The LearnSafe project; a three year perspective

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Abstract— **The paper gives a brief overview of the LearnSafe project that was running between fall 2001 and spring 2004. Five research organisations, twelve nuclear sites and one international organisation participated in the LearnSafe project, which was funded by the EURATOM part within the fifth Framework Programme of European Union. The paper focuses especially on the issues discussed in the LearnSafe project and on lessons learned. The paper serves at an introduction to the special session on Organisational learning and learning organisations – the LearnSafe project three years after.**

I. INTRODUCTION

The LearnSafe project (Learning organisations for nuclear safety[1]) was started in 2001 and it was successfully completed in 2004. The project investigated processes connected to management of change and organisational learning at nuclear power plants across Europe. The focus of the project was on tasks and activities of senior managers, who are responsible for strategic choice and resource allocation. This focus was selected due to the importance of senior management decisions, approaches and attitudes, which have an influence on the safety and economy of the plants.

The LearnSafe project built on an earlier project ORFA [1] that also got its funding from the European Union. A comprehensive report of the LearnSafe project has been published [5] as well as a few more targeted reports (cf. [2], [3]).

After the end of the LearnSafe project various initiatives were taken to continue the work, but none of the initiatives for a larger co-ordinated international project was successful. However, the main partners have all been continuing in their national setting with research and consulting within the broader area of the LearnSafe project. The 2007 IEEE HPRCT Conference in Monterey provided an opportunity for a follow up of this experience in a special session. This paper is an introduction to the session in which the main partners of the LearnSafe project come together to reflect on results from the project and how they have been used at the nuclear power plants and in their own work.

[1] The LearnSafe project "Learning organisations for nuclear safety" was funded by 5th Euratom Framework Programme 1998-2002, Key Action: Nuclear Fission during the years 2001 to 2004 by the European Commission under the contract FIKS-CT-2001-00162. Additional information from the project can be obtained at the web-site http://www.vtt.fi/virtual/learnsafe/.

II. AN EMPIRICAL STUDY

The LearnSafe project was an empirical study, which was executed in two main phases. The first phase used questionnaires, interviews and data collection session to build an understanding of the challenges that managers perceive in the operation of nuclear power. The second phase investigated how the concepts of organisational learning and learning organisations are understood and what kind of facilitators and hindrances managers see in applying the concepts at their plants.

A. Management challenges

The first data collection phase of the LearnSafe project focused on challenges that managers see in the operation of nuclear power plants, how they cope with them and what improvements can be made in their responses to the challenges. The collected data set consists of nearly 800 statements on what more than 200 managers at 10 nuclear power plants in five countries and at one international organisation see as challenges. The data set was analysed with a novel method based on fuzzy set, which was developed within the LearnSafe project. The collected statements were assigned memberships to five fuzzy sets, *people*, *procedures*, *technology*, *money* and *environment*, after which they were ordered into eight clusters depending on their memberships.

1) Economic pressures

This cluster is characterised by high loadings in the money and the environment dimensions. In this group of challenges, the competition caused by deregulation in the electricity market was one of the major themes. The competition on the market has led to the need for cost reductions and adaptations to new conditions. According to the responses the challenges are related both to national differences and to differences between forms for electricity production, i.e. taxes and subsidises. The need to maintain competitiveness on the market has increased corporate pressures on nuclear power plants, which sometimes lead to conflicts between costs and safety.

2) Human resource management

This cluster is characterised by a high loading in the people dimension. In this group of challenges the main concern was directed to how to maintain the needed competency at the nuclear power plants. Many comments were concerned with the age distribution of personnel and possible early retirements. Concerns were also expressed that recruiting of new personnel would be more difficult in the future. One underlying theme in this group of challenges was connected to the need for maintaining the specialised nuclear competency.

3) Nuclear know-how

This cluster is characterised by high loadings in the people and the environment dimensions. This group of challenges addressed in particular the decreasing number of vendors. A concern for the competency of contractors and other suppliers was also expressed. The problem of maintaining the specialised nuclear competency was voiced, but with a different direction as compared with the challenges as described in the previous section. There was a large agreement that nuclear power plants will become increasingly reliant on the availability of external competency support, but it seems difficult to predict how the availability of various services will develop.

4) Rules and regulations

This cluster is characterised by high loadings in the environment and the procedures dimensions. Many challenges in this group addressed new regulatory requirements. Furthermore, the excessive need for bureaucracy and paperwork was also considered a key issue. Many of the collected statements identified the need to maintain open communication with the regulator. Some of the challenges were questioning regulatory focus together with an expressed fear that regulatory action in some cases might be counterproductive for safety.

5) Focus and priorities

This cluster is characterised by a high loading in the procedures dimension. This group of challenges relates to management focus and priorities. Management focus and commitment together with a sound use of resources were mentioned. The challenges in this group referred to the need to keep procedures, instructions and documentation up to date. Some comments could be interpreted as indicating an excessive focus on formalities. Organisational change and their consecutive influences were also brought up in this connection.

6) Ageing, modernisation and new technology

This cluster is characterised by a high loading in the technology dimension. This group of challenges made reference to the need for maintaining plants in a good technical condition. Many comments focused upon the gradual ageing of the plants. This trend can be met in modernisation projects, which themselves have an impact on several other challenges. Many comments also made reference to new technology, which should be taken into use.

7) Public confidence and trust

This cluster is characterised by a high loading in the environment dimension. This group of challenges was concerned with the societal acceptability of nuclear power. Some comments made reference to the irrationality of anti-nuclear attitudes while others pointed to the hostility in the mass media. According to the responses there are also public misunderstandings that are necessary to combat. There were comments concerning distrust in local or regional authorities. Several comments did explicitly take up the global position of nuclear power inherent in the statement 'an accident anywhere is an accident everywhere'.

8) Organisational climate and culture

This cluster is characterised by a high loading in the people dimension. Motivation and attitudes were considered to be the major issue addressed within this group of challenges.

Comments on safety culture were also part of this group together with the need to fight complacency. There were a few comments in this group related to mental and emotional strains. Many respondents made reference to organisational and human factors.

B. Learning organisations

The second data collection asked the questions what kind of features and attributes characterise learning organisations, what the most common hindrances to organisational learning are and how various company sub-cultures influence organisational learning. The collected data reflect the views of more than 100 managers in nearly 1000 statements. The data was analysed with the same methods as the data collected in the first data collection phase.

1) Objectives, priorities and resources

The statements in this cluster were all related to objectives and the need to prioritise in allocating resources. Among the facilitators a long term outlook, clear goals and policies, an ability to prioritise sound activity planning, etc. were mentioned. In this cluster lack of time, conflicting goals and concurrent activities were seen as the most important hindrances.

2) Formal systems and practices

The statements in this cluster were related to the management system in use. Circulation of people within the organisation, communication channels and meeting practices were seen as important facilitators. Hindrances mentioned were organisational hierarchies, formal meetings and missing follow up of available experience.

3) People's attitudes and orientation

Attitudes and orientation of the staff were addressed by the statements in this cluster. The facilitators mentioned in this connection were ability to co-operate and learn from experience, skills in sharing knowledge and a feeling of participation. Among the hindrances issues such as resistance to change, lack of motivation, complacency and apathy, were mentioned.

4) Corporate culture and traditions

The statements in this cluster were interpreted as characterisations of corporate culture and traditions. The facilitators include statements such as an encouraging organisational climate, well functioning safety culture, team work and a willingness to listen. Statements on hindrances mentioned protection of turf, group thinking, inadequate traditions and silencing of criticism.

5) Communication, guidance and appraisals

The statements in this cluster showed a rather large span, which still relatively well can be characterised to fall the general area of internal communication. Issues seen as facilitators were the capacity to adjust, promoting of top-down communication and ease of initiating changes. Hindrances mentioned were lack of guidance, overload and lack of information, difficulties in handling feedback and shortcomings in following organisational lines of command and reporting.

6) Maintaining touch and focus

Statements in this cluster referred to management and leadership. Some overlap with the cluster objectives, priorities and resources could be seen. Facilitators in this cluster mentioned leadership, management and commitment, willingness to learn, doing right things and things right, realism in new initiatives and honesty about expected outcomes. The hindrances brought in issues such as missing decisions and loyalty to decisions, lack of management commitment, lack of time for reflection as well as lack of foresight and fantasy.

7) Openness and trust

This cluster was clearly related to openness and trust within the organisation. In addition the respondents mentioned issues such as team spirit, tolerance of deviation and a willingness to challenge old practices among the facilitators. Hindrances were seen in areas such as resistance to change, entrenched old habits, lack of consensus, enviousness and fear in loosing face.

8) Work community

Statements in this cluster can be seen as characterising the work community. Facilitators in this cluster were humility, visibility of managers, creative thinking, ability to see arguments from two sides, perseverance, and empowerment. Hindrances mentioned were low turnover in staff, reluctance to think in systems, prestige, unwillingness to admit weaknesses and to accept changed conditions.

9) Encouragement and rewards

The statements in this cluster were seen to characterise how the organisation handled encouragements and rewards. Issues seen as facilitators were stable and shared goals, willingness to bring important issues out on the table, endorsing critical thinking, time to meet without an agenda and that the organisation has confidence to decide. Among the hindrances opposition to change, lack of organisational commitment, too large influence of the business culture, lack of variability and the rewarding of talkers and not doers.

10) Adequacy of means and methods

This cluster contained statements on means and methods in a general sense. Facilitators were in this case seen as associated to specific events, roles to be taken in internal discussions and practices to be used in specific situations. The hindrances sorted to this group had a slightly different flavour and were mentioning the hierarchical organisation, hostility towards nuclear, cut and paste engineering and theories that fit poorly in daily practices.

11) Networking and co-operation

The statements in this cluster were seen to characterise the organisational networking and co-operation with external organisations. Among the facilitators contact networks efficient change processes and seminars were mentioned. Hindrances to organisational learning in this cluster were seen among issues such as, devious communication channels, tactical presentation of events, lack of interfaces to real world, ready made thinking models and a difficulty to get information to right people.

C. Overriding issues from the collected data

A general comparison of data from different countries and different organisations show large similarities, although some differences can be noted. The challenges identified have generated various coping strategies, which in large seem to have been successful. The data is also helpful in identifying issues to be addressed by the senior managers at the nuclear power plants both in an operational and a strategic perspective. In the data the following two overriding issues can be identified.

1) Lack of time

The most obvious issue in the LearnSafe data is that people at the nuclear power plants struggle with a lack of time. The reason is that ambitions and resources do not seem to match. A continuous lack of time in an organisation will in the long run have a deteriorating influence on safety due to different mechanisms. The organisation will loose its strategic orientation and people will move into reactive modes of operation. Work will be done in response to pressures felt and not in a planned manner. Things good to know will be given no attention and organisational knowledge will narrow down.

2) Conflicts between economy and safety

In the collected data people gave reference to various conflicts between economy and safety. On a general level no such conflicts should exist, because an unsafe plant can never be economical in the long run. This conflict is however sensed clearly in decisions in the small, which may be interpreted as the result of unsuccessful communication of changed strategies. The deregulation in the electricity market forced the nuclear power plants to change from a culture, where only the best was good enough to a consideration of what is good enough and that change seems to have caused various tensions in the organisations.

III. ISSUES DISCUSSED DURING THE PROJECT

During the LearnSafe project several working papers were written on various subjects. Partly they were stimulated by the collected data and partly by discussions among the partners. The sections below give a brief summary of some of the technical reports that were written during the course of the LearnSafe project.

A. Assessing safety performance

Assessing safety performance is the first step towards an increased safety. Several methods to assess safety performance have been proposed, but no single method seems to emerge. Instead it is important to use different methods to assess various components contributing to a good safety performance. The methods below were considered in various LearnSafe technical reports.

1) Safety indicators

Safety indicators have been proposed as a tool to support safety evaluation at nuclear power plants. A set of well-chosen safety indicators can be of large help both in monitoring safety and in reacting on possible degradations of safety performance. Both utilities and regulators have initiated activities to find suitable safety indicators, but the difficulty has been to find good indicators to use. Performance indicators have the benefit of allowing trending over time, but they may be misleading if they are not anchored in behaviour that is important for safety. In a discussion of safety indicators it is usual to differentiate

between leading and lagging indicators, where leading indicators give indications of future performance and lagging indicators only of past performance.

2) Self-assessments

Self-assessments are an important tool that can be used by organisation to improve their performance. The most important part of a self-assessment is to agree on what should be as good performance and to find suitable indicators to measure actual performance. There are many methods and tools available to do self-assessments. A precondition for self-assessments to be effective is that the organisation is mature enough to do an honest search for areas of improvements. A self-assessment may be initiated either as a part of a continuing activity or when signals of a deteriorating performance are seen. Self-assessments typically contain an analysis part, which is aimed at finding causes for and remedies to a degraded performance. A self-assessment is typically carried out as an internal activity, although external experts may be called in as moderators to the process.

3) Feedback and analysis of operational experience

Nuclear power plants have systems in place for analysing incidents occurring at their plants. The aim of the analysis is to find root causes of the incidents. The analysis of incidents is typically carried out by specialised groups, who have expertise in relevant areas. These groups also have the responsibility to put the experience gained from other nuclear power plants into the context of their own plants. In the analysis of abnormal events it is common practice to select different routes for data collection and analysis depending on the safety importance of the event. If an organisational climate is very much performance oriented, this may lead to unwillingness to report problems. Similarly an organisation that searches for scapegoats when problems occur may create an atmosphere where it is difficult to get a true picture of problems and events.

4) Peer reviews

Peer reviews have become an important part of the safety management practices in the nuclear industry for many good reasons. Firstly it is important to conduct systematic assessments and reviews to collect and evaluate achieved performance and to use results for improving factors that contribute to good performance. Secondly the reviews can contribute to a better understanding of preconditions for a good performance and thus also of signals that should trigger concerns and remedial actions. The peer reviews that are used in the nuclear industry place a focus on safety, because deterioration in safety may carry very large costs through incidents and/or regulatory interventions.

B. Good practices for nuclear safety

One of the deliverables of the LearnSafe project was a collection of good practices. To some extent such lists are somewhat problematic, because they are most often based on opinions that have not been thoroughly verified or validated. The report on good practices was partly based on data collected earlier and partly on the clustering solutions of the LearnSafe data. The report contains nearly 150 short recommendations of which the sections below give a brief account.

1) Risk analysis and designing for safety

The basis of safety of a nuclear power plant is a thorough risk analysis, which is responded to with the means of safety engineering. A good practice is to assess the depth and completeness of the risk analysis to ensure that realistic risk maps are created. The defence in depth approach should not be applied only for technical systems, but also for human and organisational systems. It is a good practice to identify borders of both safe and unsafe operations as accurately as possible. The organisation should be given enough slack in resources to cope with unexpected demands.

2) Operational decision making

Operational decision making at the nuclear power plants is typically exercised according to a line of command and reporting from a responsible manager at the plant through a few organisational levels down to the shift crew in the main control room. It is necessary that this line is understood, documented and used in the day-to-day operation. It is important that regular meetings are held, where managers at all the levels that are participating in the operational decision making meet together and with the managers of important support functions. A good practice is to re-assess all major operational decision on the organisational level above the one, where the original decision was made.

3) Surveys of organisational climate

It is a good practice to use regular surveys of organisational climate. Such surveys are efficient tools to get a general feeling of how people view the organisation. Organisational surveys have the benefit of reaching everyone in the organisation and very high response rates are typically obtained at the nuclear power plants. It is a good practice to use safety oriented questions in the surveys and to feed the results back to organisational units from which they emerged. The organisational surveys can be further supported by other data collection methods to ensure a consistent picture of attitudes and beliefs within the organisation.

4) Safety committees

It is a common practice that the nuclear power plants have safety committees. The composition of the committee and the frequency of the meetings vary, but it usually gets a kind of independency and long term view in taking stand on various issues connected to safety. At some plants the safety committee is seen as a forum that gradually through its decisions creates precedence on issues connected to safety. It is a good practice that the chairman of the safety committee gives regular reports both to the CEO and to the board of the nuclear power plant.

5) Safety culture

Safety culture has been one of the buzz words for more than a decade. IAEA has published several reports to support assessment and development of safety culture. In view of the LearnSafe data, it seems that these explanations and suggestions are felt to be distant and unpractical at the nuclear power plants. However, the data clearly shows that the issues proposed to be considered as indicators of safety culture are well known and discussed at the plants. There is also evidence that there is not only one safety culture, but several variations, which depend on the country, plant and professions within the plant. A suggestion

is therefore that measuring safety culture would be a futile exercise, because the measurements would most likely be unreliable and difficult to validate. A better suggestion would be to use the concept of safety culture in the internal discussions at the plants, where participant would be asked to define how they interpret the concept [4]. It can be assumed that such discussions also would be beneficial in creating a better understanding of work across organisational borders.

C. Organisational change

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

1) Planning and implementing organisational changes

Many organisational changes have been implemented over the nuclear power plants over the years. Most of the changes have been initiated from the inside of the organisation in a search for more efficient ways to operate. Among the changes introduced have been a transfer from unit based organisations to site or even company based organisations. Process orientation has also been introduced to enhance the flows of errands over organisational interfaces. Down-sizing and outsourcing have been used to decrease the total staffing of the plants and so on. A general observation is that medium and large organisational changes always seem to cause upsets of the organisation, which take unexpectedly long times to stabilise. Organisations also have a tendency to slip back in old deficient working practices, if the management does not maintain a proper oversight.

2) Regulatory notifications of organisational change

The regulators in some countries require a notification of organisational changes that may have an impact on safety. In the countries where this requirement is enforced, the nuclear power plants have created their own internal procedures for documenting the situation before the change, describing the intended change and doing a risk assessment of the intended change. The first step in the procedure is a categorisation of the intended change according to a set of selected criteria. When the notification has been submitted, the regulator has a set of options, which is ranging from the possibility that the proposal is turned down, to the acceptance of the proposal as such. A common approach is however, that the regulator asks for additional explanations and clarifications.

3) Future organisations

In assessing the situation of the nuclear industry today and comparing it with a situation some decades ago, there are many new demands that the senior management has to address. The most obvious change is that today it is necessary to do more with less people. This has been possible by major improvements both in organisational practices and in the competency and skills of people. The operational environment of the nuclear power plants has become more complex over the years. The increasing organisational complexity will increase the demands placed on senior managers. They have to have the insight and knowledge to see the large trends in the operational environment of the plants and to be able to translate them into a language that key persons can understand, accept and communicate further down in the organisation. Furthermore they have to have status, integrity and patience in putting themselves at stake as paragons for the whole organisation. Requirements on senior managers seem to have risen to a point, where it is getting less likely that single individuals can be found who have all the needed traits. This suggests that the future will see some sort of collective leadership of persons all with their own roles and responsibilities. This again places new demands on the senior management group as a collective entity in understanding and trusting each other.

D. Achieving sustainable improvements

It is not enough to identify problems, but they have also to be removed to achieve a sustainable improvement. This step in the learning process has shown to be the most difficult. In the LearnSafe project this aspect was investigated only in one internal report, but it was clearly recognised to be the most important issue to consider.

1) Meeting future challenges

A specific research question in the LearnSafe project addressed improvements that could be made to help the nuclear power plant to meet the challenges they saw in a continued operation of the plants. The ideas were collected at the mid-term and the final seminars that were held with all the partners. In considering improvements it was immediately clear that the challenges and the hindrances for organisational learning that were identified, could not be resolved only by the nuclear power plants themselves. Instead important changes would be required among all stakeholders in the nuclear power plant.

In looking for possibilities for improvements it is however clear that the nuclear power plants have the largest responsibility for initiating necessary actions. From a management point of view improvements are often connected to finding better balances between competing objectives such as traditions and renewal. In the search for more efficient work practices it is necessary to remember that an attractive solution may introduce unexpected problems. There is also an evident need to be realistic in planning and not to take the risks in searching for small improvements, which later may bring large costs. Finally it is important that the senior management has integrity and moral stature to withstand undue pressures from the outside.

The utilities have a large responsibility for providing their nuclear power plants with adequate resources and support. The utility managers on a senior level should have a clear recognition of the economic risk, which is introduced even with a belief that a nuclear power plant is not safe. There should also have a good understanding of how the safety is constructed at a nuclear power plant.

Vendors and contractors in the nuclear field have since the mid 1980ies seen a market that was not developing to expectations. However, the present revival of the nuclear industry may provide new opportunities. If a too rapid growth is initiated it may be difficult for vendors and contractors to re-develop the necessary skills, but an open co-operation with the nuclear power plant may help.

Some countries have felt a hardening regulatory climate, which apparently has been triggered by a concern that the nuclear power plants may not be able handle the new situation in a satisfactory way. If this development is taking a path of introducing new prescriptive regulation within the area of management and organisation, it may have a counterproductive effect. A better harmonisation of the safety requirements in Europe is also needed for several reasons. The application of new requirements for old plants is a source of controversy, which may be approached with risk informed approaches. It is also important to understand that the nuclear power plants are governed by national and European competition legislation, which may stifle co-operation between the nuclear power plants within safety matters.

The nuclear industry is supported by international organisations such as IAEA, OECD/NEA and WANO. These organisations have an important position in facilitating an exchange of operational experience between regulators and nuclear power plants. It is important that this communication is open and honest and that the information exchange is never used to create cases against single actors. The international organisations are often at the nuclear power plants seen as distant and not providing very much to the daily routines. It would most likely be beneficial for both the nuclear power plants and the international organisations if this gap would be closed.

Societal attitudes towards nuclear power have changed over the years. This has had influences on several levels, such as career preferences, research funding, education offered by colleges and universities, etc. Populist politicians that have selected nuclear opposition as their only political programme have fostered radical one issue movements and so on. In the future it would be important to recognise nuclear power as one option among others, but that this recognition also includes an understanding of the special requirements placed on nuclear power.

2) Organisational learning

Before any organisational change will move into practice it has to be understood, accepted and utilised. In practice this may take a very long time especially if it implies a profound change in models, beliefs and attitudes of members in the organisation. On a more practical level it implies an unlearning of old work practices and a learning of the new ones. Another observation is that organisational practices cannot be imposed on an organisation, but they have to develop gradually into the day-to-day work to be efficient.

Organisational learning always involves individual learning and there is an ongoing debate on the difference between the concepts of organisational learning and learning organisations. Not going into that debate, it is however clear that senior mangers always have an important saying in all organisational changes. It also seems clear that an organisational change may take very different paths depending on how it is introduced, planned and implemented. A visionary manager may for instance succeed in getting an organisation to turn around, where a more distant and calculating manager would fail.

Organisational learning should be seen as a partly controlled and partly emergent process. This means that there has to be both top-down and bottom-up processes to define new goals and requirements as well to search for new solutions for the concrete work processes. A necessary precondition for this development process to succeed is trust among the members in the organisation. It is also very clear that organisational learning will fail if people do not have the time to reflect and think.

Organisational learning implies that new structures and new knowledge has to be stored in the organisational memory. The organisational memory can be seen to consist of one formal part imbedded in the management system and one informal part reflected in the organisational culture. One specific difficulty with the nuclear field is that all innovations are not necessarily good, but they have to be assessed in a safety analysis and proven in practice before they can be introduced at a large scale.

It seems that theories on organisational learning may provide insight into observed difficulties to achieve sustainable improvements to identified problems. However, the difficulties observed in building well functioning management systems, seem to propose that prescriptive regulation would not be a viable path to take.

IV. THE SEARCH FOR A CONTINUATION

The search for a continuation of the LearnSafe project was initiated before the LearnSafe project was finished. The upcoming sixth framework programme of the European Commission provided a natural platform for the investigations. Another consideration in the search was recognition that a project, which was aimed to have an impact, should be at least formally co-ordinated by the nuclear industry.

A. An expression of interest

The planning of the sixth framework programme of the European Commission was initiated with an open call for expressions of interests. The call also opened new instruments to support research activities and the so called Networks of Excellence were considered to provide both adequate funding and a proper visibility of the activities. A core group with representatives from three major nuclear utilities in Europe was formed to draft the expression of interest for establishing a Network of Excellence targeted at "Strategies and practices of safety management (SafeMan)". The expression of interest was filed by the Swedish utility company Vattenfall in March 2004.

The SafeMan initiative identified the following broad areas to be the target of the Network of Excellence:

- *Leadership and management.* Management and organisation, quality systems, methods and tools for self-assessments and safety reviews, processes of continuous improvements, safety culture, etc.
- *Communication.* Solutions to ensure open and efficient communication internally at the nuclear power plants and between actors within the nuclear field.
- *Processes for decision making.* Structured decision processes for operations, maintenance and plant modifications. Practices to establish authority, responsibility and accountability.

- *Experience feedback and organisational learning.* Benchmarks of event analysis, experience feedback, self-evaluation and continuous improvement processes. Facilitators and hindrances of organisational learning.
- *Competency.* Management of generation change, methods for maintaining and improving competency, leadership training.

B. A co-operation between Finland and Sweden

When it became clear that the European Commission did not consider the proposed Network of Excellence worth to fund, other alternatives were sought. The alternative to apply for a Specific targeted research or a Coordination action project was not considered to be worth the effort, because of the small sums involved and the restricted visibility of such projects. In that situation a co-operative action between Sweden and Finland was sought. A broad involvement of all the nuclear sites in the two countries was seen as interesting, but the initiative was overthrown due to diverging views on the funding structure.

C. The Vattenfall Nordic Generation Safety Management Institute

In the situation Vattenfall in Sweden still saw benefits for the nuclear sites in Forsmark and Ringhals for similar research that was done in the LearnSafe project and the preparations continued. At the end of 2005 Vattenfall Nordic Generation decided to establish a new internal institute the Vattenfall Nordic Generation Safety Management Institute (NSMI), which was given a focus on training and research. The institute was inaugurated in April 2006 and undertook its first major task to build and give a course in safety management for managers from the two nuclear sites and from Vattenfall Hydropower. A second course will be given during the fall of 2007.

D. Present prospects

The largest difference over the three years since the LearnSafe project was finished is the signs of a revival of nuclear power. Surging electricity prices and responses to the global climate change have given nuclear power a new world wide impetus. In Finland one new nuclear power plant is under construction and discussions for the next one have been started. In Sweden the nuclear phase out in 2010 has been removed and the Swedish nuclear power plants will go through extensive modernisations, which also include power upgrades.

These positive views are however somewhat blurred by the difficulties with the construction project in Olkiluoto, which already have caused a one year delay as compared with the original schedule. In Sweden the aftermaths of the incident at the Forsmark plant in July 2006 have demonstrated the importance of a continuing safety and the vulnerability of the plants to hidden deficiencies in their technical and organisational systems. On the other hand these problems have, in spite of their seriousness, not brought in anything that is not already known and at least in principle manageable with a prudent approach to safety.

V. CONCLUSIONS

The LearnSafe project proved to be a successful project in the respect that it generated at least as many new question as compared to the questions that got an answer. However, the project was unsuccessful in that respect that is was not able to convince potential sponsors that a continuation was needed. This problem seems connected to a prevailing view that management and organisation are not issues were research and development can be done. This opinion is directly opposite to the impressions that were collected in the LearnSafe project. An open and trustful atmosphere can create a very fruitful dialogue between researchers and practitioners, where problems and ideas for their solution can be discussed. In that light a separation between theory and practice seems only to prolong a finding of solutions that can help the nuclear power plants in their continuous quest for safety and economy.

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