied in high risk industries such as transportation, chemicals and offshore activities. In starting up the LearnSafe project with funding from the 5th Euratome Framework Programme of the European Union, the partners believe that demands set on the nuclear industry are unique enough to warrant a dedicated study.

Differences as compared with other high-risk industries are for example connected to the following observations:

- nuclear reactors require a continued oversight, because even when they are shut down the residual heat removal has to be functional,
- the societal concerns of risks connected to nuclear power, are larger as compared with actual risk estimates given for instance by probabilistic risk assessments,
- the burden of proof that a nuclear power plant is safe, is larger as compared with other high risk applications,
- the nuclear industry is a global industry in that respect that bad performance anywhere is due to decrease trust and confidence in the industry everywhere,
- even a suspicion that a nuclear power plant is not safe, may be enough to shut it down for extended periods of time.

In assembling the LearnSafe project the assumption was that senior management has an important influence on the safety of their plants. Therefore the focus of the project was selected to be senior managers at the nuclear power plants and at the corporate level who are responsible for strategic choices and the allocation of resources. Observations and discussions confirm that there are many novel demands that are placed on the senior management in the ongoing process of adaptation to changed operational conditions. In this connection it is necessary to understand how safety threats can emerge and grow from seemingly unimportant details, to become problems, which pose *risks to the business*.

3.3 Objectives of the project

The main objective of the project is to create methods and tools for supporting processes of *organisational learning* at the nuclear power plants (NPP). This goal was selected in view of the importance of organisational learning in a process of *change management*. The nuclear industry has during recent years been forced to adapt to many changes in the political and economic environment, changing regulatory requirements, a changing work force, changing technology in the plants, and changing organisations at the power utilities. A sustainable strategy for a continued operation of the European nuclear power plants has to rely on a successful adaptation to all these changes without compromising safety at any occasion.

The main objective can be broken down into secondary objectives. Directly connected to the main objective and focus of the project, nuclear power plants and power utilities have a need for practical methods and tools to support their senior management in processes of organisa-

tional change. Such methods and tools could support an early identification of emerging issues and challenges. Project results could also support ongoing change processes by indicating issues that have to be considered more carefully than others.

The objective of the LearnSafe project is also to create a close interaction of researchers and practitioners to stimulate a search for and an exchange of innovative solutions for organisation and management. It is believed that such interactions within the project can help in finding new solutions, by which safety management activities can become increasingly efficient.

The project is expected to have an important impact through the collection and documentation of managerial experience from the participating nuclear power plants and reflecting that experience in available theoretical understanding from the management sciences. It is also the aim of the project to be instrumental in feeding this information back to the participating nuclear power plants in the form of seminars and training courses for younger managers.

3.4 Research questions

The first empirical and theoretical phase of the project is devoted to *management of change* in recognition that various mechanisms of change bring new challenges to the senior management at the nuclear power plants. This has led to the formulation of the following research questions for the first phase of the project:

- What are the perceived emerging challenges in the management of nuclear power plants?
- How do senior managers cope with emerging challenges in the management of nuclear power plants?
- What improvements could be made in respect to coping with emerging challenges in the management of nuclear power plants?

The second phase of the project is connected to the concept of *learning organisations*. A considerable amount of research within organisational and management sciences has been devoted to investigating how learning occurs and what characteristics facilitate organisational learning. The following preliminary considerations can at this stage give indications for the direction of the research during the second phase of the project:

- What kind of features and attributes characterise learning organisations?
- What are the most common barriers to organisational learning and how can they be removed?
- How are various national and company cultures influencing organisational learning?

3.5 Expectations on the project

One of the expectations on the project is that it should achieve fruitful interactions between theory and practice. The co-operation between national partners provides contributions to the project that enable cross-cultural comparisons. In addition to these interactions, the partners have been encouraged to establish direct connections between each other for in-depth investigations of interesting issues. It is also the intention that early results from the project are adopted in trial applications at the participating nuclear power plants.

Among the participating nuclear power plants there has been expressions of interest to share views on *safety management* between organisations and countries. Interesting questions in this regard, could for example be:

- What activities are seen as important in the safety management at the nuclear power plants and how are they interfaced to other activities?
- Is it possible to set performance standards on safety management activities?

One issue that has been brought up within the project is the possibility for *organisational drift*. This concept is associated to cases where organisations have drifted into unacceptable regions through a series of decisions, which may have been rational in the small, but when taken together has proven to be pernicious. Interesting questions are then under which conditions such organisational drift may occur and what indicators may be used as warning signals.

One important result of the LearnSafe project is expected to be a collection of good practices. In their most generic form such practices may even be called *organisational safety principles*, to correspond to similar technical safety principles such as the defence in depth principle and the single failure criterion. If organisational safety principles could be identified, they would have many applications. They could for example be used to formulate organisational requirements on safe operation to support analysis and review. They could also provide a basis for developing methods and tools for *organisational self-assessments*.

4 Challenges within the nuclear industry

4.1 What do we mean with a challenge?

Looking up a dictionary definition of the word *challenge*, one may find definitions such as
- a summons to engage in a contest,
- a call to fight in a battle or duel,
- difficulty in an undertaking that is stimulating to one engaging in it.

These definitions fit quite well into the situation where the nuclear industry is today. There have been many changes in the political and economic environment, in the regulatory requirements and in the work force available at the labour market, which pose a challenge to approach. Some of these challenges have been approached by introducing new technologies and by restructuring organisations and ownership at the nuclear power plants and power utilities. These strategies have in turn brought in a series of new challenges for senior managers to consider.

4.2 Challenges in a cause and consequence relationship

Challenges are seldom issues that can be approached and coped with in isolation. They are more often complex issues with a multitude of causal relationship, which can be approached at various levels and within different time frames. To create efficient coping strategies for approaching the challenges the senior management at the nuclear power plants have to have a kind of relational model of how the issues interact. In its most simple form one could consider one single step in a causal chain and speak about *preconditions* for or *precursors* to *conditions* or *events*. A condition or event may in turn have a number of *consequences* that have to be taken into account. Using this simple model to trace relationships between various challenges one can immediately see that a challenge issue may be either a precondition or precursors to another challenge and that actions to cope with a certain challenge may have a number of other challenges as their consequence.

Challenges may also be considered according to a dimension ranging from general to specific. To give one example, the creation of awareness and understanding in the organisation may be regarded as a very general challenge applicable to many situations. Similarly the selection of appropriate methods and tools for implementing an organisational change can be considered to be a far more specific challenge. On may actually hypothesise that specific challenges can be described using more general challenges.

4.3 Data collection

The data collection for the first phase of the LearnSafe project has concentrated on the processes for the *management of change* at the nuclear power plants. To support the data collection phases a list of challenges (cf. Table 2) was generated within the LearnSafe project based on literature and earlier experience of the partners. This list has been used to stimulate discussions during the data collection sessions.

Table 2. List of challenges as generated by the LearnSafe project

1. Ageing personnel
2. Contractor competency and skills
3. Recruiting young people
4. Motivational problems
5. New regulatory requirements
6. Pressures from owners and higher management
7. Adapting to the role of a skilful customer
8. Public confidence
9. Changes in company ownership
10. Focus on short term goals and performance
11. Deregulation and competition
12. Human and organisational factors
13. Cost pressures as compared to competing energy sources
14. Internal debiting for services
15. Requirements on formalisation and documentation
16. Negative publicity
17. A decreasing number of vendors
18. Differences in national regulatory requirements
19. Handling nuclear waste in a short term perspective
20. Asset management when there are multiple owners
21. New technologies
22. Loss of confidence in national and international regulators
23. Diverging views between regulator and utility
24. Ageing plants
25. Decommissioning of plants
26. Terrorism and sabotage
27. Dissimilarities in regulatory philosophy by different authorities
28. Maintaining nuclear competency
29. Changing societal priorities

The following groups of people have participated in the data collection so far:

- experts (nuclear safety, occupational safety, regulators),
- utility top management (vice-president nuclear, chairman of the board),
- upper nuclear power plant managers (members of the senior management group at the nuclear power plants),
- multifunctional managers (operation, maintenance, technical, quality/safety, radiation protection, chemistry, human resources management, training)

The first group participated by judging the list of challenges as generated by the LearnSafe project according to two dimensions *importance* and *time frame* of influence. For the second group semi-structured interviews were used and for the two last groups Metaplan sessions [19] were used to collect challenges and to structure them into clusters.

4.4 Preliminary results

The following results are based on results from Finland and Sweden at a point in time when about 90% of the data have been collected. The results given are not based on a thorough analysis, but they may still reflect some interesting qualitative impressions from the material.

The list of challenges collected by the LearnSafe project can be considered to have covered the challenges as seen by different persons within the industry reasonably well. Some of the issues brought up during the Metaplan sessions enlarged the amount of challenges and suggested additional cause consequence relationships. One comment regarding the LearnSafe list of challenges was that they were rather detailed as compared with the more general issues to which managers devote their attention.

The expert opinions from Finland on the LearnSafe challenges were rather similar. The most important challenges were (1) ageing personnel, (8) public confidence, (24) ageing plants, (28) maintaining nuclear competency, and (21) new technologies. The challenges of (13) cost pressures as compared to competing energy sources, (22) loss of confidence in national and international regulators, (25) decommissioning of plants, and (19) handling nuclear waste in a short-term perspective were seen as rather unimportant. The most urgent challenges to ap-

proach were (10) focus on short-term goals and performance, (15) requirements on formalisation and documentation, and (21) new technologies.

The utility top management identified issues related to competency, deregulation, ageing and renewal of the plants and management of safety as the main challenges. They were rather unanimous that the perhaps largest challenge to the nuclear industry was to maintain competency in the nuclear field world-wide. All saw a new coming of nuclear power, but they were afraid that this might take time.

The Metaplan sessions have generated large data sets and the final analysis of the material will be started when the data collection has been completed. Some qualitative observations can however be made already at this stage. Firstly there are large similarities in the material. Secondly the clusters and the challenges seem to fall well within the following larger meta-clusters:

– regulator,
– ageing, modernisation and new technology,
– economy,
– competency,
– management and organisation,
– society.

4.5 A set of generic challenges

In an attempt to identify generic challenges, which can be seen in the material, one can use the balances (cf. Table 3) as identified in the ORFA project. The balance between economy and safety can clearly be seen in the responses. This balance can be seen as an instance of the balance between costs and benefits, which means that and the management has to take a stand on how much it is worth to spend on certain issues of importance. In the regulatory domain there seems to be a need to balance between traditions and renewal, which is connected to a regulatory hesitance to new organisational structures.

Table 3. Balances in management.

traditions – renewal
formal – informal
self-confidence – willingness to listen
co-operation – competition
centralised – distributed
discipline – flexibility
focus on details – maintaining an overview
monitoring and reporting – confidence and accountability
short term versus long term optimisation
specific/practical – generic/theoretical

The balance between co-operation and competition for the nuclear utilities has shifted with the deregulation and this may be necessary to take into account when the challenges are addressed. There has been earlier decentralisation of the nuclear organisations, but it now seems that the pendulum has swung to favour more centralised organisational forms. The balance between discipline and flexibility has been addressed in the renewal of the quality systems, where at the same time the need for providing a better overview has been identified.

Fears have been expressed that ownership and responsibility may be diluted in the organisational changes and this may suggest to give due attention to the balance between monitoring and reporting as compared with confidence and accountability. Fears have been expressed that cost pressures may introduce short-sightedness in decision making at the plants. This could be counterproductive for the nuclear industry as a whole, when taking into account the need for a long-term outlook in investments within both plant renewal and personnel competency.

5 A set of strategies for coping with the challenges

5.1 Regulator

Issues addressed in this connection were related to new regulatory requirements that are under development. Another issue that was brought up is related to the role-play between the regulator and the nuclear power plants. Some also touched on the fear that the focus of the regulator may shift away from issues, which are relevant for safety only to bring in formalities where they are not considered necessary. In this connection it is also necessary to note that it is not only the safety authorities that place requirements on the nuclear power plants, but also other authorities, issuing requirement on environmental protection, labour safety, competition, etc.

One issue mentioned in this connection is that it has been somewhat difficult to agree on a suitable safety standard for old reactors with due consideration to the costs involved in bringing them to modern standards. Another problem is connected to the licensing of programmable instrumentation and control systems, where considerable difficulties have been encountered.

Many persons especially in consideration of the fact that nuclear utilities in Europe are competing on the same markets brought up the need for a harmonisation between regulatory requirements. The establishment of the Western European Nuclear Regulatory Association (WENRA) was greeted with satisfaction in this connection. Generally it was believed that a better international co-operation in comparing and assessing systems of requirements could help in coping with some of these challenges.

5.2 Ageing, modernisation and new technology

The issues in this connection are related to the need to follow and predict when certain components have to be exchanged. This will require careful optimisation of the remaining age of main components. This will also involve the introduction of new functions using advanced instrumentation and control systems. An increasing obsoleteness of certain components has forced plants to modernise. Sometimes the modernisations have been connected to safety requirements, which have made it cost effective to exchange old materials with new ones.

These issues were seen as important, but to be relatively well under control. There are efficient methods and programmes for following the ageing of major components. Many plants have voluntarily initiated large modernisations with the aim of extending plant lifetime far beyond forty years. One major difficulty seems to be to find agreeable methods for licensing of programmable instrumentation and control systems.

5.3 Economy

Deregulation of the electricity market in Europe has brought additional pressures to decrease cost at the nuclear power plants. This pressure is sometimes associated to owners and sometimes to the higher management of the companies. A continued safety relies on conservative decision making, which also builds trust and confidence between the nuclear power plant and the regulator. Many persons brought up the danger that a conflict between economy and safety may emerge, but other pointed to the need for a good economy in maintaining the safety of the plants.

The deregulation in Finland and Sweden occurred in 1995-96 and that time was characterised by a large surplus of hydropower in the Nordic system, which putted more strain on the adaptation process. It seems that some of the plants have had larger difficulties than others in their adaptation to the deregulation of the electricity market. Most people expressed however a sat-

isfaction with the situation today but pointed also out that the issue requires continued efforts. No plant had so far experienced any difficulties in getting their investment programmes accepted by their boards.

5.4 Competency

Competency was a theme that was brought up in all places. One concern was connected to maintaining own competency at the nuclear power plants especially in view of the forthcoming generation changes that are foreseen at many plants in Europe. One special challenge in this connection is to select and train senior managers for the nuclear industry. A second issue was connected to the competency of vendors and contractors and some persons saw a possible increase in prices if competition would disappear. Some concern was also voiced connected to the competency of regulatory bodies. More generally many felt that maintaining of competency in the whole nuclear field is the largest challenge facing the nuclear industry today.

At the plants the competency issue has been addressed in many ways. Firstly all plants have initiated projects to establish an inventory of their own competency together with a projection of the expected situation in the future to identify possible gaps and the need for actions. One organisation has even brought in the average age of the personnel to be followed as a performance indicator.

Especially the competency of major vendors was seen as problematic. There have been recently mergers among them and some persons expressed a satisfaction with this concentration of resources, but other expressed a fear that it may lead to a hollowing out of the competency in a longer run. The competency of contractors were seen to be somewhat easier to cope with and some nuclear power plants for example systematically employ contractors in long-term contracts to enhance a development of their competency and skills.

5.5 Management and organisation

Developing management practices and organisational structure was seen as major challenges. Some expressed a fear that frequent organisational changes may tend to dilute ownership and responsibilities. Abating complacency was also seen as an important challenge. The special challenge of maintaining personnel alertness, also when the plant performance is good and has been good for many years, was mentioned. Many comments regarding the importance to maintain a sound safety culture were given in this connection.

Many of the nuclear power plants have gone through organisational changes as one strategy to become more efficient. Many indicated that they had been successful in their rationalising efforts. Some plants have outsourced some peripheral activities, but that strategy has not been that common in Finland and Sweden.

Many plants have implemented major revisions in their quality systems, partly with the intent to become more efficient and partly to make procedures and practices more transparent. In the transfer towards more integrated systems for activity planning and implementation, which many of the nuclear power plants have taken into use, the so called balanced score card concept for their goal definition and follow up has been implemented.

5.6 Society

The need to maintain confidence among the local and national public was mentioned by many. The importance of openness in the communication with media was stressed in this connection. Political preconditions for instance as seen in taxes can have a large influence on many of the

other challenges and they can easily makes a difficult situation worse. The need for taking into account the possibility of terrorism and sabotage was also considered in this connection.

The public trust and confidence in the nuclear power plants in Finland and Sweden seem to be well established. Polls for example from Sweden show a far higher support for nuclear power from the public than from the political establishment. Many of the nuclear power plants conduct regular polls to assess the public opinion both regionally and nationally. The plants have good relationships with regional authorities to provide information and to support various local activities. The political gauntlet in the premature shutting down of one of the plants in Sweden was considered grotesque and not in support of safety of the rest of the plants.

6 Conclusions

The nuclear power plants today are faced with many challenges. It is apparent that these challenges are matters of continuous management attention and that various approaches to address them have been taken. A satisfactory resolution of some of the challenges may require a coordinated action from several nuclear operators, but the competitive situation today may make such actions more difficult. In a consideration of the challenges facing managers at the nuclear power plants today it is evident that they have increased the burden on people. Fortunately at the same time new ways to structure work, new tools and new management practices have been found to make the use of resources more efficient.

Initial results from the LearnSafe project support the conclusions from earlier projects that research addressing issues connected to management and organisation is important. Discussions with senior managers also tend to confirm that they have a very large amount of issue they have to tend to. At the same time earlier research has demonstrated that incidents seldom are the consequence of some major mistake or error, but rather the outcome of a large number of seemingly minor issues that are combined to create an unlucky coincidence. This would actually imply that senior management has to approach all details with a similar rigor to ensure that no hidden deficiencies are brought into the systems.

Discussions within the LearnSafe project have tended to confirm anecdotal evidence that senior managers have a large influence on organisational culture. It is therefore important that they are aware of the impact minor slips can have and that such are reacted on with a necessary force. By large it is hoped that the LearnSafe project will have a contribution to the awareness and understanding, which is needed to maintain a good safety record. This safety record is a precondition for a continued public support of nuclear power and therefore also an important component in an efficient use of available energy resources in Europe.

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